ISAE2021

54TH CONGRESS
of International Society for Applied Ethology
2nd – 6th August, 2021

Proceedings of the
54th Congress of the ISAE

2-6 August 2021
Online congress

*'Developing animal behaviour and welfare:
Real solutions for real problems'*

Edited by:

Cathy M. Dwyer

Moira Harris

S. Abdul Rahman

Susanne Waiblinger

T. Bas Rodenburg

ΗΘΟΣ

International
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Ethology

ISAE 2021

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Welcome to ISAE 2021 ONLINE!

On behalf of the organisers and the scientific committee, we would like to welcome you to ISAE 2021 ONLINE!

Of course, we would have loved to welcome you to a regular, physical ISAE Congress in Bangalore, India. Unfortunately, the situation with covid-19 did not allow this. We are very happy that we have the option for an online congress and we will do our best to make the experience as similar to a physical congress as we possibly can!

We feel we can offer an exciting program, featuring two (parallel) live stages, where oral presentations and workshops will be hosted live! Individual presentations will also be available on demand, based on your prerecorded presentations. For the poster sessions, PDF files of all posters and (optional) poster pitch videos are available on demand. Also there, we try to add a live element by using a networking tool to visit poster presenters linked to specific scientific sessions and exchange with them directly.

Our live ISAE 2021 ONLINE event space can be found here: https://event.isae2021.exordo.com/. In the event space, you can find the congress program and links to all sessions and activities available. You will be able to access pre-recorded presentations and view posters.

We hope to see you all online for the congress opening and subsequent Wood-Gush Memorial Lecture on Monday 2nd of August at 14:00 Irish Summer Time!

On behalf of the organizing and scientific committee,

Cathy Dwyer

Moira Harris

S. Abdul Rahman

Susanne Waiblinger

T. Bas Rodenburg

Acknowledgements

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Sponsors

Program

Monday, August 2, 2021

Times in Irish Summer Time (UTC +1)

14:00-14:30	**Opening ceremony -** *Stage 1*

14:30-14:55	**Plenary: One Welfare -** *Stage 1*

Don Broom: One biology, one welfare, one health, one stress and some consequences of this view.

15:00-16:00	**Wood-Gush Memorial Lecture -** *Stage 1*

Ullas Karanth: Applying macro-ecology to assist tiger recovery in India

16:00-17:30	**Parallel workshops -** *Zoom*

Workshop 1 - Freeing the hens: applying ethology to the development of cage-free housing systems in the commercial egg industry

Workshop 2 - Getting your manuscript published: real solutions for real problems

17:30-18:00	**Break: Posters on demand or networking in the virtual coffee-room**

18:00-19:30	**Parallel workshops -** *Zoom*

Workshop 3 - Danger of global climate change on animal welfare

Workshop 4 - Ethics for applied ethology and animal welfare research

19:30-20:00	**Break: Posters on demand or networking in the virtual coffee-room**

20:00-21:30	**Parallel workshops -** *Zoom*

Workshop 5 - Open science in applied ethology

Workshop 6 - The economic and welfare impact of sub-optimal mobility and hoof health in dairy cows

Tuesday, August 3, 2021

Times in Irish Summer Time (UTC +1)

8:00-9:30	**Parallel workshops - *Zoom***	
	Workshop 1 - Freeing the hens: applying ethology to the development of cage-free housing systems in the commercial egg industry	**Workshop 2** - Getting your manuscript published: real solutions for real problems
9:30-11:00	**Break: Posters on demand or networking in the virtual coffee-room**	
11:00-12:30	**Parallel workshops - *Zoom***	
	Workshop 3 - Danger of global climate change on animal welfare	**Workshop 4** - Ethics for applied ethology and animal welfare research
13:00-14:00	**Eating with Ethologists: *Zoom***	
14:00-14:45	**Plenary: Welfare of Bovids** ***Stage 1***	
	Maria Vilain Rørvang,: Assessing cognition in cattle - Challenge and possibility?	
14:45-15:15	**Parallel sessions** ***Stage 1*** **Welfare of bovids (1)**	***Stage 2*** **Application of Technology to Applied Animal Behaviour and Welfare (1)**
14:45		*Amelia Redfearn:* Fewer steps to a better ewe: behavioural transitions (BT) and activity monitors to measure lambing activity in Merino ewes
15:00	*Debora Racciatti:* Cattle welfare: a protocol for its assessment in Argentinian feedlots	*Laura Hunter:* Using machine learning to predict sleep stage from muscle activity and heart rate in dairy cows
15:15-15:45	**Break: Posters on demand or networking in the virtual coffee-room**	
15:45-17:00	**Parallel sessions continued**	
15:45	*Megan Woodrum-Setser:* Isolation Box Test: Development and investigation of its potential to measure personality traits of dairy calves	*Richard Mott:* Use of the Polar V800 and Actiheart 5 heart rate monitors for the assessment of heart rate variability (HRV) in horses
16:00	*Emily Lindner:* Effects of early social contact on dairy calf response to initial social grouping and regrouping	*Laura Candelotto:* Validation of a sensor-based behavioral observation method in poultry
16:15	*Anna Schwanke:* Impact of dairy cow personality and concentrate allocation on the adaptation, behaviour, and production of dairy cows introduced to a free-traffic automated milking system	*Julie Johnsen:* Can technology inform decisions about optimized separation strategies of the dairy cow and calf in cow-calf contact systems?
16:30	*Kathryn McLellan:* Free-choice pasture access helps lame dairy cows recover	*Oleksiy Guzhva:* Utilising the power of computer vision for pre-and post-calving monitoring in dairy cattle: simplicity in motion
16:45	*Laura Whalin:* Use of outdoor access by dairy calves	

17:00-18:00	**Posters & coffee - *Virtual coffee room Wonder***	
	Poster sessions 1 & 2 Application of Technology to Applied Aninmal Behaviour and Welfare Welfare of Animals used in Research and Teaching	
18:00 - 18:45	**Plenary: UFAW/ISAE Welfare of Animals used in Research and Teaching** ***Stage 1***	
	Georgia Mason: The impact of conventional housing on stress-sensitive health conditions in laboratory rodents: a systematic review and meta-analysis	
18:45-19:15	**Parallel sessions** ***Stage 1*** **UFAW/ISAE Welfare of Animals used in Research and Teaching**	***Stage 2*** **Companion and Wildlife Management**
18:45	*Aileen MacLellan:* Characterizing inactivity in laboratory mice: What does it reveal about welfare and how can it be objectively assessed?	
19:00	*Agustina Resasco:* Assessing mouse welfare with a novel judgement bias task: validation and application to oncology	*Krista McLennan:* Facial expression in French bulldogs: A preliminary study
19:15-19:45	**Break: Posters on demand or networking in the virtual coffee-room**	
19:45-21:00	**Parallel sessions continued**	
19:45	*Tayla Hammond:* Acoustic playback paradigms alter affective states in juvenile male Wistar rats	*Aiden Juge:* Canine Olfaction as a Disease Detection Technology: A Systematic Review
20:00	*Emma Tivey:* The neural correlates of tickling may differ from those involved in pro-social behaviours	*Erin Ryan:* Non-target Interactions and Humaneness Evaluation of Captive Bolt Traps in Rodent Control
20:15	*Carole Fureix:* Is time spent inactive but awake in the home cage in mice alleviated by antidepressant, by environmental enrichment, and/or by both?	*Selene Nogueira:* Individual temperament traits of chestnut-bellied seed-finches (Sporophila angolensis) affect their exploratory behavior during pre-release training
20:30	*Birte Nielsen:* How can we improve the welfare of animals used in behavioural tests?	*Sayantani Basak:* Unlocking urban animal response to reduced human activity during COVID-19 lockdown
20:45	*Anna Olsson/Sophie Brajon:* Unreliability of pup mortality estimation in laboratory mouse breeding is a consequence of cannibalism but not infanticide	*Courtney Graham:* Identifying the scaredy cat: training improves public rating of emotional states in kittens
0:00-1:00	**Eating with Ethologists: Zoom**	

Wednesday, August 4, 2021

Times in Irish Summer Time (UTC +1)

9:15-10:15	**Parallel sessions** *Stage 1* **Welfare of Bovids (2)**	*Stage 2* **Emotion, Cognition and Behavioural Testing**
09:15	*Kimberly Reuschner:* Preference for ventilation and social contact in pair-housed dairy calves in outdoor hutches	*Charlotte Goursot:* Affective styles and animal welfare
09:30	*Dharma Sahu:* Effect of bull biostimulation on puberty and estrus behaviour of Murrah buffalo heifers	*Sara Hintze:* Going with the flow – balancing skill and challenge for positive welfare
09:45	*Manmohan Singh:* Effect of bull biostimulation on estrus behaviour and reproductive performance of postpartum Sahiwal cows (Bos indicus)	*Christian Nawroth:* Selection for high performance altered behavioural flexibility, but not comprehension of physical and social cues, in goats
10:00	*Vinayak Ingle:* Effect of fence-line and restricted cow-calf contact on behaviour, health and growth performance of Sahiwal (Bos indicus) calves	*Katrina Rosenberger:* Performance of goats in a spatial detour and a problem-solving task following long-term cognitive test experience.
10:15-10:45	**Break: Posters on demand or networking in the virtual coffee-room**	
10:45-12:00	**Parallel sessions continued**	
10:45	*Veenesh Rajpoot:* Welfare status of dairy animals in field conditions	*Lucy Oldham:* Qualitative behaviour assessment of pigs' emotions prior to an agonistic encounter
11:00	*Miroslav Kjosevski:* Social network analysis for associating the social behaviour and attributes of dairy cows	*Alja Mazzani:* Phenotyping addictive-like behaviour towards toys in dogs using a behaviour test and questionnaire
11:15	*Susanne Waiblinger:* Early maternal contact affects dairy animals' spontaneous social behaviour and sociality	*Sara Verlinden:* Influence of cold incubation on later life distress experiences.
11:30	*Guilherme Amorim Franchi:* Dairy cows fed an energy-reduced diet ad libitum during dry-off display behavioural changes indicative of hunger	*Rajashree Rath:* Do Buffalo calves speak through their ears?
11:45	*Laura Shrewbridge Carter:* Do cows want to be outside in the autumn?	
12:00-14:00	**Posters & coffee -** *Virtual coffee room Wonder*	
12:00-13:00	Poster sessions 3 and 4 Companion and Wildlife Management Emotion, Cognition and Behavioural Testing	
13:00-14:00	Poster sessions 5 and 6 Welfare of Bovids Human Behaviour Change for Animal Welfare	

14:00-14:45	**Plenary: Human Behaviour Change for Animal Welfare** *Stage 1*	
	Jean-Loup Rault: Positive animal welfare: bridging the gap or raising inequalities worldwide?	

14:45-15:15	**Parallel Sessions** *Stage 1* **Human Behaviour Change for Animal Welfare**	*Stage 2* **Social Behaviour**
14:45	*Megan Hayes:* Piglets' fear of novelty and humans is influenced by housing systems and human interaction	
15:00	*Noémie Lerch:* Interest in humans: comparisons between riding school lesson equids and assisted-intervention equids	*Denise Hebesberger:* The effects of social interactions on heart rates of group-housed horses

15:15-15:45	**Break: Posters on demand or networking in the virtual coffee-room**	

15:45-17:00	**Parallel sessions continued**	
15:45	*Lauren Finka:* Cats are more affiliative and display fewer signs of conflict and agonistic behaviour when humans adopt a more cat-centric approach during cat-human interactions	*Nikolina Mesarec:* Recurrence of agonistic interactions between littermates after mixing multiple litters at weaning
16:00	*Kristi Benson:* Behaviour modification for dogs who are fearful or neutral at the vet: The Academy's Husbandry Project	*Désirée Brucks:* Do pigs show prosocial behaviours in a group service paradigm? A pilot study
16:15	*Carly O'Malley:* Understanding barriers to refining rodent handling and training techniques amongst laboratory animal professionals	*Simon Turner:* Relationship between dominance hierarchy formation and aggression social network properties in newly mixed pigs
16:30	*Lexis Ly:* Exploring the Relationship Between Human Social Deprivation and Animal Surrender to Shelters in British Columbia, Canada	*Rosemary Whittle:* Maternal fed omega-3 fatty acids have sex specific effects on social anxiety in broiler chickens
16:45	*Lisa Gunter :* Emergency Fostering of Dogs from Animal Shelters During the COVID-19 Pandemic: Shelter Practices, Foster Engagement, & Dog Outcomes	*Frania Shelley-Grielen:* Why can't we be friends? From aggression to affiliation in multi cat households

17:00-19:00	**Posters + wine & cheese -** *Virtual coffee room Wonder*
17:00-18:00	Poster sessions 7, 8 and 9: Social Behaviour Farm Animal Housing and Enrichment Welfare and Welfare Assessment
18:00-19:00	Poster sessions 10, 11 & 12: Early Life and Maternal care Welfare of Working Animals Management of Free-Roaming Animals

19:00-20:15	**Parallel sessions**	
	Stage 1	*Stage 2*
	Farm Animal Housing and Enrichment	**Welfare and Welfare Assessment**
19:00		*Mayamitta Saini:* On-farm assessment of welfare status of dairy animals under extensive production system in Uttarakhand state of India
19:15		*Miguel Somarriba:* The effects of a commercially relevant composite stressor treatment on behaviour and physiological responses in beef cattle
19:30	*Jakob Winter:* Piling behaviour and smothering in British layer flocks: a mixed-methods investigation	*Giovanni Marcone:* Animal-based indicators for the evaluation of sheep welfare on-farm
19:45	*Heng-Lun Ko:* Effect of loose pens with temporary crating on piglet crushing	*Francesca Carnovale:* The effects of heat stress on sheep welfare during live export voyages from Australia to the Middle East
20:00	*Essam Abdelfatttah:* 2019 Survey of antimicrobial drug use and stewardship practices in adult cows on California dairies	*Laura Salazar:* Ad-lib fed finishing pigs perform oral behaviours usually associated with hunger in dry sows
20:15-20:45	**Break: Posters on demand or networking in the virtual coffee-room**	
20:45-22:15	**Parallel sessions continued**	
20:45	*Chantal LeBlanc:* Evaluation of broiler chicken environmental enrichments for animal welfare benefits under commercial field conditions	*Valentine Obiasogu:* Assessment of Cattle Welfare and Ethical Practices in Akinyele Abattoirs, Ibadan
21:00	*Renee Garant:* Accessing elevated tiers in a complex housing system is affected by the presence of intact flight feathers in egg-laying chickens	*Anice Thomas:* Objective determination and quantification of pain associated with digital dermatitis lesions
21:15	*Tessa Grebey:* Daily Morning Litter Restriction: Variation in Dust Bathing Patterns Among 4 Genetic Strains of Laying Hen	*Cassandra Reedman:* The effects of xylazine sedation in 2 to 6-week-old calves disbudded with a cautery iron
21:30	*R. Cyril Roy:* Farrowing crates to open pens for sows: Changes in behaviour and what it means	*Brittany Perron:* The influence of severity of gastric ulceration on horse behavior and heart rate variability
21:45	*Blair Downey:* Long hay provision in a bucket or a novel feeding device reduces abnormal behaviors in milk-fed dairy calves	*Teresa Collins:* An animal welfare assessment protocol for use in the Australian live export industry
22:00		*Emma Dunston-Clarke*: Piloting a welfare assessment protocol for sheep in preparation for sea transport

9:00-9:45	**Plenary: Application of Technology to Applied Animal Behaviour and Welfare** *Stage 1*	
	Bas Rodenburg: Back to the future: moving towards more natural animal production systems, supported by 21st century technology	
9:45-10:15	**Oral session -** *Stage 1* **Application of Technology to Applied Animal Behaviour and Welfare (2)**	
09:45	*Malou van der Sluis:* Automated activity recordings throughout life in broilers: heritability of activity and the relationship with body weight	
10:00	*Mike Toscano:* Identifying movement sub-populations of laying hens within a commercially-relevant aviary: Persistency and implications	
10:15-10:45	**Break: Posters on demand or networking in the virtual coffee-room**	
10:45-12:00	**Parallel sessions** *Stage 1* **Application of Technology to Applied Animal Behaviour and Welfare (2) continued**	*Stage 2* **Welfare of Working Animals**
10:45	*Elodie Briefer:* Towards an automated classification of pig calls according to their emotional valence and behavioural context: a comparison of methods	*Syed Bukhari:* Impact of Mounted Loads on Welfare of Working Equids
11:00	*Lisette van der Zande:* Monitoring activity on an individual level of group-housed pigs using computer vision	*Elena Gobbo:* Real-time aggression activates stress axis but not serotonergic system in police working dogs
11:15	*Martyna Lagoda:* Personality and birth characteristics of piglets reflect patterns of electronic feeder (ESF) use by their mothers	*Fanny Menuge:* Go back to the foster family every weekend: what is the impact on stress of future guide dogs in an ongoing training program?
11:30	*Rick D'Eath:* 3D cameras to measure tail posture on commercial farms: lameness, tail and ear biting are associated with low tails	*Natasha Clark:* Releasing Elephants from Overnight Tethers: Impacts on Behaviour and Welfare
11:45	*Maëva Manet:* Influence of genetics and light during incubation on stress responsivity in young laying hens	*Saber Y Adam :* Welfare Assessment of Working Horses and Their Owners perceive in Fashir and Zalingei, Darfur, Sudan
12:00-13:30	**Parallel workshops -** *Zoom*	
	Workshop 5 - Open science in applied ethology	**Workshop 6** - The economic and welfare impact of sub-optimal mobility and hoof health in dairy cows

14:00-15:15   Oral session - *Stage 1*
Early Life and Maternal Care

14:00   *Prasanna Basavaraju:* Farm animal welfare through adoption of automation rearing system in Dairy Farms

14:15   *Anina Vogt:* Don't forget the dams. Stress reactions of dairy cows to two different weaning and separation methods in cow-calf-contact systems

14:30   *Vivian Witjes:* Effects of on-farm hatching on layer chick welfare and cognitive flexibility

14:45   *Alex Johny:* Use of light cues encourages earlier and increased use of ramps in the early life of laying hens

15:00   *Regine Holt:* Early life exposure to environmental choice affects behavioural development in laying hens

15:15-15:45   **Break: Posters on demand or networking in the virtual coffee-room**

15:45-17:00   **Oral session continued**

15:45   *Oluwaseun Iyasere:* Which is more stressful: physical or visual separation of hen from chicks?

16:00   *Victoria McEvoy:* Benefits of a Novel Socialisation Protocol on Commercially Bred Dogs

16:15   *Claire Toinon:* Growing up without a mom: early social deprivation affects goat kids' social behaviour

16:30   *Rebecka Hellgren:* Sow and Piglet Welfare: Implications of Different Ages of Weaning

16:45   *Ana Rentsch:* Effect of Brooding Compartment Design on Physical Abilities of Laying Hen Chicks

17:00-18:00   **Annual General Meeting**

Friday, August 6, 2021

Times in Irish Summer Time (UTC +1)

14:00-15:00	**Oral Session - *Stage 1*** **Management of Free-Roaming Animals**
14:00	*Lauren Smith:* Assessing the impact of free-roaming dog population management through systems modelling
14:15	*Abi Collinson:* Identifying research priorities for canine surgical sterilisation programmes: What are the unanswered questions?
14:30	*Miriam Casaca:* Is there hope beyond fear? Effects of social rehabilitation on unsocialized stray dogs
14:45	*Mohammad Alam:* Management of free-roaming dogs at a Chattogram Veterinary School of Bangladesh
15:00:-16:00	**Break: Networking in the virtual coffee-room**
16:00:-17:00	**Awards and Closing**

Poster sessions

Posters and poster videos can be viewed throughout the entire congress.

In addition, there will be poster sessions in another online tool. Poster presenters are assigned to specific time slots where they are expected to be in or around the area of their poster, so that you will be able to directly talk to them. Below is an overview over the time slots for the poster sessions.

Time Poster Session	Poster session
Tuesday, 3.8. 16:45-18:00	Application of Technology to Applied Animal Behaviour and Welfare Welfare of Animals used in Research and Teaching
Wednesday, 4.8. 12:00-13:00	Companion and Wildlife Management Emotion, Cognition and Behavioural Testing
Wednesday, 4.8. 13:00-14:00	Welfare of Bovids Human Behaviour Change for Animal Welfare
Wednesday, 4. 8. 17:00-18:00	Social Behaviour Farm Animal Housing and Enrichment Welfare and Welfare Assessment
Wednesday, 4. 8. 18:00-19:00	Early Life and Maternal Care Welfare of Working Animals Management of Free-Roaming Animals

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Plenary: UFAW/ISAE Welfare of Animals used in Research and Teaching

UFAW/ISAE Welfare of Animals used in Research and Teaching

Companion and Wildlife Management

Welfare of Bovids (2)

Emotion, Cognition and Behavioural Testing

Plenary: Human Behaviour Change for Animal Welfare

Human Behaviour Change for Animal Welfare

Social Behaviour

Farm Animal Housing and Enrichment

Welfare and Welfare Assessment

Plenary: Application of Technology to Applied Animal Behaviour and Welfare

Application of Technology to Applied Animal Behaviour and Welfare (2)

Welfare of Working Animals

Early Life and Maternal Care

Management of Free-Roaming Animals

Application of Technology to Applied Animal Behaviour and Welfare posters

Welfare of Animals used in Research and Teaching Posters

Companion and Wildlife Management posters

Emotion, Cognition and Behavioural Testing posters

Welfare of Bovids posters

Human Behaviour Change for Animal Welfare posters

Social Behaviour posters

Farm Animal Housing and Enrichment posters

Welfare and Welfare Assessment posters

Early Life and Maternal Care posters

Welfare of Working Animals posters

Management of Free-Roaming Animals posters

Plenary: One Welfare

One biology, one welfare, one health, one stress and some consequences of this view.

Sunday, 1st August - 18:00: Plenary: One Welfare - Plenary talk

Monday, 2nd August - 14:30: Plenary: One Welfare - Plenary talk

Prof. Don Broom [1]

1. Department of Veterinary Medicine and St Catharine's College, University of Cambridge, Cambridge

Every individual animal uses brain mechanisms and a wide range of responses to try to cope with the impacts of the world in which they live and to maximise good welfare. This biological principle emphasises that most of the problems, analytical methods needed, and processes involved are the same for humans and other species. There is one biology, one welfare, one health and one stress. We need to change some misleading terminology that is widely used in the world as a consequence of this. An important area for welfare assessment is to evaluate the costs and benefits of different coping attempts to the individual, directly and via the society in which the individual lives. Many of the responses and associated processes are feelings that have short-term or long-term consequences. Attempted coping responses that can be considered for a range of species include: avoidance and flight, depression with reduced overall responsiveness, suppressing particular responses, activation of the adrenal cortex, fear and sympathetic nervous system activity, stereotypies, pain and pain responses, various immune system responses, aggression, taking risks that would normally be avoided and other gambling, eating too much, polydypsia, eating sub-optimal food, changing metabolic rate and re-partitioning body energy, taking alcohol and other drugs, physical self-harm, adopting a life view that is more negative or positive (with reference to judgement bias), unreasonably increasing a previously rewarding positive activity (such as buying clothes), writing poetry or other creative works, creating visual art or music, other actions that are aimed at altering social group mood. For example, some avoidance and flight can be energetically expensive in the short term, reduce the risk of mortality and injury, reduce time for feeding or reproduction, increase anxiety and depression, provide opportunities for pleasurable activities, or increase mean environmental predictability.

References

Broom, D.M. 2021. *Domestic Animal Behaviour and Welfare, 6th edn, Ch* 1,5. CABI.

Broom, D.M. and Johnson, K.G. 2019. *Stress and Animal Welfare: Key Issues in the Biology of Humans and Other Animals, 2nd edn.* Ch 1,6. Springer Nature.

Tarazona, A.M., Ceballos, M.C. and Broom, D.M. 2020. Human relationships with domestic and other animals: one health, one welfare, one biology. *Animals,* 10, 43; (pp. 23).

Wood-Gush lecture

Wood-Gush: Applying macro-ecology to assist tiger recovery in India

Sunday, 1st August - 18:00: Wood-Gush Memorial Lecture - Plenary talk

Monday, 2nd August - 15:00: Wood-Gush Memorial Lecture - Plenary talk

Dr. K. Ullas Karanth [1]

1. *Centre for Wildlife Studies, and National Centre for Biological Sciences, Tata Institute of Fundamental Research*

Tigers are large carnivores that are in serious decline from several anthropogenic impacts: e.g. prey depletion by humans through over-hunting of prey species, killing of tigers for conflict mitigation and poaching of tigers to meet the commercial demand for their body parts as well as loss and degradation of habitats due to variety of extractive pressures and industrial impacts.

In spite of conservation efforts over 50 years, wild tigers now occupy <7% of their historical range. Reproducing populations of tigers at reasonable densities survive in <1% of the ~1.6 million km^2 potential habitat available. Wild tiger populations are managed by governments under multiple constraints imposed by other stakeholders. Evaluating why some conservation efforts have succeeded while many others have failed is therefore critical to reversing tiger decline.

I have studied the population recoveries of tigers across a ~38,000 km^2 area landscape matrix in *Malenad*, India over the past five decades. Historical accounts, current research data and empirical observations on tiger ecology, human impacts on tigers, emergent conflicts, as well as key conservation interventions made at macro-ecological scales by the non-governmental project 'Malenad Tiger Program (MTP)' are evaluated in this review.

Between 1970-2015 tiger habitat occupancy remained unchanged at 14,000 km^2, out of ~21,000 km^2 of potential habitat in Malenad. However, tiger numbers rose from ~70 to ~391, primarily because of sporadic recoveries in a few wildlife reserves. If tiger recovery efforts can be improved and optimized in future, the Malenad landscape can potentially support ~1300 wild tigers. I propose pragmatic conservation interventions that may improve success rates as well as cost-effectiveness of future tiger recovery efforts.

I evaluate challenges and opportunities that non-governmental conservation programs must address to be effective in assisting tiger species recoveries in the future in the context of ongoing global trends in economic growth and demographic transitions in tiger range countries. These trends offer not just impediments but also opportunities for recovering tigers and wild nature. However, some of the currently dominant wildlife conservation paradigms that romanticize the past and decry technological progress are unlikely be useful either for making more room for tigers or meeting aspirations of the people who live next to them. In the future, innovative conservation concepts such as 'Sustainable Landscapes' should be integrated in an Ecomodernist framework to practically expand the recovery of wildlife and wildlands to ensure the survival and restoration of not only tigers, but many other threatened species.

Workshop 1 - Freeing the hens: applying ethology to the development of cage-free housing systems in the commercial egg industry

Freeing the hens: applying ethology to the development of cage-free housing systems in the commercial egg industry

Monday, 2nd August - 16:00: Workshop 1 - Freeing the hens: applying ethology to the development of cage-free housing systems in the commercial egg industry - Workshop

Tuesday, 3rd August - 08:00: Workshop 1 (repeat) - Freeing the hens: applying ethology to the development of cage-free housing systems in the commercial egg industry - Workshop

Dr. Sara Shields [1]

**1.** Humane Society International

A growing number of food and hospitality companies around the world have enacted policies to purchase only eggs laid by hens kept without cages, and several nations have advanced legislation to better address the welfare of laying hens. To meet the growing demand and societal expectations, egg producers are exploring aviary and barn production systems, and remodeling or building new cage-free houses. Humane Society International proposes to host a two-hour workshop on the science and policy of hen welfare in cage-free egg production. The study of hen welfare has a long history in ethology and it is well established that hens have specific behavioral needs, which are not met in conventional battery cages. The science complements growing ethical concerns within society. However, cage-free egg production requires a greater level of husbandry skill to manage and there are animal welfare challenges. The aim of this workshop is to disseminate background information and provide current updates to foster discussion and communication among ethologists and other interested attendees.

The agenda for the workshop will include an introduction by a state government representative (pending availability), welcoming participants and setting the tone for a fruitful, positive discussion. The next segment of the workshop will include short (10 minute) presentations, starting with the science of hen welfare as it pertains to housing systems, including a summary of hen behavioral needs, an overview of alternative housing types, and challenges in those systems. This segment may include case studies, and practical and scientific advances. The third segment will include a presentation on the world-wide legal landscape for egg production with a special focus on India including the latest developments following the High Court ruling prohibiting construction of new battery cage facilities. A cage-free egg producer, describing the experience of producing and marketing cage-free eggs in India, will give a concluding presentation. The workshop will proceed with breakout sessions—moderated subgroups to discuss key themes—with participants returning to the plenary to briefly present conclusions. Themes for breakout sessions will include: 1) overcoming the challenges of cage-free egg production; 2) collaborative opportunities to facilitate the transition to cage-free systems; 3) identification of remaining research needs, and next steps for the ethology community. The aim of the discussion will be to arrive at a more consistent, unified position and understanding of the issue among the different sectors. Participants will be provided with questions ahead of time to better ensure a robust discussion.

Workshop 2 - Getting your manuscript published: real solutions for real problems

Getting your manuscript published: real solutions for real problems

Monday, 2nd August - 16:00: Workshop 2 - Getting your manuscript published: real solutions for real problems - Workshop

Tuesday, 3rd August - 08:00: Workshop 2 (repeat) - Getting your manuscript published: real solutions for real problems - Workshop

Dr. Irene Camerlink [1] , Dr. Péter Pongrácz [2]

1. *Institute of Genetics and Animal Biotechnology, Polish Academy of Sciences, Jastrzebiec, Poland,* **2.** *Department of Ethology, Institute of Biology, Eötvös Loránd University*

Despite the high number of publications in animal behaviour science, an even larger amount of manuscripts gets rejected. In *Applied Animal Behaviour Science*, the official journal of the *International Society for Applied Ethology* (ISAE), almost 50% of the initial submissions end up as being rejected. Reasons for this are that manuscripts are out-of-scope, not novel enough or are not of sufficient quality. Most common out-of-scope manuscripts are studies that do not or not predominantly focus on the behaviour of the animals, or the investigated phenomenon does not have a reasonable applied connection. Some of the rejections could have been prevented, for example by carefully considering the journal's scope. This would save the author time in waiting for the editors' response. Other manuscripts are rejected based on problems with their experimental design. At such stage there is unfortunately not much that can be done by revisions. Typical flaws include a too low sample size, which is often due to an incorrect identification of the experimental unit; lack of a control group; or procedures (or the lack thereof) that limit the interpretation of the data. Those manuscripts that fit to the scope of the journal and have a sound enough experimental and/or theoretical framework, after being subjected to peer review, are nearly always returned to the authors with an editorial request for revision. In order to provide some guidance on how you can avoid rejection or major revisions (which requires a lot of elaboration from the authors and yields not necessary a final acceptance for publication), this workshop will provide some examples and tips on how to not only improve your manuscript but also your experimental design. During the interactive discussions, participants are invited to step into the role of the editor by deciding and explaining why they would choose reject, major, or minor revisions on example manuscripts. The workshop is particularly aimed at researchers from the ISAE developing regions and ideally facilitates participation from different time zones. The workshop will be held by the editors of *Applied Animal Behaviour Science* and is supported by Elsevier.

Workshop 3 - Danger of global climate change on animal welfare

Danger of global climate change on animal welfare

Monday, 2nd August - 18:00: Workshop 3 - Danger of global climate change on animal welfare - Workshop

Tuesday, 3rd August - 11:00: Workshop 3 (repeat) - Danger of global climate change on animal welfare - Workshop

Dr. Oluwaseun Iyasere [1], *Dr. Samuel Durosaro* [2], *Dr. Oluwaseun OJELADE* [3], *Mr. Victor Oyeniran* [4]

1. *Department of Animal Physiology, Federal University of Agriculture, Abeokuta, Nigeria.,* **2.** *Department of Animal Breeding and Genetics, Federal University of Agriculture, Abeokuta,* **3.** *Federal University of Agriculture Abeokuta,* **4.** *Federal University of Agriculture Abeokuta Ogun State Nigeria*

Globally, there is an ever-growing awareness of animal welfare, defined as 'the state of an animal regarding its attempts to cope with its environment'. Climate change which results from increased Greenhouse Gases (GHGs) in the atmosphere is the greatest environmental threat of this century and way forward for future. Climate change can have both direct (increased incidence of heat and cold stress) and indirect negative effect on animal health and welfare such as a reduction of suitable habitat, quantity and quality of food and water, changing distribution of infectious disease agents, and increasing the risk of flood, fire and drought. The question now is how to sustain/maintain the welfare of animals in the face of the impending danger of climate change. Climate change negatively affects almost all animal species existing on terrestrial (land), aquatic (freshwater), and marine (saltwater) environments. Heat stress is one of the fundamental and global issue arising from climate change which raises concern for animal welfare due to distress/suffering experienced by animals under this condition. If appropriate measures are not developed or adopted then it is expected that many animals will continue to suffer and die from these effects which could lead to most animals being endangered. Most developed countries have structures in place to alleviate heat stress in their farm animals but this is not feasible in most undeveloped countries due to low awareness in animal welfare and financial incapability to install such structures. At the end of this workshop, we intend to enlighten people on the impending danger and to prompt the need to develop appropriate alleviation strategies in order to sustain good animal welfare

Draft Plan

Introduction of the workshop session by Dr. Oluwaseun Iyasere (5 mins)

Each presentation will be pre-recorded and played during the workshop, after which a 20 mins discussion session on each sub theme will be initiated and moderated by Dr. Samuel O. Durosaro, Dr. Oluwaseun Ojelade and Mr. Victor J. Oyeniran. A short feedback session will follow for 10 mins to wrap up the workshop.

Sub themes

1. ***Impact of climate change on farm animal welfare***

Invited speaker: Dr. M.O. Abioja, Department of Animal Physiology, Federal University of Agriculture, Abeokuta, Nigeria.

2. *Strategies to mitigate the effect of climate change on animals*

Invited speaker: Dr. Suriya Ramiah, Universiti Putra Malaysia

3. ***Outdoor production systems and exposure to extreme weather conditions: implication on animal welfare***

Invited speaker TBA

Workshop 4 - Ethics for applied ethology and animal welfare research

Workshop: Ethics for applied ethology and animal welfare research

Monday, 2nd August - 18:00: Workshop 4 - Ethics for applied ethology and animal welfare research - Workshop

Tuesday, 3rd August - 11:00: Workshop 4 (repeat) - Ethics for applied ethology and animal welfare research - Workshop

Dr. Anna Olsson [1] *, Dr. Irene Camerlink* [2] *, Dr. Péter Pongrácz* [3] *, Dr. Maria Camila Ceballos* [4] *, Dr. Huw Golledge* [5] *, Dr. Birte Nielsen* [5] *, Dr. Jen-Yun Chou* [6] *, Dr. Alex Whittaker* [7]

__1.__ Laboratory Animal Science, Universidade do Porto, i3S, Instituto de Investigação e Inovação em Saúde, __2.__ Institute of Genetics and Animal Biotechnology, Polish Academy of Sciences, Ul. Postepu 36A, Jastrzebiec, 05-552 Magdalenka, Poland, __3.__ Department of Ethology, Institute of Biology, Eötvös Loránd University, __4.__ University of Calgary, Department of Production Animal Health, Grupo de Pesquisa em Etologia e Ecologia Animal, __5.__ UFAW, __6.__ Teagasc, __7.__ University of Adelaide

Research into applied ethology and animal welfare is ethically challenging, as it sometimes requires studying animals in situations of compromised welfare. At the same time, those researchers have an added responsibility given the ultimate aim to encourage practice for better animal welfare. Against this background, ISAE developed and adapted its own ethical guidelines in 2001. The guidelines directly influence how animals are used in research within ISAE, in particular through imposing the guidelines on the congress abstracts. The guidelines were the collective work of an international group of applied ethologists, and the original edition was discussed at the Annual General Assembly at the ISAE conference in 2001. An updated (but not thoroughly revised) version was published in 2017.

During the 20 years that have passed, important changes have happened to the context to which the guidelines apply. The critical scrutiny of ethical issues in research has increased, expanding from the regulatory setting, to public-facing debate via the vehicle of social media. This can even lead to the retraction of papers which are found after publication to violate ethical standards. As a society, ISAE has become more geographically and culturally diverse, with greater involvement of researchers from the Global South. The notion of privacy and other ethics issues in human subjects research has expanded, and it seems clear that the ethical issues in applied ethology and animal welfare research are not limited to the animal research subjects.

In this interactive workshop, we will discuss with participants how to best handle the ethical challenges faced by the ISAE research community.

Examples of critical issues to address:

- Studies aimed at evaluating or improving the welfare of animals housed in systems or subject to practice which are illegal in some countries but still widely used in others
- Studies which involve sensitive human data in less obvious ways, such as on-farm collection of animal welfare data and use of data from farm management systems
- Studies of invasive and/or stressful procedures when these are performed as part of routine farm practice but included in a research study
- Requirements for ethics review of different type of research in different jurisdictions, including the possibility (or absence thereof) to have certain types of research reviewed
- Publication ethics

The team behind this workshop includes the present and former ethics officer of ISAE, the editors-in-chief of the journals Applied Animal Behaviour Science and Animal Welfare and the ISAE development officers.

Workshop 5 - Open science in applied ethology

Open Science in Applied Ethology

Monday, 2nd August - 20:00: Workshop 5 - Open science in applied ethology - Workshop

Thursday, 5th August - 12:00: Workshop 5 (repeat) - Open science in applied ethology - Workshop

__Dr. Christian Nawroth__ [1] , Dr. Anna Olsson [2]

__1.__ Leibniz Institute for Farm Animal Biology, __2.__ Laboratory Animal Science, Universidade do Porto, i3S, Instituto de Investigação e Inovação em Saúde

Open Science is much more than Open Access publishing of scientific results. Encompassing measures for sharing and discussing resources, methods and results throughout the research process, it holds great potential for making research more robust and knowledge more accessible. In the face of a lurking replication crisis in many fields, transparency is key for impactful research.

The implementation of Open Science practices is having a huge impact on how data and information are shared and assessed in fields such as psychology. Here, many psychology journals have adopted pre-print friendly policies, offer Registered Reports as article submission type, and require authors to deposit their data in Open Data repositories. Irrespective of field, researchers are offered many best-practice guidelines and exciting tools to share pre-printed versions of their manuscript (https://www.biorxiv.org/), pre-register their test protocols (https://osf.io/prereg/), and share their code and data (FAIR principles). However, in the field of applied ethology, institutional training opportunities and inter-institutional Open Science networks are scarce. As a result, Open Science in our field often happens as isolated initiatives of individual researchers sharing different parts of their research process. As a result, the absence of concerted efforts and agreed-on standards strongly limits the impact of such initiatives.

In the absence of existing guidelines for applied ethology research, we as individuals, but above all as a research community, have to move forward with this issue. We have to critically reflect on the potential impact of Open Science in our field and work together towards best practice recommendations.

In this workshop, we will introduce key concepts and resources as a starting point for a discussion on how to develop and foster the implementation of Open Science practices in applied ethology. We will focus on three main aspects of Open Science: Pre-prints, Registered Reports, and Open Data. We will provide an overview of each aspect, and will also aim to clarify common misconceptions that can hinder the implementation of these practices. We aim to have discussion rounds for each of the three aspects and participants will receive surveys prior to the workshop with the results being implemented in the overview and the discussion sessions.

Workshop 6 - The economic and welfare impact of sub-optimal mobility and hoof health in dairy cows

The economic and welfare impact of sub-optimal mobility and hoof health in dairy cows

Monday, 2nd August - 20:00: Workshop 6 - The economic and welfare impact of sub-optimal mobility and hoof health in dairy cows - Workshop

Thursday, 5th August - 12:00: Workshop 6 (repeat) - The economic and welfare impact of sub-optimal mobility and hoof health in dairy cows - Workshop

**Mr. Francis Edwardes** [1], _**Dr. Mariska van der Voort**_ [1], _**Prof. Henk Hogeveen**_ [1]

**1.** Business Economics Group, Wageningen University and Research

Sub-optimal mobility, also known as lameness and largely a result of poor hoof health, is an important welfare issue in dairy production for reasons attributed to associated pain and reductions in mobility and natural behaviour to name a few. Besides the welfare importance, sub-optimal mobility is also an economically important health issue, mostly due to associated milk yield losses, increased risk of culling and reduced reproductive performance. Quantifying the economic and welfare impact of sub-optimal mobility is an imperative step to _i_) stimulate farmer awareness of its economic and welfare importance to promote better management of sub-optimal mobility and _ii_) to realise a benchmark for comparison of management strategies with the objective to reduce the overall economic and welfare impact of sub-optimal mobility.

In this workshop, we will elaborate on the current knowledge apropos the aspects of the economic and welfare impact due to sub-optimal mobility, and hoof health, with reference to existing frameworks used to quantify the economics of animal diseases. In addition, we will present a novel method that relies on expert knowledge to assess the impact of animal diseases on welfare aspects. To demonstrate the applicability of the method we will focus on the welfare impact of sub-optimal mobility.

Structure of workshop and learning outcomes:

The economic impact of sub-optimal mobility and hoof health

In this session, participants will be introduced to methods and frameworks used to quantify the economic, direct and indirect, impact of sub-optimal mobility. Through this, participants will gain an understanding of the existing frameworks used in animal health economics to quantify the economic impact of animals diseases in agricultural livestock systems.

A method of expert knowledge elicitation to assess the welfare impact of animal disease

In the second session, we will present a method to evaluate the impact of animal diseases on dairy cow welfare aspects. The method known as adaptive conjoint analysis is a choice based method used to elicit expert knowledge when information is scarce and can be used to assess the effects of animal diseases at varying severities on certain welfare aspect.

A novel approach to assess the welfare impact of sub-optimal mobility

Drawing from the content presented in the second session a basic, and novel, framework to quantify the impact of sub-optimal mobility and hoof health on cow welfare will be presented. The workshop will end with a presentation of preliminary results drawn from the application of the framework.

Plenary: Welfare of Bovids

Assessing cognition in cattle - Challenge and possibility?

Sunday, 1st August - 18:00: Plenary: Welfare of Bovids - Plenary talk

Tuesday, 3rd August - 14:00: Plenary: Welfare of Bovids - Plenary talk

Dr. Maria Vilain Rørvang [1] *,* ***Dr. Christian Nawroth*** [2]

1. *Swedish University of Agricultural Sciences, Department of Biosystems and Technology, Alnarp,* **2.** *Leibniz Institute for Farm Animal Biology, Institute of Behavioural Physiology, Dummerstorf*

Dairy cattle are managed in modern housing systems on a daily basis. Behaving in these systems requires different aspects of cognitive functioning, ranging from simply locating food, to manoeuvre e.g. an automatic milking robot. As our current knowledge about cattle cognition and learning is still limited we need to assess whether current housing systems may need adaptation to ensure functionality. If perceptive and cognitive abilities of cattle are not considered there is also a risk that new initiatives to improve housing systems might end up failing. Gaining more knowledge in the area of cattle cognition will benefit to our understanding of how cattle behave and learn, hence offering an opportunity to ensure well-adapted housing systems and management routines to the animals, ultimately safeguarding the welfare of the animals and safety for the farm personnel.

In this presentation, current knowledge on cattle cognition and learning is summarized. Areas with limited or lacking information are identified, with special emphasis on those which may constitute areas where cognitive capacities of cattle may be used to optimize housing systems, and management routines. Lastly, we try to elucidate why knowledge on cattle learning and cognition is scarce compared to other domestic species e.g. the horse and the goat.

Positive reinforcement and target training are two examples of already established training regimes from other species, which could be used in the management of cattle e.g. when training cattle to better cope in stressful situations such as during loading to transport. This is not only beneficial for animal welfare but also to human safety, as calmer animals are safer to handle. Another example is social transmission of information in cattle. Studies indicate that social transmission mechanisms, such as social facilitation, may be at play when cattle interact in a group. This means that some behaviours may be contagious or attenuated between individuals e.g. fear reactions could be decreased via a calm peer in the group.

With this overview, we want to stimulate discussion of the recent advances and challenges, in assessing the cognitive capacities of cattle. Further research on the cognitive capacities of cattle is greatly needed and may ultimately ensure a sustainable cattle production in terms of improved animal welfare alongside improved human safety.

Welfare of Bovids (1)

Cattle welfare: a protocol for its assessment in Argentinian feedlots.

Sunday, 1st August - 18:00: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 14:45: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 15:45: Welfare of Bovids (1) - Oral

Mrs. Débora Racciatti [1], Dr. Natalia Aguilar [2], Mrs. Trinidad Soteras [3], Mr. Leandro Langman [3]

1. _National Service of Agri-Food Health and Quality (SENASA) & University of Buenos Aires (UBA),_ **2.** _National Institute of Agricultural Technology (INTA) & Northeast University (UNNE),_ **3.** _National Institute of Agricultural Technology (INTA)_

The intensification of livestock farming has led to the expansion of feedlots in many countries. In these systems, cattle are kept in large outdoor pens, on a soil surface, fed with a balanced fattening diet. As in any other husbandry context, there is a need to adopt an evidence-based approach to objectively monitor animal welfare. The aim of this research was to develop an animal welfare assessment protocol for beef cattle in feedlots of Argentina.

Three steps were conducted to identify welfare indicators and methods: (1) electronic database searches for relevant publications, (2) expert consulting, and (3) validity and feasibility analysis through focus groups. Fieldwork in feedlots allowed the creation of a database of pictures and videos from where Gold Standards were obtained. With a preliminary protocol drafted, an external expert trained the observers for the set-up. The protocol was tested at 25 feedlots and the following variables were assessed: (1) intra- and inter-observer reliability of the indicators by Spearman's Rank correlation coefficient (threshold $r_s \geq 0{,}7$) and Kendall Correlation Coefficient (threshold $W \geq 0{,}7$) ($p \leq 0{,}05$) (INFOSTAT v. 2019e) and (2) feasibility, focused on the application of all measurements and their duration. At last, the final protocol was drawn up.

Of 150 candidate indicators obtained from the literature search, 28 were selected on the basis of their validity, reliability and practicality to integrate the final protocol: 18 animal-based measurements (Good feeding: body condition score; Appropriate housing and handling areas: animal hygiene, panting and discomfort due to presence of flies; Good health: lameness, alterations in integument and/or underlying structures, coughing, nasal discharge, respiratory disease, eye condition, diarrhea, ruminal bloat, fecal score, cattle needing further care and mortality; Appropriate behaviour: vocalizations, agonistic and affiliative behaviours) and 10 resource or management-based measurements (Good feeding: feeder frontage, drinkers availability and cleanliness of water points; Appropriate housing and handling areas: waterlogged pen condition, provision of resources to avoid heat and cold stress, pen capacity, loading and unloading area conditions; Good health: potentially painful handling procedures; Appropriate behaviour: abusive handling). In addition, the final protocol included information about: introduction; objective; preliminary interview; sampling order; estimated evaluation time; sample size; equipment required; and steps to follow from arrival at the farm until completion of the evaluation.

This research allowed the obtention of the first standard protocol following an evidence-based welfare assessment for beef cattle feedlots in Argentina.

ISOLATION BOX TEST: DEVELOPMENT AND INVESTIGATION OF ITS POTENTIAL TO MEASURE PERSONALITY TRAITS OF DAIRY CALVES

Sunday, 1st August - 18:00: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 14:45: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 15:45: Welfare of Bovids (1) - Oral

Mrs. Megan Woodrum Setser [1], *Dr. Heather Neave* [2], *Dr. Joao Costa* [1]

1. *University of Kentucky,* **2.** *AgResearch*

Isolation box tests, placement of animals in a dark enclosed box with an electronic measurement of movement, has been used to determine personality traits in sheep but its use in dairy calves remains unexplored. The aim of this study was to investigate the relationship between behavioral response of dairy calves to an isolation box test and traditional standardized personality tests [novel person, novel object, and startle test]. Holstein calves (n=27) were subjected to a day of personality testing at 24±3 d of age consisting of the traditional tests and an isolation box test. Agitation of the isolation box was measured via tri-axis accelerometers (HOBO Pendant g Data Logger, ONSET, Bourne, MA, USA; 2Hz frequency) attached to the box in 5 positions [left, right, back, top-back, top-front]. The total acceleration of the three axes through the test were summed for the 5 positions, to create a total movement index (**TMI**). The 3 standardized tests: novel person (10 min with an unknown stationary human), novel object (10 min with a black 94L bucket) and a startle test (time with a closed umbrella that opened when approached or when 5 min lapsed, with another 5 min of test after opened). During the standard tests, 9 behaviors were scored: time interactive with the environment, time non-interactive, time spent touching the novel person, novel object and umbrella, time spent playing, time spent attentive, and latency to approach the person, object, closed and open umbrella. Behaviors were summed across tests. Principal component analysis revealed 3 factors (1: "fearful", 2: "curious", and 3: "explorative") that explained 61% of the variance. Spearman's correlations were conducted to investigate the relationship between the total movement index from the isolation box tests and with and the standardized tests factor scores. The total movement index from the pre-weaning isolation box test had a positive association with factor 2 (curious) (r=0.31, P=0.003) and a negative association with factor 3 (explorative) (r=-0.25, P=0.04). Total average daily gain had a positive association (r=0.28;
P=0.001) with total movement index from the pre-weaning isolation box test. Indicating calves who are less active in the isolation box spend more time interacting with novelty in the traditional tests and less time exploring the test arena. In summary, this is an early indication that an isolation box test may be a tool for measuring personality traits in dairy calves.

Effects of early social contact on dairy calf response to initial social grouping and regrouping

Sunday, 1st August - 18:00: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 14:45: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 15:45: Welfare of Bovids (1) - Oral

Ms. Emily Lindner [1], Ms. Katie Gingerich [1], Dr. Emily Miller-Cushon [1]

1. University of Florida

In dairy calves, the age of introduction to social housing varies on-farm and may have implications for behavioral development and response to social grouping. We evaluated the effects of early social contact on dairy calf early life behavior and performance and responses following initial group housing, followed by subsequent regrouping. At birth, calves were randomly assigned to individual (IH; n = 16 calves) or pair housing (PH; n = 8 pairs). Calves were mingled between treatments and initially grouped (4 calves/pen) at 13 ± 2 (mean ± SD) d of age and then regrouped (8 calves/pen) at 20 ± 5 d of age. We assessed calf ability to learn to feed independent from the teat bucket in early life and autofeeder following grouping. Calf health, feed intake, and weight gain were recorded throughout the first 3 weeks of life. Activity and social interactions were continuously recorded from video for the first 24 h following grouping and regrouping (except for allogrooming and social play, which were observed for 12h due to nighttime visibility). Social housing did not affect calf feed intake and weight gain in the first weeks of life, but calves housed in pairs tended to scour for fewer days (4.1 vs. 5.6 d; PH vs. IH; SE = 0.58; P = 0.10). We found no effect of social contact on the number of days required to feed independently from a teat bucket early in life (2.6 d; SE = 0.02; P = 0.95) or from the autofeeder after grouping (2.4 d; SE = 0.42; P = 0.76). We saw no effects (P > 0.26) of previous social contact on brush use (31.5 min/d; SE = 4.2), allogrooming (4.1 min/12h; SE = 0.16), or social play (0.52 min/12h; SE = 0.19) following either initial group-housing or regrouping. However, previously pair-housed calves spent more time lying socially (within one body length of another calf) than previously individually-housed calves following both initial grouping (9.8 vs. 5.7 h/d; PH vs. IH; SE = 0.83; P = 0.0052) and regrouping (11.3 vs. 9.1 h/d; PH vs. IH; SE = 1.1; P = 0.06), and also tended to have greater lying time after regrouping (17 vs. 17.6 h; PH vs. IH; SE = 0.47; P = 0.08). These results suggest that social contact in the first weeks of life may increase social rest following grouping without affecting calf performance or health.

Impact of personality and concentrate allocation on the adaptation, behaviour, and production of dairy cows introduced to a free-traffic automated milking system

Sunday, 1st August - 18:00: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 14:45: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 15:45: Welfare of Bovids (1) - Oral

**Ms. Anna Schwanke** [1] , **Ms. Kaitlyn Dancy** [1] , **Dr. Greg Penner** [2] , **Dr. Renée Bergeron** [1] , **Dr. Trevor DeVries** [1]

1. University of Guelph, **2.** University of Saskatchewan

The success of transitioning dairy cows from conventional milking to an automated milking system (AMS) hinges on the motivation of cows to voluntarily milk. Two factors that influence this motivation may be the individual personality traits of dairy cows and the amount of concentrated feed offered at the AMS. The objective of this study was to determine the effects of the trait of boldness and AMS concentrate allowance on the behaviour and production of dairy cows during and after transition to an AMS. Thirty-two Holstein cows (218 ± 47 days in milk; 1.6 ± 0.8 lactations), with no previous AMS exposure, were assigned a Boldness Score (**BS;** ranging from 3 to 29) based on previous observations of feed bunk displacements. Cows were randomly assigned to an AMS concentrate allocation of either 6 (**High**) or 2 (**Low**) kg/d of dry matter. Cows were trained to use the AMS over 72 h, by being brought to the AMS and encouraged to enter. Milking activity and production data were recorded from 3 d prior to AMS introduction until 9 wk after training, then summarized by cow and day, and analyzed in repeated measures mixed-effect linear regression models. During the training period, High cows spent more time milking compared to Low cows (19.7 vs. 15.4 min/d; SE=1.44; P=0.04); for High cows, time spent milking tended to increase with greater boldness (+0.36 min/d per 1 unit increase in BS; P =0.08). In the 3 d after training compared to 3 d before introduction to the AMS, bolder cows tended to have a lesser decrease in milk yield (+0.23 kg/d less decrease in yield per 1 unit increase in BS; P=0.08). Bolder cows tended to have their first voluntary milking visit earlier (0.13 days earlier per 1 unit increase in BS; P=0.07). No difference in milking frequency was detected over the 9 wk after training (High=2.6 vs. Low=2.2 milkings/d; P=0.15), however, bolder cows tended to have greater milking frequency (+0.06 milkings/d per 1 unit increase in BS; P=0.06). High cows had greater milk yield than Low cows (35.0 vs. 30.2 kg/d; P<0.01), although, within the Low cows there was greater milk yield with increasing boldness (+0.4 kg/d per 1 unit increase in BS; P=0.04). Overall, these data indicate that bolder cows are more adaptable to an AMS, and that allocating a greater amount of concentrate in the free-traffic AMS, may promote greater milk yield and quicker adaptation to voluntary milking.

Free-choice pasture access helps lame dairy cows recover

Sunday, 1st August - 18:00: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 14:45: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 15:45: Welfare of Bovids (1) - Oral

Ms. Kathryn McLellan [1] *, Dr. Daniel M. Weary* [1] *, Dr. Marina A. G. von Keyserlingk* [1]

1. *Animal Welfare Program, University of British Columbia*

Pasture access may benefit lame cows by providing a softer and more comfortable lying and standing surface. Free-choice access to pasture allows cows to exert their own preference, but the effect of this access on lameness has not yet been explored. We evaluated whether a 7-week period of free-choice pasture access would improve lameness recovery, relative to control cows kept in the same group but not allowed outside. Lactating Holstein cows, all lame upon enrollment and housed in a free-stall barn, were pseudo-randomly allocated to one of two treatments (balancing for gait score, parity, and previous lesion history, using rolling enrollment): free-choice access to pasture (n = 27; Pasture) or indoor housing (n = 27; Indoor). Cows were gait scored weekly, by an observer blind to treatment, using a 5-point numerical rating system (NRS 1=sound, NRS 5=severely lame) and hoof inspections performed at the start and end of the trial. Cows were categorized as sound (NRS < 2 over two consecutive weeks) or lame (NRS > 3) according to weekly gait scores. Using a mixed model, lameness status and environmental variables were tested for their effects on weekly pasture use. Pasture cows spent on average 14.8 + 10.0% (range 0–36.9%) of their time on pasture; pasture use was higher at night (1630 to 0700h; averaging 22.9 + 15.5%) than during the day (0700 to 16300h; averaging 2.5 + 3.0%). Increasing precipitation ($F_{1,132}$ =7.15, P = 0.01) and temperature-humidity index ($F_{1,132}$ =5.96, P = 0.02) decreased and increased pasture use, respectively, but lameness status was not related to time outdoors ($F_{1,147}$ =0.10, P = 0.75). Multivariate logistic regression was used to test the effect of treatment on a binary outcome (lame or sound) and a general linear model for the total number of weeks sound. Pasture cows were more likely to become sound (OR = 4.1, 95% CI: 1.1 – 14.6 %, P = 0. 03) and spent more time sound compared to Indoor cows (Pasture: 2.0 + 0.34 wk; Indoor: 0.81 + 0.35 wk; P = 0.02). Cows with no history of a previous lesion were more likely to become sound (P = 0.01) and spent more time sound (P = 0.01); no effects were found for other cow-level variables. Our results suggest that free-choice pasture access aids in lameness recovery. Further research is required to investigate longer-term effects of pasture access on hoof lesions and re-occurrence of lameness.

Use of outdoor access by dairy calves

Sunday, 1st August - 18:00: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 14:45: Welfare of Bovids (1) - Oral

Tuesday, 3rd August - 15:45: Welfare of Bovids (1) - Oral

**Ms. Laura Whalin** [1], **_Dr. Daniel M. Weary_** [1], **_Dr. Marina A. G. von Keyserlingk_** [1]

1. *Animal Welfare Program, University of British Columbia*

Adult dairy cattle show a preference for outdoor spaces during summer nights, but little is known about such preferences for dairy calves who are typically housed indoors. Our aim was to describe the use of outdoor access, during summer, and how the use changes with calf age. Calves were paired (n = 10) at 5 d of age and placed in one of 10 pens (7.3 x 2.4 m, deep bedded with bark mulch), each with equally sized outdoor and indoor areas. Calves had *ad libitum* access to water, hay, and starter located indoors. During the pre-weaning period, from 5-29 d of age, calves were offered 12 L/d of milk divided into two feedings, indoors. Calves were weaned step-wise, with milk gradually reduced to 6 L/d from d 30-35, then gradually reduced to 0 L/d from d 51-56. Calves remained in the trial until 70 d of age. Pens were continuously video recorded, and behaviours were scored 3 d/week using 5-min scan samples. Four observers scored whether calves were inside, outside, lying, standing, in the sun or shade (inter-observer reliability: $r \geq 0.90$). Sun and shade could not always be detected, so a proportion was calculated as the amount of time in the sun or shade divided by the total time sun or shade was visible. Calves spent more time inside than outside before (67 ± 24%), during (65 ± 23%), and after (70 ± 21%) weaning. Of the approximately 8 h/d calves spent outside, most was spent during the nighttime (20:00 – 8:00) rather than during the daytime (8:00 – 20:00) before weaning (56 ± 49%) and after weaning (58 ± 39%). Calves spent similar amounts of time outside in sun and shade before (45 ± 21% vs 55 ± 21%) and during (48 ± 23% vs 52 ± 23%) weaning, but after weaning calves spent more time in the shade (37 ± 28% vs 63 ± 28% of their time outside). While outside, calves spent more time lying than standing before weaning (72 ± 44%), during the weaning period (88 ± 32%) and after weaning (79 ± 32%). Of the approximately 6.5 h/d calves spent standing, 72 ± 12% was spent indoors, likely because all feeding was indoors. These results indicate that, when given the option in summer, calves spend a considerable portion of their time outdoors and that this use varies with calf age and time of day.

Application of Technology to Applied Animal Behaviour and Welfare (1)

Fewer steps to a better ewe: behavioural transitions (BT) and activity monitors to measure lambing activity in Merino ewes

**Ms. Amellia Redfearn** [1], **Mrs. Jody McNally** [1], **Mrs. Heather Brewer** [1], **Mr. Daniel Hutchinson** [2], **Dr. Rebecca Doyle** [3], **Dr. Emma Doyle** [4], **Dr. Frances Cowley** [4], **Dr. Sabine Schmoelzl** [1]

1. _CSIRO,_ **2.** _University of Melbourne,_ **3.** _The Animal Welfare Science Centre, The University of Melbourne,_ **4.** _University of New England_

Lambing is a period of increased risk for lambs and ewes, and lamb survival remains an issue of high importance to the sheep industry. Across different breeds, birth injury due to dystocia (prolonged and/or difficult labour) has been conclusively identified as the leading cause of neonatal lamb mortality (Refshauge et al., Anim.Prod.Sci. 56:4, 2016). In this trial, we focused on ewe behaviour in the 5.5h leading up to birth, and the 2h immediately after, asking whether behaviour metrics could be used to identify any differences between normal and difficult births. We also asked whether birth difficulty affected expression of maternal care behaviours immediately after birth. Finally, we wanted to identify whether accelerometers could capture these differences.

Lambing was observed in a small paddock in groups of 20 ewes at a time, with constant video surveillance. All ewes were fitted with an accelerometer around the neck. Based on quality and completeness of the video footage, 15 ewes were selected for detailed annotation (normal n=9; difficult n=6). Videos were continuously annotated for the period of 5.5h leading up to birth and 2h after using Behavioural Observation Research Interactive Software (BORIS).

Accelerometer data were loaded into ActiLife software and were analysed as an activity metric (% time spent active/resting). Data were then analysed in R using GLMs and GLMER.

Birth difficulty significantly influenced total BT ($P<0.001$), and a significant interaction of time and birth difficulty was seen on BT frequency over the 5.5h before birth ($P<0.001$). In the 2h after birth, difficult ewes performed significantly fewer BT than normal ewes ($P=0.016$), and spent less time performing care behaviours than normal ewes ($P=0.032$).

From the ActiLife output, normal ewes spent significantly less of their time active than resting ($P<0.001$), while difficult ewes spent equal parts of their time active and resting before birth. Additionally, difficult ewes spent significantly more time active than normal ewes ($P<0.001$). In the 2h after birth, difficult ewes spent significantly more of their time resting than active, while the normal ewes spent more of their time active than resting.

In summary, lambing difficulty affects ewe behaviour over the 5.5h before birth, and, interestingly, on the amount of care given to the lamb in the 2h immediately after. Here, motion data showed promise for capturing the difference between normal and difficult labours. Capturing these differences without direct observation will help increase our research capabilities and, through this, our knowledge surrounding dystocia.

Using machine learning to predict sleep stage from muscle activity and heart rate in dairy cows

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Tuesday, 3rd August - 14:45: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Tuesday, 3rd August - 15:45: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Ms. Laura Hunter [1], _Dr. Abdul Baten_ [2], _Dr. Fritha Langford_ [3], _Dr. Cheryl O'Connor_ [4], _Prof. Marie Haskell_ [3], _Dr. Jim Webster_ [5], _Prof. Kevin Stafford_ [6]

1. _AgResearch/ Massey University/ SRUC,_ **2.** _Institute of Precision Medicine & Bioinformatics, Sydney Local Health District,_ **3.** _Animal Behaviour and Welfare, Scotland's Rural College (SRUC),_ **4.** _Animal Behaviour and Welfare, AgResearch,_ **5.** _Animal Ethics, AgResearch,_ **6.** _Department of Animal Science, Massey University_

Little is known about the importance of sleep for cow welfare, mainly due to difficulties in accurately determining when an animal is asleep. The gold standard method - polysomnography (PSG)- involves recording electrophysiological traces of the brain (EEG), eyes (EOG) and muscles (EMG), but is fragile and impractical to apply in large-scale studies or pastoral environments. Algorithms and devices such as smart watches have been developed for humans to predict sleep stages using movement and physiological changes. The aim of this project was to determine if similarly, heart rate (HR) and EMG activity alone could predict sleep stages accurately compared to PSG in dairy cows. Assessing the use of the new measures in both indoor-housed and pasture environments would allow the methodology to be used in either environment.

Ethical approval was obtained prior to the start of the study. Six pregnant dry cows (New Zealand) and six non-pregnant dry cows (Scotland, UK) were fitted with PSG-recording equipment and a Polar HR monitoring belt. During recordings the cows were managed individually in a 5m x 5m indoor straw (UK) or 10m x 10m outdoor pasture enclosure (NZ), but always maintained audio-visual contact with group mates. Four sleep stages (Rapid Eye Movement (REM) and Non-REM (N1, N2, N3)), wakefulness and rumination were scored in 30 second epochs from the PSG traces and corresponding statistics were generated from the filtered HR and EMG traces. 192.7 hours of good quality data were used to build and test a machine learning model using the Orange machine learning platform. The performance of two machine learning algorithms (Neural Networks (NN) and Random Forest (RF)) was compared using ten-fold cross validation. NN performed best and was able to predict overall sleep stages with an area under the receiver operating curve (AUC) of 92.5% and classification accuracy (CA) of 82.3%. In predicting individual sleep stages, the model had more success identifying REM sleep (AUC 92.4%, CA 95.8%) and wakefulness (AUC 94.7%, CA 88.4%) than Non-REM stages such as N3 (AUC 90.8%, CA 85.25).

Using HR and EMG data alone, the model was able to accurately predict sleep stages in the range of similar human models. These results are promising and the identification of sleep using non-PSG methods will allow us to investigate sleep in more commercially relevant settings.

Use of the Polar V800 and Actiheart 5 heart rate monitors for the assessment of heart rate variability (HRV) in horses

Mr. Richard Mott [1], Dr. Fiona Dowell [2], Prof. Neil Evans [3]

1. Institute of Biodiversity Animal Health and Comparative Medicine, University of Glasgow, 2. School of Veterinary Medicine, University of Glasgow, 3. Institute of Biodiversity, Animal Health and Comparative Medicine, University of Glasgow

Purpose

Heart rate variability (HRV) is derived from interbeat interval (IBI) data and is a commonly used metric in animal science to quantify aspects of the physiological response to stressors. The accurate detection of IBIs in horses is complicated due to their ECG waveform morphology and a high incidence of 2nd-degree atrioventricular (AV) block in clinically normal animals at rest. The current study aimed to validate the use and interpretation of data from two heart rate monitors designed for personal monitoring of cardiovascular activity in humans (Polar V800 and Actiheart 5), for use in the horse.

Methods

The study was conducted with a mixed sample (n=17) of general riding horses, with (n=4) and without (n=13) cardiac dysrhythmias. IBI data was collected using Polar V800 and Actiheart 5 monitors and a veterinary ECG (Televet 100). Synchronous recordings were made with all 3 devices for 30 min, whilst horses were at rest. HRV analysis was conducted using Kubios software.

RMSSD (time domain) and HF Power (frequency domain) were compared for each device, with a range of artefact correction levels, using the Bland Altman test of agreement, in R Studio . Acceptable limits were defined *a priori* as a bias within 5% of the sample median for that parameter and with the 95% CI of that bias encompassing 0. RMSSD acceptable bias $< \pm 4$ ms, HF Power acceptable bias $< \pm 128$ ms^2.

Results

Data from the Actiheart 5 produced the best agreement relative to ECG data, with a 0.9 sec correction applied to both data sets (RMSSD bias of 0 ms (95% CI -2 ms – 1 ms) and an HF Power bias of 45 ms^2 (95% CI -51 ms^2 - 141 ms^2)). An acceptable level of agreement was achieved between the Polar V800 data and the ECG data when the Polar V800 data had a 0.4 sec artefact correction applied (RMSSD bias of 0 ms (95% CI -2 ms – 3 ms) and an HF Power bias of -90 ms^2 (95% CI -505 ms^2 - 325 ms^2)).

Conclusions

Personal heart rate monitors can be used to accurately detect IBI and therefore quantify HRV in horses at rest. There was good agreement between the HRV data obtained from the Actiheart 5 and the ECG where both had a 0.9 sec correction applied, but the Polar V800 data required an artefact correction of 0.4 sec to be comparable with data obtained from an ECG.

Validation of a sensor-based behavioral observation method in poultry

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Tuesday, 3rd August - 14:45: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Tuesday, 3rd August - 15:45: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

**Ms. Laura Candelotto** [1] _**, Ms. Klara Grethen**_ [2] _**, Ms. Camille Montalcini**_ [3] _**, Dr. Yamenah Gomez**_ [4] _**, Dr. Michael Toscano**_ [4]

1. _Center for Proper Housing: Poultry and Rabbits (ZTHZ), Division of Animal Welfare, VPH Institute, University of Bern, Burgerweg 22, 3052 Zollikofen, Switzerland,_ **2.** _Center for Proper Housing: Poultry and Rabbits (ZTHZ) Division of Animal Welfare, VPH Institute, University of Bern,_ **3.** _Center for Proper Housing: Poultry and Rabbits (ZTHZ) Division of Animal Welfare, VPH Institute, University of Bern, Burgerweg 22, 3052 Zollikofen, Switzerland,_ **4.** _Center for Proper Housing: Poultry and Rabbits (ZTHZ), Division of Animal Welfare, VPH-Institute, University of Bern, Burgerweg 22, 3052 Zollikofen, Switzerland_

Remote sensor-based observation systems may allow a better understanding of individual behavior in large groups such as commercial poultry. Our study sought to develop and validate a simple post-collection cleaning method for broiler breeders (BB) and laying hens (LH) in commercially relevant housing against video observations. For the BB study, thirty-three female and three males (Ross 308) were kept in each of 10 pens containing a litter area, a slatted area and two nest boxes. The LH study used a commercial aviary split into 6 pens each containing 225 hens (Dekalb White). Within each environment, 4 (BB) or 5 (LH) resource-related zones were defined and transitions between zones were registered by tracking devices worn by focal hens (BB, 10/pen; LH, 18/pen). Scoring of video data was performed on 3 x 20min/day on 2 days with 20 focal BB and 3 days for 18 focal LH. As a first step, multiple entries with the same timepoint of transition (consecutive equals) were reduced to the last added transition. The developed cleaning method then defined the current location of the bird according to the zone with the longest duration within specific time intervals (i.e. bins) ranging from 10s to 300s. The total number of transitions and duration of matching zones between video and tracking data was extracted per observation interval and bird. Lin's Concordance Correlation Coefficient (CCC) and the proportion of matching durations was calculated to measure reliability between video and tracking observations of total transitions and durations respectively. While the mean proportion of matching duration after removal of consecutive equals was high in both LH and BB (BB: 0.963; LH: 0.949), the reliability of total number of transitions was not (BB: CCC = 0.104; LH: CCC = 0.290). Binning improved the reliability of the number of transitions in BB and LH while the mean proportion of matching duration decreased with increasing bin size. The highest reliability was found when applying 50s and 30s bins for LH and BB, respectively (LH: mean proportion = 0.935, transitions CCC = 0.891; BB: mean proportion CCC = 0.961, transitions CCC = 0.758). Transitions were overestimated due to the registered location flickering between zones within short time spans though the bird was not transitioning. We conclude that the developed cleaning method is a relatively simple yet promising solution for data of this nature.

Can technology inform decisions about optimized separation strategies of the dairy cow and calf in cow-calf contact systems?

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Tuesday, 3rd August - 14:45: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Tuesday, 3rd August - 15:45: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Dr. julie johnsen [1], *Ms. Johanne Sørby* [2], *Dr. Stine Grønmo Kischel* [3], *Dr. Cecilie Mejdell* [1], *Dr. Sabine Ferneborg* [2]

1. *Section of Terrestrial Animal Health and Welfare, Norwegian Veterinary Institute, Ås, Norway,* **2.** *Norwegian University of Life Sciences, Faculty of Biosciences, Dept. of Animal and Aquacultural Sciences, 1432 Ås, Norway,* **3.** *Department of Research and Development, Farm Advisory Services, TINE SA, Ås, Norway*

As an alternative to early separation of the dairy cow and calf, we investigate a novel cow-calf contact (CCC) system: computer-controlled smart-gates allow the dairy cows to visit their calves. Systems allowing contact for part of the day may be practical for farmers and provide beneficial CCC. However, separation is stressful for both cow and calf. Vocal response is a behavioural indicator of separation stress. To enable a less stressful separation, calf nutritional independence is important. We ask if data from smart-gates can inform about the cows' motivation to have continued access to the calf. Similarly, may data from an automatic milk and concentrate feeder convey information about the individual calf's state of nutritional independence? Such data may be valuable for dairy farmers to make informed decisions about optimized separation strategies. After 3 d in an individual calving pen, cow-calf pairs (n = 8) were moved to the CCC compartment with a cow area, a calf creep and a meeting area. During the next 31 d calves could suckle the cows in the meeting area (suckling phase). During this phase, cow access to the meeting area was free 24 h/d (group 1) or restricted (group 2) based on milking permission in the automatic milking unit. Thereafter, cow access was gradually decreased over 9 d (separation phase). We found that cows paid frequent (8.1 ± 3.91 times per d) and short (23.1 ± 14.00 min) visits to their calves. However, the duration and frequencies of these events varied among pairs and groups. Additional analyses from the study and preliminary results from an ongoing trial using similar design may be presented at the conference. We predict that the frequency and duration of cow visits through the smart-gates may be higher during the first weeks after birth, with a high level of individual variation. We also predict that a high visit-frequency at the time of separation is positively correlated with the cows' vocal response to separation. Calf intake of supplemental milk and concentrate may increase as the calf ages. Low intakes of supplemental feed and low growth may be associated with vocal response to separation. Taken together, this can aid the understanding of when and how the cow-calf dyad in a ccc-system may be separated with the least negative consequences.

Utilising the power of computer vision for pre-and post-calving monitoring in dairy cattle: simplicity in motion

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Tuesday, 3rd August - 14:45: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Tuesday, 3rd August - 15:45: Application of Technology to Applied Animal Behaviour and Welfare (1) - Oral

Dr. Oleksiy Guzhva [1], Dr. Håkan Ardö [2]

_1._ _Swedish University of Agricultural Sciences, Department of Biosystems and Technology, Alnarp,_ **_2._** _Axis Communications AB_

The set of strict management routines related to pre- and post-calving monitoring in dairy cattle is crucial for good calf welfare and health. The overall complexity of the existing sensor-based methods, requiring consideration of several behavioural and physiological parameters to be continuously monitored to predict the onset of calving with acceptable accuracy, makes them hard to apply in real-world scenarios. Computer vision algorithms could provide a flexible, non-invasive framework for monitoring calving boxes, providing valuable data for further analysis and decision-support. A two-step approach for calving monitoring was proposed during a pilot study. A custom convolutional neural network (CNN) for cow/calf detection and tracking was used to process 16 calving events recorded in a conventional farm environment (group-housed cows in a deep-straw box with access to feeding area). The detector was trained on a set of manually annotated frames (n = 15000) from two different farms and contained such classes as a cow, calf, and cow's pose – standing or laying down. The cow/calf detector's performance was as follows: F1 score for calf 95.04%, 98.07% for a cow and – 98.62% for the pose estimation (cow only). The video fragments containing five hours pre-calving and four hours post-calving were used as input for the Kalman Filter-based tracker to derive animal-based features such as general activity (based on individual variations in speed and acceleration for each cow), head-to-body angle and posture change (standing and laying), in order to provide the visualised stream of behavioural and activity data. By continuously monitoring the activity and pose changes, the deviations in behaviour could be quantified and integrated into the management system to find cows in need of potential assistance. Due to a large individual variation between cows, the prediction of calving's onset was not considered viable from a practical farming perspective. The animal caretakers often do not have the time and opportunity to interfere with the ongoing calving and concentrate on helping the newborn calf instead. To assist with timed care for newborn calf, the simplified approach based on frame-to-frame object detection was tested. The basic cow/calf detector was used to continuously process the frames from a camera installed in a calving box, counting the number of cow/calf class detections. When the calf detection was reaching a certain threshold (to account for false-positive detections), the alarm was raised to indicate the calving event and the need for manual assistance.

Plenary: UFAW/ISAE Welfare of Animals used in Research and Teaching

The impact of conventional housing on stress-sensitive health conditions in laboratory rodents: a systematic review and meta-analysis

Sunday, 1st August - 18:00: (Oral presentations) - Plenary talk

Tuesday, 3rd August - 18:00: (Stage 1) - Plenary talk

Prof. Georgia Mason [1] **_, Ms. Jessica Cait_** [2]

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Under conventional laboratory conditions, rodents live in shoebox-sized barren cages that restrict movement and highly motivated natural behaviours. This potentially increases abnormal behaviour, elevates in-cage aggression, impairs thermoregulation and causes obesity. But do these stressors matter? Literature on humans living in aversive environments and/or exposed to repeated stressors indicates that if conventional cages are impactfully stressful, then compared to rodents housed in environmentally enriched cages (typically larger, more complex, and supportive of species typical behaviours), rodents from conventional cages will show greater stress-related morbidity and increased all-cause mortality. To test this hypothesis, we conducted a systematic review and meta-analysis on effects of conventional cages on the morbidity of seven _a priori_ designated stress-potentiated diseases (cardiovascular disease, cancer, depression, anxiety, stroke, asthma and viral infections), as well as mortality rates. Outcome variables were selected _a priori_ as disease-specific outcomes that are negatively impacted by stress in humans and commonly reported in biomedical rodent research. A comprehensive literature search of MEDLINE, CAB abstracts, Science Citation Index, Elsevier and Proquest Dissertations and Theses yielded 10,130 articles that were screened at two levels (title/abstract and full text). Articles were included if published in English, utilised mice or rats, and provided enrichments within the home cage. A total of 6,469 mice and rats from 169 studies met inclusion criteria for final meta-analysis, spanning five diseases (cardiovascular disease [9 studies], cancer [45 studies], depression [18 studies], anxiety [26 studies], and stroke [45 studies), with viral infections and asthma being excluded due to insufficient data. All-cause mortality rates were also evaluated by calculating hazard ratios for a further 26 studies (2,201 animals). Two reviewers independently obtained data on enrichment conditions, experimental set up and animal characteristics. Raw data on outcomes were converted to effect sizes (standardized mean differences: Hedge's G) to quantify housing impacts. Currently, a three-level random-effects meta-analysis is being performed separately for each disease plus all-cause mortality, and a mixed-effects meta-analysis conducted to analyze the contribution of moderators (e.g. species, sex and enrichment type) to the overall estimated effects of housing conditions. Results will quantify the degree to which conventional cages exacerbate stress-sensitive diseases and shorten lifespans. If the hypothesis is confirmed, this would have practical implications for the use of rodents in biomedical research (raising questions about the applicability of rodent data to humans who are not stressed, sedentary or overweight). It would have major ethical implications for these animals and their housing too.

UFAW/ISAE Welfare of Animals used in Research and Teaching

Characterizing inactivity in laboratory mice: What does it reveal about welfare and how can it be objectively assessed?

Sunday, 1st August - 18:00: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Tuesday, 3rd August - 18:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Tuesday, 3rd August - 19:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Ms. Aileen MacLellan [1] , _Prof. Georgia Mason_ [1]

1. _Department of Integrative Biology, University of Guelph, Guelph_

Though relationships between inactivity and welfare are complex, some distinct forms may indicate poor welfare. For example, in mice laying motionless with eyes open, inactive-but-awake (IBA) has attracted attention and concern. IBA reliably occurs at higher levels in barren, conventional housing (CH) than welfare-friendly, enriched housing (EH); and predicts increased time floating immobile in Forced Swim Tests (FST): a measure of 'learned helplessness' common in rodent models of depression. IBA is thus potentially an indicator of poor mouse welfare, possibly even "depression-like" states, but further investigation is needed. We first sought to replicate FST effects and extend these findings to two additional signs of depression (University of Guelph Animal Use Protocol #3700). Females (n=132) from three strains (C57BL/6, DBA/2, Balb/c) were reared to adulthood in EH or CH (both meeting Canadian Council on Animal Care requirements). We first replicated past findings that levels of home cage IBA and immobility during FSTs were higher in CH than EH mice, with significant effects in C57BL/6 and Balb/c strains ($p<0.05$). IBA also significantly predicted FST floating in CH mice ($p=0.02$). Assessing two other diagnostic criteria of depression, changes in weight and sleep, revealed that IBA positively covaried with BMI across all strains ($p=0.003$) and with sleep during the active phase in DBA/2 ($p=0.0001$) and CH Balb/c mice ($p<0.0001$). Next, we piloted methods to better phenotype this behaviour, investigating whether facial expressions (based on the mouse 'grimace scale'), postures and location during IBA differed between EH and CH in C57BL/6 and Balb/c females (n=24). Home cage observations confirmed higher levels of IBA in CH than EH, though differences were non-significant ($p=0.433$, _Cohen's d_= 0.331). Including only scans of 'IBA with eyes squinted' increased the effect size from medium to large ($d=0.851$) and the housing effect became a trend (p=0.0610). The same held for IBA performed using hunched postures ($p=0.077$, $d=0.791$) and CH mice also performed more IBA in their paper cup shelters than EH mice ($p=0.001$, $d=0.603$). Though replication (on a larger scale, with blinding) is now needed, these pilot results suggest that particular facial expressions, postures and locations can help identify forms of IBA that are most specific to negative states. Overall, awake inactivity is thus emerging as a promising, non-invasive welfare indicator for mice, reliably occurring at higher levels in suboptimal conditions, and being linked with three signs of depression. Next steps are to better assess sensitivity and specificity of this indicator.

Assessing mouse welfare with a novel judgement bias task: validation and application to oncology

Sunday, 1st August - 18:00: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Tuesday, 3rd August - 18:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Tuesday, 3rd August - 19:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Dr. Agustina Resasco [1] *, Ms. Aileen MacLellan* [2] *, Dr. Miguel Angel Ayala* [3] *, Ms. Lindsey Kitchenham* [4] *, Dr. Michelle Edwards* [5] *, Ms. Sylvia Lam* [6] *, Ms. Stephanie Dejardin* [7] *, Prof. Georgia Mason* [2]

1. *Institute of Cell Biology and Neurosciences, National Scientific and Technical Research Council-University of Buenos Aires, Autonomous City of Buenos Aires,* **2.** *Department of Integrative Biology, University of Guelph, Guelph,* **3.** *Laboratory of Experimental Animals, Faculty of Veterinary Sciences, National University of La Plata, La Plata,* **4.** *Department of Animal Biosciences, University of Guelph, Guelph,* **5.** *Ontario Agricultural College, University of Guelph, Guelph,* **6.** *Ontario Veterinary College, University of Guelph, Guelph,* **7.** *Formerly Department of Animal Biosciences, University of Guelph, Guelph*

Affective states can bias peoples' responses to ambiguous information, causing judgement bias (JB). In animals, tasks to assess similar JB have been developed, by training individuals to perform operant responses to one cue for a reward, and another cue to avoid punishment, before assessing responses to intermediate, ambiguous cues. Construct validation of these tasks requires evidence that individuals experiencing positive states respond 'optimistically' to ambiguous stimuli as if expecting reward, while those in negative affective states behave 'pessimistically'. Validation is crucial for these JB tasks since they differ from the human techniques that inspired them. For laboratory mice however, a valid task has remained elusive. Of 16 attempts, 11 failed to demonstrate the predicted effects of affect on ambiguous cue responses, while 5 did not manipulate affect prior to JB assessment. We aimed to validate a novel mouse JB task: a Go/Go design, in which subjects learned to discriminate between odour stimuli that predicted the presence of high- or low-value food rewards buried in a substrate. During the testing phase of the assay, latency to dig and total duration of digging were recorded for responses to positive, negative and ambiguous odour cues. To manipulate affective state, we employed preferred, environmentally-enriched cages, versus barren conventional cages known to induce anxiety and depression-like effects (Experiment 1, University of Guelph Animal Use Protocol #3700). In C57BL/6 (n=17) and Balb/c (n=18) females presented with ambiguous odour cues, latency to dig proved sensitive to housing-induced changes in affect: environmentally enriched animals demonstrated relative optimism, through shorter latencies as if expecting high-value rewards (p=0.014, Cohen's d=1.148). Effects of housing on digging duration were non-significant however, thus highlighting the importance of construct validation. Since this task is potentially useful to study affective processes underlying disease, and tumour development in humans has been linked to negative states like depression, we subsequently applied the task to a widely used animal model in cancer research (Experiment 2, National University of La Plata Animal Use Protocol 42-1-14T). Male (n=19) and female (n=19) nude mice implanted with subcutaneous lung adenocarcinomas were trained in the JB task and latency to dig was assessed. Tumour-bearing males (but not females) treated ambiguous cues more pessimistically than did healthy controls (p=0.005, Cohen's d=1.425). Although refinements to improve its sensitivity are still needed, to our knowledge this is the first validation of a JB task for mice (and the first potential evidence of pessimism in tumour-bearing animals).

Acoustic playback paradigms alter affective states in juvenile male Wistar rats

Sunday, 1st August - 18:00: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Tuesday, 3rd August - 18:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Tuesday, 3rd August - 19:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Ms. Tayla Hammond [1], Dr. Sarah Brown [2], Prof. Simone Meddle [2], Dr. Birte Nielsen [3], Prof. Alistair Lawrence [4], Dr. Vincent Bombail [5]

1. Animal & Veterinary Sciences, 2 Scotland's Rural College (SRUC), Roslin Institute, Easter Bush, UK 2 The Roslin Institute, The Royal (Dick) School of Veterinary Studies, The University of Edinburgh, United, 2. The Roslin Institute, The Royal (Dick) School of Veterinary Studies, The University of Edinburgh, United Kingdom, UK, 3. UFAW, 4. Animal & Veterinary Sciences, 2 Scotland's Rural College (SRUC), Roslin Institute, Easter Bush, UK, 5. Physiologie de la Nutrition et du Comportement Alimentaire (PNCA), INRAE, Université Paris-Saclay, France

Play has been proposed as a promising indicator of positive emotions and welfare in domesticated animals. During play, rats produce ultrasonic vocalisations often referred to as 50kHz USVs (or 'rat laughter') which are thought to indicate a positive emotional experience and have a role in social communication. Previous work has shown playback of USVs to individual rats can alter rat behaviour. In a radial maze setting, 50kHz positive communicative calls induce approach behaviour and increase exploration, whereas, 22kHz alarm calls induce behaviours indicative of the fight/flight system, e.g., reduced locomotor activity and freezing. When given the opportunity to express play behaviour, we hypothesised that playback of calls of contrasting valence would alter affective state and result in a matched change in play. Playback of 50kHz USVs would increase 50kHz vocalisations and play, with 22kHz USV playback reducing USV production and play. Juvenile male Wistar rats (N = 58; 37 days old) were housed in pairs and assigned to one of 3 groups balanced by bodyweight. Each pair of rats received acoustic stimuli treatments in the home cage in a pseudo-randomised Latin square design across three days. Experiment I tested 50kHz calls, 22kHz calls and background noise, whilst Experiment II tested 50kHz calls, white noise within the $30 - 100$kHz range and background noise. Each day, a playback session consisted of a habituation phase, then 3 sets of acoustic stimuli followed by a pause for a total of 7 minutes, with each phase lasting 1 minute. Playback of 50kHz calls increased subject-produced 50kHz vocalisations and approach behaviour towards the sound source when the speaker was above the cage compared with background noise. Contrastingly, playback of 22kHz calls reduced the number of 50kHz USVs. When rats were exposed to white noise, the number of USVs produced matched the number produced during playback of 50kHz calls. In contrast with our hypotheses, we found that social play was dampened when played 50khz calls but induced when played the white noise compared with background noise. Further investigation is required for use as play an indicator of positive welfare and to investigate relationships between playback of USVs and spontaneous behavioural responses.

The work described in this abstract conforms with the ISAE Ethical Guidelines.

The neural correlates of tickling may differ from those involved in pro-social behaviours

Sunday, 1st August - 18:00: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Tuesday, 3rd August - 18:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Tuesday, 3rd August - 19:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Ms. Emma Tivey [1], _Dr. Jessica Martin_ [1], _Dr. Sarah Brown_ [1], _Dr. Valerie Bishop_ [1], _Prof. Alistair Lawrence_ [2], _Prof. Simone Meddle_ [1]

1. _The Roslin Institute, The Royal (Dick) School of Veterinary Studies, The University of Edinburgh, United Kingdom, UK,_ **2.** _Animal & Veterinary Sciences, 2 Scotland's Rural College (SRUC), Roslin Institute, Easter Bush, UK_

'Tickling' is a widely used technique to model social play and positive affective states in rats. The behavioural response to tickling is associated with the ascending mesolimbic dopamine system and the somatosensory cortex. However, any involvement of other regions that regulate social behaviours is yet to be explored. This study aimed to investigate whether tickling altered neuronal activity within the social behaviour network in female and male Wistar rats, testing the hypothesis that tickling is a social interaction that activates the neural social behaviour network in rats. Rats received either tickling (tickled, n=16/sex) or no hand contact (control, n=16/sex), and play behaviours (approach and solitary play behaviours) and trill and flat 50 kHz USVs were quantified. Rats were culled and their brains taken: immunohistochemistry was used to quantify c-fos expression (a marker of neuronal activity) in multiple brain regions that play a vital role in the regulation of social behaviours. All animal work was carried out following ethical approval by Roslin Institute's Animal Welfare and Ethical Review Body. We found that correlations in neural activation between several regions that are involved in social conspecific play are disrupted in tickled rats: there was a significant correlation in c-Fos expression between the bed nucleus of the stria terminalis (BNST) and the nucleus accumbens in control (p= 0.006) but not tickled (p= 0.607) rats. Similarly, tickling altered activation patterns of projections from the amygdala to the BNST (control, p= 0.004; tickled, p= 0.39) and to the ventral tegmental area (control, p= 0.01; tickled, p= 0.38). This was also the case from the lateral septum to the amygdala (control, p= 0.004; tickled, p= 0.245) and to the periaqueductal gray (control, p= 0.004; tickled, p= 0.54). We also found that tickled rats, regardless of sex, had lower numbers of c-Fos positive oxytocin (p=0.02) and vasopressin (p=0.03) neurons in the paraventricular nucleus of the hypothalamus. This suggests that tickling is altering activity in known brain circuits that are active during social play in rats. Specifically, tickled rats appear to have lower neural activity in these networks. Therefore, while rewarding, tickling may not be perceived as a social interaction for rats. To investigate this further, we conducted a social preference test, where the rat could choose between a novel object and the hand that had tickled it, and a runway test to measure the motivation to be tickled. The results of this study are currently being analysed.

Is time spent inactive but awake in the home cage in mice alleviated by antidepressants, by environmental enrichment, or by both?

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Tuesday, 3rd August - 19:45: UFAW/ISAE Welfare of Animals used in Research and Teaching - Oral

Dr. Anna Trevarthen [1], Ms. Emily Finnegan [1], Dr. Katarína Bučková [2], Dr. Agustina Resasco [3], Dr. Elizabeth Paul [1], Prof. Michael Mendl [1], Dr. Carole Fureix [1]

1. *University of Bristol,* **2.** *Queen's University Belfast,* **3.** *Instituto de Biología Celular y Neurociencias (IBCN)*

We previously identified in laboratory mice an inactive state [being awake with eyes open motionless within the home cage, inactive but awake 'IBA'], triggered by barren cages and associated with a key feature in animal models of human depression: cessation of swimming in forced-swim tests. We tested further the hypothesis that greater time spent displaying IBA indicates a depression-like state in mice by testing whether IBA is alleviated by giving antidepressants that are clinically efficient in humans, by providing less stressful life conditions, and whether combining these therapeutic approaches magnifies their effects (UK HomeOffice ethical approval #P2556FBFE). Seventy-two C57BL/6J and 72 DBA/2J female mice were pseudo-randomly housed in mixed strain-pairs in small non-enriched (NE) or in large environmentally enriched (EE) cages from 3-4 weeks of age. After 34 days, half of the mice housed in NE cages were either relocated to EE cages or left in NE cages. For each of these conditions, half of the mice were orally given either a placebo (n=24 mice) or the antidepressant Venlafaxine (10mg/kg, n=24). The 48 mice housed in EE cages were all relocated to NE cages and allocated to either a placebo treatment (n=24), or Venlafaxine (n=24). In-cage IBA data were collected by trained observers using a mix of live scan- and focal-sampling in two daily 90-minute time blocks repeated over 2-4 days per week, over 3 consecutive weeks prior to and after environmental adjustment. Experimenters were blind to the pharmacological treatment, and behavioural observers were blind to both pharmacological and environmental adjustment treatments. Data were analysed using generalised linear mixed models. As expected, NE cages triggered IBA more than EE cages (LRTChi$^2_6$ =2.768, p<0.0001). For mice originally housed in NE cages, only individuals in the NE-NE-Placebo control group showed an increase over time in their proportion of visible scans displaying IBA, while IBA decreased following pharmacological, environmental enrichment, and both treatments (LRTChi$^2_9$ =0.850, p=0.003). Importantly, Venlafaxine and environmental enrichment appear equally as effective at reducing IBA, and combining these approaches did not magnify reduction in IBA (post-hoc comparisons, p=0.2050 to 0.5816). Moving mice from EE to NE cages induced a significant increase in IBA (LRTChi$^2_5$ =0.932, p<0.001), with no significant difference in the rise shown by the placebo and drug groups (LRTChi$^2_3$ =0.024, p=0.864). Venlafaxine therefore did not overcome the increase in IBA resulting from enrichment loss. Theoretical and practical implications for mouse welfare, and further research directions, will be discussed.

How can we improve the welfare of animals used in behavioural tests?

Dr. Birte Nielsen [1]

1. *UFAW*

Use of animals for scientific and educational purposes is subject to regulations. Within the European Union, a directive (2010/63/EU) stipulates rules and limits for experiments carried out on non-human vertebrate animals and cephalopods, with detailed standards for the housing and management of a variety of species used in research. The directive states that animals have intrinsic value, and that they should always be treated as sentient creatures. In addition, it is "*necessary to improve the welfare of animals used in scientific procedures by raising the minimum standards for their protection in line with the latest scientific developments*". Guidelines complementing legislation exist (eg. ARRIVE) for improving the reporting of research using animals.

In behavioural tests of animals, we ask the animal a question by exposing it to a test situation. To get a sensible answer, the animal needs to be in a suitable state and not be stressed. Handling our animals regularly, habituating them to the test situation, and keeping them in suitable housing contributes to the validity of our results. Many/most behavioural tests of animals are non-aversive, and some tests even appear to improve the affective state of the animals, such as response to tickling in rats and choice of novelty in pigs. Some behavioural tests, however, involve aversive stimuli. These are not necessarily painful stimuli, as 'aversive' simply means those that the animal wants to avoid, e.g. an unpleasant smell. Nevertheless, several commonly used behavioural tests use electric shock as a stimulus.

During interactions with animals in our care, we can all do our best to improve their welfare, applying training and test methods that confer a maximum of contentment, and restricting aversive stimuli to the bare minimum. But even when a behavioural test is non-aversive, or mimics a naturally occurring situation, we are still using live animals for scientific purposes, which continues to raise concerns among the public. As an animal behaviour scientist, I should endeavour to perform behavioural tests that are non-aversive and without detrimental effects on the welfare of the animals tested. If aversive tests are used, these should be the least severe, of the shortest duration, and involve the lowest number of animals possible. Behavioural tests exist that we should no longer use. As scientists, we play a role in providing information to the public about our work, thereby creating a common basis from which to start a dialog, preventing the debate from becoming polarised.

Unreliability of pup mortality estimation in laboratory mouse breeding is a consequence of cannibalism but not infanticide

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Dr. Sophie Brajon [1], Dr. Gabriela Morello Munhoz [1], Ms. Sara Capas Peneda [1], Dr. Jan Hultgren [2], Dr. Colin Gilbert [3], Dr. Anna Olsson [1]

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Laboratory mouse pup mortality is a major welfare and economic issue. Previous studies indicated that perinatal mortality may be underestimated, especially if counting failed to include pups cannibalised (eating a dead pup) between birth and first husbandry check. This study aimed at comparing two counting methods (daily cage checking alone (DAILY_CHECK, $N_{litters}$=138) or in combination with video analysis (VIDEO_TRACK, $N_{litters}$=55)) for estimating the number of C57BL/6 pups born, died and weaned. Studied litters were from trios with (TRIO-OVERLAP, $N_{litters}$=90) or without (TRIO-NO_OVERLAP, $N_{litters}$=103) the presence of another litter in the cage. Linear mixed models were used to compare counting methods at the litter level. To further understand divergences, pup mortality and cannibalisms across time were monitored by analysing video captured in VIDEO_TRACK counting in litters from TRIO-OVERLAP (N_{pups}=170), TRIO-NO_OVERLAP (N_{pups}=308) and SOLO (single dam, N_{pups}=472), and analysed using the Kaplan-Meier method and logistic regression at the pup level. The most thorough method (VIDEO_TRACK) did not artificially increase pup mortality compared to the standard practice (DAILY_CHECK) since the number of weaned pups did not significantly differ between both methods (P=0.593). However, compared to VIDEO_TRACK counting, DAILY_CHECK counting underestimated litter size at birth by 35% (6.3±0.2 vs. 8.6±0.4 born pups/litter, P<0.0001) and pup mortality by 102% (2.0[1.8;2.4] vs. 4.2[3.5;5.0] dead pups/litter, P<0.0001). Thereafter, VIDEO_TRACK data indicated that pup mortality was highest within the two first days of life for all litters but was even higher in TRIO-OVERLAP litters. When exploring pup mortality between birth and first cage checking after birth (on the same day), a total of 69%, 53% and 21% of dead pups were already cannibalised in TRIO-OVERLAP, TRIO-NO_OVERLAP and SOLO litters, respectively, meaning that dead pups were 2.5 and 1.7 more likely to be cannibalised when born in TRIO-OVERLAP or TRIO-NO_OVERLAP than in SOLO litters (P<0.0001 and P=0.007). Pups cannibalised before the first daily cage check could only be detected later using video analyses. Infanticide (killing a live pup) was only observed 7 times in trios, therefore most of the cannibalised pups were not actively killed before being eaten. These alarming results indicate that (i) the number of mouse pups born may be highly underestimated in breeding facilities even when newborns are counted shortly after birth, (ii) underestimation is more severe for litters born when another litter is already present (iii) cannibalism of dead pups between birth and first cage check is the main cause of this underestimation.

Companion and Wildlife Management

Facial expression in French bulldogs: A preliminary study

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Ms. Jemima Locke [1] *, Dr. Jane Ladlow* [2] *, Dr. Nai-Chieh Liu* [2] *, Dr. Krista McLennan* [3]

1. *Harper and Keele Veterinary School,* **2.** *Department of Veterinary Medicine, University of Cambridge, Cambridge,* **3.** *University of Chester*

Brachycephalic dog breeds such as the pug, French bulldog and bulldog can suffer from a condition commonly referred to as Brachycephalic Obstructive Airway syndrome (BOAS). The breathing difficulties associated with brachycephalic dogs is often considered 'normal' by both owners and veterinarians, meaning many dogs do not receive appropriate veterinary treatment or management. Facial expression is considered to be an honest signal of affective state, and humans are naturally drawn towards the face when asked to assess pain in animals. The aim of this study was to investigate the possibility of using facial expression to assess the current affective state of BOAS-affected and non-affected brachycephalic dogs, using the French bulldogs as a case study. Photographic images were collected as part of the clinical assessment before physical examination took place. Data consisted of (n= 15, n=43, n=91, n=16) dogs from each of the four BOAS severity grades (0, I, II, & III respectively). Five facial areas were identified (orbital tightening, abnormal ear position, brow tension, masseter muscle tension and abnormal nasal tension) and given a score of zero (not present), one (partially present) and two (present). Images were scored for each area and a total facial expression score generated. Sensitivity and specificity were analysed using the Receiver Operator Curve analysis, and differences in total facial expression scores between the BOAS grading scores were analysed using Kruskal-Wallis. Sensitivity and specificity testing demonstrated an acceptable level of accuracy (AUC = 0.64) in line with other published scales, and scores of 8.5 and above were accurately identified as BOAS-affected. The five facial action units identified were significantly ($P<0.01$) affected by BOAS grading score (BOAS grade (median); 0 (3), 1 (4), 3 (5), 4(5)), with the total facial expression score increasing as BOAS grade increased. We are confident that this preliminary investigation demonstrates that there are identifiable changes occurring in response to the presence of BOAS and that facial expression in these breeds could be a useful tool in helping to recognise and evaluate the current affective state of BOAS-affected dogs.

Canine Olfaction as a Disease Detection Technology: A Systematic Review

Mr. Aiden Juge [1], Dr. Courtney Daigle [1]

1. Texas A&M University

Capitalizing on canine olfactory capacity is a promising strategy for detecting and diagnosing human, animal, and plant diseases. The purpose of this review was to assess the extent of current research in canine disease detection. In this systematic review, multiple databases were searched for studies in which dogs were trained to detect diseases or health conditions. Following PRISMA guidelines, 3731 studies were screened and 58 relevant studies identified. The majority of studies (n=33, 57%) took place in Europe. Lung cancer (n=11, 19%) and prostate cancer (n=8, 14%) were the most frequently-studied conditions. Urine (n=19, 33%) and breath (n=12, 21%) were the most common sample types. Across all studies, 194 unique detection dogs were tested. The most numerous breeds were Labrador Retrievers (n=26, 13.4%), Belgian Shepherds (n=24, 12.3%), and German Shepherds (n=22, 11.3%). The median number of dogs per study was 2, ranging from 1-20. To analyze experimental design and results, studies including multiple test paradigms were divided into sub-studies (n=103). In 85.4% of sub-studies (n=88), dogs were presented with sets of samples, and 72.8% (n=75) reported a constant number of samples per trial. The median number of samples per trial was 6 (range: 2-100). Of the sub-studies reporting a fixed number of positive samples (range: 1-10; n=64), 89% (n=57) presented one positive sample per trial. A plurality of sub-studies (n=47, 46%) presented samples in a lineup. Sensitivity (median: 0.90; range: 0.05 to 1.0; n=88) and specificity (median: 0.96; range: 0.08 to 1.0; n=77) were the predominant measures of detection success, although reporting strategies were inconsistent. In 21 of the 78 sub-studies that included multiple dogs (26.9%), statistically significant differences in performance between individual dogs were reported. Dogs appear to have the capacity to detect disease via olfaction; yet the nascent nature of this discipline yields little consistency across studies.

Non-target Interactions and Humaneness Evaluation of Captive Bolt Traps in Rodent Control

Sunday, 1st August - 18:00: Companion and Wildlife Management - Oral

Tuesday, 3rd August - 19:00: Companion and Wildlife Management - Oral

Tuesday, 3rd August - 19:45: Companion and Wildlife Management - Oral

Mrs. Erin Ryan [1] *, Dr. David Fraser* [1]

1. *Animal Welfare Program, University of British Columbia*

Alternatives to rodenticides are desirable to pest control customers and operators concerned with the environment and animal welfare, but there are few practical alternatives to handle rodent infestations. The Goodnature® A24 automatic rat trap is a self-resetting captive bolt trap powered by pressurized CO_2, designed with the objective of instantly crushing the skull to cause spontaneous nervous system suppression. Conservation and environmentally-minded institutions that conduct rodent control are interested in these traps, but have concerns about the potential to harm non-target animals including other small mammals, birds, and pets. This study aimed to identify potential risks to non-target animals, and conduct a humaneness evaluation of the traps. Nine traps were deployed at a compost facility where rodents were present, and each trap paired with a motion-activated video camera. To assess non-target risk, the traps were baited, but not activated, and a cross-over design was used with a blocking device ("blocker") to evaluate the effectiveness of this tool at reducing non-target strikes. A total of 2,282 animals across 34 different species were recorded by video camera. Rodents were the most common mammalian visitor (n=566), followed by squirrels (n=302), and other mammals (raccoons, skunk, shrew, n=92). Birds were the most frequently observed (n=1,312), but had the fewest interactions with the trap itself – only 1 bird was observed entering the trap body (with no blocker equipped), while the remaining interactions involved no interaction (n=1,087), investigating the trap (n=147) or perching on the trap (n=97). A small number of unidentifiable animals (n=10) were observed, but did not interact with the trap. 36 raccoons and squirrels were observed either entering the trap or inserting limbs in the trap when there was no blocker in place, however this number was reduced to 0 with a blocker in place. Once the researchers were confident in avoiding non-target strikes, the traps were activated and video footage observed to evaluate humaneness. To date, nine animals have been observed activating the trap – all apparently instant kills*. The Goodnature A24 rodent trap is a promising tool as an alternative to rodenticide poisons, however the researchers recommend the use of a blocker in outdoor settings where other non-target animals are present.

*Note this phase of the study is still ongoing, with data collection expect to be complete by the spring. By the time of the conference, we expect to have a larger number of observations, in addition to post-mortem analysis.

Individual temperament traits of chestnut-bellied seed-finches (Sporophila angolensis) affect their exploratory behavior during pre-release training

Sunday, 1st August - 18:00: Companion and Wildlife Management - Oral

Tuesday, 3rd August - 19:00: Companion and Wildlife Management - Oral

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Prof. Selene Nogueira [1] **_, Ms. Jaqueline Meira_** [1] **_, Dr. Stella Lima_** [1] **_, Prof. Sérgio Nogueira-Filho_** [1]

1. _Universidade Estadual de Santa Cruz_

The use of environmental enrichment (EE) during pre-release training is proposed as a way to improve reintroduction success. However, individual animal behavioral characteristics may influence the animals' responses to EE, which may lead to interpretation biases on the effectiveness of this technique. Therefore, we aimed to investigate whether temperament traits of chestnut-bellied seed-finches (_Sporophila angolensis_) affect their behavioral responses to EE. The species conservation statuses is low concern, but is critically in danger in some states of Brazil. We submitted 19 captive seed-finches to two short-term challenges, new environment (NE) and new object (NO), allowing us to rate the birds in a temperament dimension named 'confidence'. Subsequently, we used the ABA paradigm to evaluate the effect of EE on the individuals' behavioral responses. During the enriched phase, the birds spent more time in exploratory patterns ($P < 0.001$), while decreasing the time spent on maintenance patterns ($P = 0.005$) compared with both control phases. The higher the confidence score, the longer seed-finches spent exploring the cage ($P = 0.025$) during the enriched phase. Our data showed that EE indeed led to a positive increase in the exploratory behavior of _S. angolensis_, which may improve the likelihood of survival after release. However, adjustments must be made, taking into account the individuals' temperament traits to promote the effectiveness of EE schedules in pre-release training. Increasing the time of environmental enrichment may lead less confident individuals to explore more, which may improve reintroduction success. This work followed the principles of laboratory animal care (NIH publication # 86-23, revised in 1985), Brazilian laws and was approved by the Animal Use Ethics Committee (CEUA) of the Universidade Estadual de Santa Cruz – UESC (protocol # 024/17).

Unlocking urban animal response to reduced human activity during COVID-19 lockdown

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Tuesday, 3rd August - 19:00: Companion and Wildlife Management - Oral

Tuesday, 3rd August - 19:45: Companion and Wildlife Management - Oral

Mrs. SAYANTANI M. BASAK [1], **Dr. Declan T. O' Mahony** [2], **Dr. Maciej Lesiak** [3], **Mr. Arpan Kumar Basak** [4], **Dr. Elżbieta Ziółkowska** [1], **Dr. Dominik Kaim** [5], **Dr. Md Sarwar Hossain** [6], **Dr. Izabela A. Wierzbowska** [1]

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The interrelations between human activity and animal populations are of increasing interest due to the emergence of novel COVID-19 across the world. Anthropogenic impacts of the pandemic on animals living in urban-suburban environments are largely unknown. In this study, for the first time, temporal and spatial aspects of urban animals' response to the impacts of COVID-19 lockdown were assessed using animal-vehicle collisions (AVC) data. The aim of the study was to identify any effects of changes in human and vehicular activity on AVC in an urban-suburban landscape during the COVID-19 pandemic. The study was conducted in southern Poland within the Krakow metropolitan area, which is comprised of the urban commune of Krakow and two sub-urban communes. We used 1741 AVC incidents from January to June for 2019 and 2020, which included the lockdown months. Traffic data of the city were obtained from the Department of City Traffic through the light detection system installed at major roads in the city. Our analysis revealed 21 animal species involved in high levels of AVC particularly in the city. The rates of the incidents peaked in the mornings and were significantly greater in urban as compared to suburban environments, but comparable within suburban study sites. Wild boar (*Sus scrofa*), red fox (*Vulpes vulpes*), domestic dog (*Canis lupus familiaris*) and cat (*Felis catus*), roe deer (*Capreolus capreolus*), brown hare (*Lepus europaeus*) and bird species were the most common animals involved in road collisions in all locations. There was a significant difference of AVC between Krakow and the sub-urban regions (False Discovery Rate <0.05). The Spearman's correlation analysis between AVC incidents and traffic intensity (Rho= -0.51; p=0.01) indicated that reduction of traffic in Krakow during the lockdown did not reduce AVC in the city. The spatial analysis of AVC between lockdown and non-lockdown periods indicated although lower, yet not a large disparity in AVC in 2020 throughout the study area. It might suggest that animals responded by increasing utilisation of urban-suburban interfaces in response to reduced human activity induced by COVID-19. In conclusion, considering these findings within the context of the reduced human activity due to COVID-19 restrictions, our results argued that the global pandemic has had a limited impact on AVC levels within the study area. We thus emphasise the importance of developing targeted AVC mitigation strategies that will decrease injury, mortality, and impending conflicts especially due to short term changes affecting species movement.

Identifying the scaredy cat: training improves public rating of emotional states in kittens

Sunday, 1st August - 18:00: Companion and Wildlife Management - Oral

Tuesday, 3rd August - 19:00: Companion and Wildlife Management - Oral

Tuesday, 3rd August - 19:45: Companion and Wildlife Management - Oral

__Ms. Courtney Graham__ [1] , Dr. David Pearl [1] , Dr. Lee Niel [1]

__1.__ Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, ON

Recognizing when kittens are in a fearful emotional state is crucial to their long-term welfare. Early identification allows caretakers to prevent exposure to fear-evoking stimuli, and to reduce development of related behavioural issues. To determine whether the general public can identify fear in kittens, we conducted an online survey in Qualtrics that examined whether participants could correctly rate a series of kitten videos, and whether specialized training was effective at improving performance. Participants (N=761) watched and rated two series of twelve short video clips of 5- to 8-week-old kittens displaying behavioural indicators of a neutral/positive state, mild fear, and moderate fear during exposure to novel stimuli. In between each series of kitten videos, participants were randomly selected to receive a short educational video of either specialized training in identifying kitten behaviour or general information on kitten care. Kitten videos were scored by three experts to ensure 100% consensus on fear categorization, and participant responses were then compared to expert responses and identified as being either correct or incorrect for each video (before and after training). The effect of training on participant ability to categorize each level of kitten fear correctly in the second video series was assessed using mixed logistic regression models with participant as a random effect. Training was associated with participants being significantly more likely to correctly categorize all levels of kitten behaviour compared to receiving general kitten care information: *Neutral/positive:* OR=5.79, 95%CI: 2.40, 13.99; p<0.0001; *Mild fear:* OR=5.39, 95%CI: 4.22, 6.87; p<0.0001; *Moderate fear:* OR=6.69, 95%CI: 5.02, 8.93, p<0.0001. Even with training and associated improvement, the proportion of participants with correct ratings was lowest for the mild fear category (after training: 88.3% vs. after general info: 62.4%), suggesting a mid-state to be more challenging to identify than more extreme emotional states. Overall, these findings suggest clear and concise training in identification of specific fear-related behaviours—including ear, tail, and abdomen positions; and other behaviours like avoidance, freezing, slow movements, and piloerection—can improve people's ability to recognize and rate emotional states in kittens. This research can be used to improve education programs within shelters and for foster parents to ensure accurate recognition of emotional states in kittens, to mitigate situations where kittens might be in a negative emotional state, and to enhance kitten welfare and behavioural development.

Welfare of Bovids (2)

Preference for ventilation and social contact in pair-housed dairy calves in outdoor hutches

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

Ms. Kimberly J. Reuscher [1], *Ms. Christina So-hyun Yu* [1], *Ms. Rekia S. Salter* [1], *Dr. Tiago Bresolin* [1], *Dr. Jennifer Van Os* [1]

1. University of Wisconsin-Madison

Pre-weaned dairy calves in the U.S. are commonly housed in individual outdoor hutches, where they are exposed to environmental extremes. Socially housing calves has been shown to result in welfare benefits, but it is unknown how social contact and ventilation interact to affect heat stress in outdoor-housed calves. Our objective was to evaluate calves' preferences for hutch ventilation and social contact. Holstein heifer calves (n = 25 pairs) were pair housed with access to adjacent hutches with a shared fence. Each pair had 1 ventilated hutch with the rear bedding door propped open and 2 windows at the rear base of the hutch and 1 non-ventilated hutch with the bedding door closed and no windows. From 1100-1200 and 1230-1330 h on 2 consecutive d during wk 4, 6 (pre-weaning), and 9 (post-weaning) of life (23 ± 1.6, 38 ± 1.3, and 55 ± 0.9 d of age, respectively, mean ± SD), calves were exposed to each of 4 treatments in a 2 × 2 factorial design, in a balanced order: individually or in pairs in the non-ventilated or ventilated hutch. To evaluate preference, the calves' locations (inside each hutch vs. outside) were recorded at 15-min intervals by an observer blinded to hutch ventilation for the 3 subsequent d each wk. The proportion of time calves spent in each hutch, out of time inside both hutches, was averaged within pairs; this measure, along with the time calves spent together in each location, was averaged across the 3 observation d/wk. For each wk, a 1-sample t-test was used to determine if the pairs had a preference for the ventilated hutch or to be together, compared to 50% (chance, no preference). Calves showed no preference for ventilation in wk 4 (47.3 ± 4.5% of time inside both hutches, mean ± SE; $P = 0.555$), but did in wk 6 and 9 (61.2 ± 5.1% and 73.8 ± 4.3%, respectively, of the time inside both hutches; $P < 0.038$). Calves spent the majority of their time together, regardless of location, in all 3 wk (79.2 ± 1.6%, 78.4 ± 1.8% and 77.2 ± 2.3%, in wk 4, 6 and 9 respectively, mean ± SE; $P < 0.001$). Overall, calves prefer to be in the same location, and they prefer a ventilated hutch at 6 and 9 wk of age.

Keywords: dairy cattle, calves, ventilation, heat stress, social housing

Effect of bull biostimulation on puberty and estrus behaviour of Murrah buffalo heifers

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

__Dr. Dharma Sahu__ [1], Dr. Madan Lal Kamboj [1], Dr. Sunil Dutt [1], Dr. Sanjay Choudhary [1], Dr. Pawan Singh [1], Dr. Nishant Kumar [1], Dr. Anjali Aggarwal [1]

__1.__ ICAR-National Dairy Research Institute, Karnal (Haryana)

Late onset of puberty and poor estrus detection are major reproductive problems in water buffaloes. Biostimulation has been reported to advance age at puberty and helps in accurate detection of estrus in cattle, sheep, goat and pigs . It has also been reported to improve estrus detection and reproductive performance in buffaloes during post-partum period. The aim of the present study was to investigate the effect of bull biostimulation on growing buffalo heifers through fenceline bull contact and direct bull contact on age at puberty and estrus behaviour. For this 24 pre-pubertal Murrah heifers were allotted to 3 groups of 8 each on the basis of age (15.08 ± 0.16 months) and body weight (199.5 ± 0.21 kg). In no bull exposure (NBE) group, heifers were not exposed to bull; in fenceline bull exposure (FBE) , heifers were exposed to a bull through a fenceline contact round-the-clock and in DBE (direct bull exposure), heifers were exposed to bull through direct contact twice daily for 6 hours (6.00-9.00 am and 4.00-7.00 pm). Estrus behaviours were recorded on day -3, -2 and -1 (prior to estrus), d 0 (on the day of estrus) and on day +3, +2 and +1 (post estrus) using 24 hours CCTV cameras. The significance of differences among mean values of variables was tested using one-way ANOVA in SPSS version 22 software. Number of heifers detected in estrus in FBE, DBE and NBE were 5, 8 and 5 ; age at first estrus was 23.55 ± 0.85, 21.50 ± 0.44 and 25.61 ± 0.70 months with body weight of 342 ± 13.46, 348 ± 8.53 and 330 ± 12.45 kg respectively after 10 months of experiment. Frequencies of estrus behaviors viz., sniffing/licking, tail raising, micturition, chin resting, and mounting attempts on the day of first estrus were in DBE (89.00 ± 0.63, 14.25 ± 0.65, 23.00 ± 0.80, 55.13 ± 0.13 and 23.63 ± 0.94 respectively), in FBE (64.00 ± 0.63, 11.20 ± 0.74, 19.20 ± 0.80, 32.60 ± 1.08 and 13.00 ± 0.71 respectively) and in NBE (35.80 ± 0.66, 5.80 ± 0.58, 16.40 ± 0.51, 10.20 ± 0.66 and 6.60 ± 0.40 respectively). These values were higher ($p<0.5$) in second estrus than in first estrus in all 3 groups. These frequencies were the highest (($p<0.01$) in DBE followed by FBE and NBE. The onset of most of estrus behaviors was seen on d-3 and their frequencies continued to rise till d-0 and then declined on d+1 and almost ceased on d+3. We concluded that biostimulation of buffalo heifers by direct bull contact or fenceline bull contact advanced the age at puberty and elicited greater expression of estrus behaviours.

Effect of bull biostimulation on estrus behaviour and reproductive performance of postpartum Sahiwal cows (Bos indicus)

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

Dr. Manmohan Singh [1], *Dr. M. L. Kamboj* [1], *Dr. Sunil Dutt* [1]

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The prolonged inter-calving period due to delay in onset of post-partum ovarian function and poor estrus detection is one of the major reproductive problems especially in native breeds of cattle in India. Biostimulation has been reported to improve both estrus detection and reproductive performance in some beef breeds of cattle during the postpartum period. The aim of this study was to investigate the effect of biostimulation on estrus behaviour, estrus intensity and reproductive performance of postpartum Sahiwal cows through 2 types and durations of bull contact. For this, 24 postpartum cows were divided into 3 groups (T_0, T_1 and T_2) of 8 each based on their yield in the previous lactation in pleuriparous cows and expected producing ability of primiparous cows. In T_0, cows were not exposed to bull; in T_1 the cows were exposed to the bull after 15-30 days of calving through a fenceline contact round-the-clock and in T_2, the cows were exposed to the directly bull contact for 12 hours daily. The estrus behaviours were recorded on day -3, -2 and -1 (prior to estrus), d 0 (on the day of estrus) and on day +3, +2 and +1 (post estrus) by 24 hours CCTV camera recording. During first estrus, mean frequencies of different estrus behaviours viz., sniffing/licking (8.75±0.52, 16.00±1.22 and 26.88±0.78), tail raising (5.88±0.61, 14.50±0.63 and 23.63±1.36), micturition (10.13±0.80, 15.50±0.48 and 18.88±0.71), chin resting (8.38±0.65, 18.62±0.77and 25.25±0.86), number of steps (3053.88±55.86, 3767.75±81.39 and 4106.50±87.69), allowing mounting attempts (8.37± 0.41, 15.50±1.01 and 23.62±1.48), flehmens response (0, 6.38±0.88 and 10.88±0.97) and agonistic interactions of cows and bull (6.25±0.32, 13.88±0.47 and 19.50±0.66) were significantly (*p≤0.05*) higher in T_2 than in T_1 and T_0 on the d0. These frequencies of estrus behaviours were increased in the second estrus as compared to the first estrus in all 3 groups of cows. The average days to first estrus post-partum in T_1 and T_2 were significantly (p<0.05) lower than in T_0. It was concluded that the biostimulation of Sahiwal cows by exposure to bull contact from 15-30 days post-partum improved the expression as well as the intensity of estrus symptoms and reduced the days of first estrus postpartum in comparison to non-bull exposed cows. The biostimulation by exposure to bull by direct contact was found to have a greater effect than fenceline bull contact in improving the expression and intensity of estrus.

Effect of fence-line and restricted cow-calf contact on behaviour, health and growth performance of Sahiwal (Bos indicus) calves

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

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Varying degrees of cow–calf contact has been reported in recent years to have positive consequences on the behaviour and performance of calves. Effects of different modes and durations of cow-calf contact have been investigated predominantly in *Bos taurus* and beef breeds of cattle. The aim of this investigation, therefore, was to study the effects of fence-line and restricted cow-calf contact on behaviour, health and growth performance of Sahiwal (*Bos indicus*) calves. For this 20 cow-calf pairs were selected at parturition and assigned to 2 groups of 10 each. Calves in fence-line contact (FC) group were separated from their mother through fence-line barrier and allowed mother suckling twice daily at milking. In restricted contact (RC) group, calves were separated from mother at birth and allowed limited contact for 10-15 min each at morning and evening milking. Behavioral parameters were recorded fortnightly using CCTV cameras one hour before and one hour after milk feeding of calves for a period of four months. Growth and health parameters were recorded for 6 months from the birth of the calves. The significance of differences in mean values of variables was tested using independent sample t-test. A general linear model was used in SPSS software for differences in IgG concentrations. Frequencies of time spent on abnormal behaviour of cross-sucking (2.64±0.27 vs. 1.84±0.19 min), self-licking (1.88±0.14 vs. 1.22±0.20 min) and licking inanimate objects (1.98±0.28 vs.1.22±0.18 min) were lower (p<0.05) in FC than in RC. Incidence of calf diarrhoea (6 vs. 10 afflictions) and fever (0 vs. 2 afflictions) was lower in FC as compared to RC calves. Immunoglobulin G concentrations in blood plasma on day 28, 41 and 60 after calving were 16.46±0.79 vs. 14.06±0.63, 14.89±0.66 vs. 13.09±0.60 and 13.30±0.77 vs. 11.71±0.52 mg/ml in FC and RC calves, respectively. These values were higher (p<0.01) in FC than RC, the effect of day and treatment within time (days x group) being significant (p<0.01). Final body weight at 6 m of age was higher (*p<0.01*) in FC (119.2 ±4.9 kg) than in RC (98.3 ±2.4 kg). Daily body weight gain was also higher (*p<0.01*) in FC (0.544±0.13 Kg) than in RC (0.431±0.17 Kg) calves. Daily dry matter intake was higher (*p<0.01*) in FC (2.26±0.32 kg) than in RC (1.72±0.25 kg) calves. The results indicated that the Sahiwal calves provided fence-line mother contact, showed lesser behavioral abnormalities, had better growth and suffered fewer health disorders.

WELFARE STATUS OF DAIRY ANIMALS IN FIELD CONDITIONS

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

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Animal welfare is primarily considered as a major issue in intensively managed large commercial dairy farms. In India, there is a huge traditional smallholder production system. The animal welfare issues in this system are supposed to be unique in view poor availability of feedstuffs, improper housings, and outdated management practices. Aim of this study, was to measure the availability of major inputs and assess the welfare of dairy animals kept under smallholder production system. For this study, total of 80 dairy farms, were selected on the basis of landholding size. Three landholding size categories were made as marginal (<1 ha), small (1-2 ha) and medium (2-10 ha) as per Ministry of Agriculture and Farmer's Welfare, Government of India. For assessing the animal welfare, score, the methodology suggested under Integrated Diagnostic System Welfare by Calamari and Bertoni (2009) and modified according to Indian conditions by Kamboj and Kumar (2014) was utilized. Accordingly a total of 20 welfare indicators were identified and grouped into three components viz., housing and other facilities -A, feeds and feeding practices - B and animal health, performance and behaviour- C with a weightage of 30, 30 and 40 respectively. The significance of difference among means of welfare scores was tested using ANOVA in SPSS software. Average herd size of in marginal, small and medium farms was 2.12±0.37, 3.31±0.42 and 4.73±0.42 respectively. Mean floor area per adult unit in marginal, small and medium farms was 47.54± 2.99, 50.41± 2.91 and 54.10± 6.26 sq ft, respectively. Mean welfare score in components A was 12.38±0.45, 13.75±0.45 and 14.47±0.51, in B was 23.36±0.50, 24.50±0.64 and 29.53±0.65 and in C was 11.28±0.40, 11.38±0.48 and 14.00±0.42 for marginal, small and medium farms with an overall total score of 47.03± 0.86, 49.63±0.98 and 58.00±1.08, respectively. In welfare component A mean welfare score did not differ significantly among 3 farm size categories higher whereas in component B and C it was significantly (P<0.05) higher in medium farms than in marginal and small farms. Proportions of farmers under good (60-80), average (40-60) and poor (<40) welfare ranking was 12.50, 83.75 and 3.75 percent respectively, whereas only 12.50% farmers achieved an acceptable welfare level (welfare score > 60) across farm size categories. It was concluded that cattle welfare at most of the dairy farms in Muzaffarnagar district of Uttar Pradesh was average and only a few farms had acceptable level of welfare.

Keywords: Dairy farms, Cattle, Welfare

SOCIAL NETWORK ANALYSIS FOR ASSOCIATING THE SOCIAL BEHAVIOUR AND ATTRIBUTES OF DAIRY COWS

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

Prof. Miroslav Kjosevski [1] , Prof. Vlatko Ilieski [1]

_1._ _Animal Welfare Center - Faculty of Veterinary Medicine - Skopje_

Dairy cows are herd animals with complex and clearly defined social structure. Their social environment is comprised of nonrandom and heterogeneous social (affiliative and agonistic) interactions. Social network analysis (SNA) is a method that provides detailed description, analysis and understanding of social relations at multiple levels. Some animal's attributes might influence their social behaviour, and consequently the social networks. The objective of this study was to analyze the social network in a herd of dairy cows and to identify the potential associations between the animal's attributes and the SNA's parameters. Individual continuous observations were performed on 91 free-range dairy cows in an enclosed area within the dairy farm for a total period of 28 hours (2 days x 14hours/day). The data about the animal's attributes such as age, BCS, milk production, pregnancy state, and the animal's medical history were exported from the data herd management software. Three associative directed matrices were developed from the social interactions between the animals: 1) all interactions; 2) agonistic and 3) affiliative interactions. The dominance rank for each animal was calculated based on the displacement indexes. The following SNA parameters for each matrix were measured: density, distance, in/out degree; farness; betweenness; and clustering coefficient. The potential associations between SNA measures and animal's attributes were identified by homophily test - Moran autocorrelation, Pearson's χ^2 test and E-I index; Spearman's correlation or Mann–Whitney U test and clique's analysis. Animals with similar age have high homophily in the affiliative network (r = 0.74, p<0.05) and directed agonistic interactions towards the younger animals (E-I$_{index}$= 0.47). Individuals with similar gestational period had increased mutual affiliative interactions (r = 0.50, p<0.05). Cows with higher milk production received less interactions in comparison with other individuals in the herd (r$_{InFarness}$=0.23-0.25, p<0.05). The animals with high somatic cell count in the current lactation received more affiliative interactions than others (InDegree = 4.74±8.02 vs 2.23±2.13, p<0.05). There was a positive correlation of dominance rank with age (r=0.42, p<0.05) and current milk production (r=0.24, p<0.05). Advanced pregnancy led to increased cluster coefficient (r=0.26, p<0.05), while non-pregnant (cycling) cows had more diversified social interactions, implying possible use of SNA for heat detection in cows. The network comparison reveals positive Pearson correlation between affiliative and agonistic social interactions (r=0.46, p<0.001). This study confirms that SNA parameters have the potential to indicate animals' behaviour, welfare, health, and can be regarded as tools for dairy herd management.

Early maternal contact affects dairy animals' spontaneous social behaviour and sociality

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

Prof. Susanne Waiblinger [1] **_, Ms. Viola Magierski_** [1] **_, Dr. Kerstin Barth_** [2]

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Dairy calves are mostly separated from their dam within hours after birth and reared artificially. Rearing calves with cow contact has short-term benefits and long-term effects on response to social challenges and enhanced social competence. The aim of our study was to investigate potential effects of maternal contact in the first weeks of life on different social traits. Eighteen female dairy calves and heifers (aged 20 – 71 weeks), either separated within 12 h after birth from the mother and reared artificially (A, n=9) or reared in a cow-calf-contact system (C, n=9) in the first 12 weeks of life, were observed for a total of 5 h each for spontaneous social behaviour (SB) and underwent a social reinstatement test (SRT, 5 min separation from herd members, 5 min time to re-join the herd through a 12 m alley) for assessing sociality. Animals were balanced for age across treatments and lived in four different groups during observations of SB and in two groups during SRT. SB was recorded by focal animal sampling and continuous recording, SRT was video recorded. Additionally, videos recorded during the first three days of life of six Contact-Animals were available. Maternal behaviour of their dams was analysed for 12 hours immediately after their birth and for 4 hours at the 3rd day of life to check for associations with calves' later affiliative behaviour. ANOVA included treatment, group and their interaction as fixed factors as well as the covariates age and weight. Correlation between maternal behaviour and SB was analysed using Spearman rank correlation test.

C-animals showed more subordinate behaviour in the herd (P < 0.039), but did not differ from A-animals in affiliative or aggressive behaviour. During the SRT separation phase, C-animals looked longer towards (P < 0.014), and tended to spent more time closer to the exit door that led to the peers (P < 0.072) and showed more vigilance (P < 0.001), but reinstatement-time did not differ. Maternal behaviour in the first days of life (licking, sniffing, muzzle close) was associated positively with later initiated (p=0.048) and received (p=0.016) affiliative SB (social licking, head play).

The results highlight the importance of the social environment and maternal contact in the first weeks of life for development of social behaviour and social personality traits in dairy cattle. Results regarding early maternal contact are in line with findings in other species, but need further confirmation.

Dairy cows fed an energy-reduced diet ad libitum during dry-off display behavioural changes indicative of hunger

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

Dr. Guilherme Amorim Franchi [1], **_Dr. Mona Lilian Vestbjerg Larsen_** [2], **_Dr. Mette Herskin_** [1], **_Dr. Mogens Larsen_** [1], **_Dr. Margit Bak Jensen_** [1]

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We investigated single and combined effects of 2 diet energy densities [lactation diet (NORM; Net Energy for Lactation-NE_L=6.59 MJ/kg of dry matter (DM)) vs. lactation diet diluted with 30% straw (REDU; NE_L=4.96 MJ/kg DM), both offered for ad libitum intake] and 2 daily milking frequencies (2× vs. 1×) during 7 d before the dry-off day (D0) on automatically monitored feeding behaviour of 119 (72 primi-, 47 multiparous) clinically healthy, loose-housed, pregnant, lactating Holstein cows from the resident herd of Aarhus University, Denmark. All experimental procedures involving cows were approved by the Danish Animal Experiments Inspectorate (Permit No. 2017-15-0201-01230). Biweekly, batches of 1-6 cows (milk yield≥15 kg/d) were allocated to 1 of the 4 treatments on D-14, and moved to an experimental pen in the same barn on D-7. Cows were individually assigned to computerised feed bins and feed was allocated 4× daily. Dry matter intake (kg/d), feeding time (min/d), feeding rate (kg/min), visits to assigned feed bin (no./d) and visit attempts to unassigned feed bins (no./d) were recorded on D-6, D-4, D-3 and D-1. Data were analysed in R using GLMM including as fixed effects: day, diet, milking frequency and possible interactions, and parity group. Number of cows in the pen and baseline value (averaged D-14 to D-8 for each of the variables) were included as covariates. Batch and cow were included as random effects. Cows fed the REDU diet ingested less feed (LSM±SE: 13±0.4 vs. 18±0.4 kg/d; P<0.01), spent more time feeding (205±4.2 vs. 155±4.2 min/d; P<0.01) at a lower rate (0.06±0.002 vs. 0.12±0.002 kg/min; P<0.01), visited their own feed bin more often (34±1.7 vs. 24±1.7 no./d; P<0.01), and attempted to visit unassigned feed bins more often (8±0.9 vs. 3±0.3 no./d; P<0.01) than NORM cows. The effect of milking frequency was not evident (P≥0.1). Reducing energy supply before dry-off to decrease milk yield is a typical practice. However, this study showed that this dry-off management practice led to consistent changes in feeding behaviour. Whilst changes in DM intake, feeding time, feeding rate and visits to assigned feed bin may also have been influenced by physical properties of the energy-reduced diet, visit attempts to unassigned feed bins likely reflected an increased feeding motivation, suggesting that REDU cows were hungry. These findings support the understanding of how typical dry-off management practices can negatively affect the behaviour and welfare of cows.

Do cows want to be outside in the autumn?

Sunday, 1st August - 18:00: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 09:15: Welfare of Bovids (2) - Oral

Wednesday, 4th August - 10:45: Welfare of Bovids (2) - Oral

Ms. Laura Shewbridge Carter [1] *, Prof. Marie Haskell* [2] *, Dr. Jenny Gibbons* [3] *, Mr. David Ball* [3] *, Prof. S. Mark Rutter* [4]

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Dairy cows are motivated to access pasture when compared to indoor housing with free-stalls. However, dairy cows are being housing for longer periods, with all-year-round housing growing in popularity. It is important to assess factors affecting cow motivation for pasture access, to facilitate emulation of this indoors and make housing more suitable for when cows are housed. Previous studies suggest that this motivation is possibly driven by qualities pasture offers for lying down, although it is unclear whether simply being outside is the driving force.

This study aimed to investigate cow preference and motivation to be outside in the autumn when the lying area indoors and outdoors were of equal size and surface type, thus removing these as confounding factors. Twenty Holstein-Friesian pregnant cows (9 primiparous; 11 multiparous), with previous outdoor experience as heifers, were offered identical lying areas (open cow mattress of 9m x 5m) indoors and outdoors, which were equidistant from a choice point, to measure preference. Motivation to be outside was assessed by increasing the distance to the outdoor area from equidistant to 55m (short distance) and 110m (long distance) via an indoor raceway, while cows had free access to the indoor mattress.

A linear mixed effects model was used to compare time spent on the indoor mattress (IN) versus time spent on the outdoor mattress (OUT) at the different distances.

There was an interaction between distance and IN versus OUT (P < 0.001). There was no significant difference in total time spent indoors (7.2hr) and outdoors (9.3hr) when the mattresses were equidistance. At the short and long distances cows spent less time outdoors (2.6hr at both distances) compared to indoors (11.6 and 12.6hr), indicating low motivation to be outdoors.

Lying down was the dominant behaviour exhibited on both mattresses (79.7% of total time on the mattresses), and was analysed separately. Lying behaviour showed a similar interaction between distance and location (P < 0.001); cows showed no preference between lying down IN versus OUT at an equidistant and had low motivation to access the outdoors for lying down when the walking distances were imposed.

Results show that when the lying areas indoors and outdoors are the same, cows have no preference and show low motivation to go outside in the autumn. This could influence future design of cow housing, better meeting the behavioural needs of dairy cows when pasture is not available and cows are housed indoors.

Emotion, Cognition and Behavioural Testing

Affective styles and animal welfare

Dr. Charlotte Goursot [1], Dr. Sandra Düpjan [1], Prof. Birger Puppe [2], Dr. Lisette M. C. Leliveld [3]

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Acknowledging captive and farm animals as individuals is necessary for advancing research in animal welfare because each animal appraises the same stimulus, situation, environment or living conditions differently. In the field of human psychology, the framework of "affective styles" contributed to a concept of individualized well-being. Affective styles refer to consistent individual differences in emotional reactivity and regulation and therefore relate to individual appraisal. Interestingly, individual differences in baseline cerebral lateralization (i.e. the fact that brain hemispheres differ in their structure and function) are suggested to represent the origin of these affective styles. The lateralization underlying human affective styles is established as a reliable biomarker of psychological well-being and psychopathology. In this contribution, we propose extending the affective styles framework to animal welfare research and make recommendations on how to investigate affective styles in non-human animals. This research field should encompass the study of consistent individual patterns in affect associated with individual hemispheric dominance (i.e. an individual's preferred brain hemisphere), as it likely underlies various aspects of consistent individual differences. Many findings showing a link between consistent behavioural asymmetries (a proxy for individual hemispheric dominance, as the brain controls the contralateral part of the body) and individual affective reactions suggest the existence of affective styles in non-human animals. It can be reasonably assumed that individual patterns in affect can lead to consistent individual patterns in emotional reactivity, motivational tendency, personality or coping, which all reflect individual patterns in emotional regulation. Studies on affective styles in animals need to account for repeatability and multidimensionality of these individual reactions. We need to extend our theoretical background with suitable hypotheses that for instance predict the lateralisation of the behavioural inhibition and behavioural activation systems, supposed to be the neurophysiological basis of personality. This could contribute to the understanding of individual differences in motivation and hence individual appraisal and emotional regulation. Using our findings in pigs, we give practical examples on how we could test for the existence of affective styles in this species. We hope this will inspire other researchers to investigate affective styles in non-human animals.

Going with the flow – balancing skill and challenge for positive welfare

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 09:15: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 10:45: Emotion, Cognition and Behavioural Testing - Oral

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Developing and expressing increasing levels of mastery is typically enjoyable and has been studied in humans under the designation of "flow". Flow can be defined as a mental state of complete absorption in an intrinsically rewarding activity where the process of the activity is enjoyed for its own sake. It has been a paragon for research on the positive psychology of human flourishing and thriving. As such, flow has the potential to advance research on positive animal welfare. However, doing so requires some degree of operational translation as the traditional methods used in flow studies (e.g. self-report, surveys) differ. Here we propose that translating the concept of flow to non-human animals is an innovative and promising next step in the emerging field of positive animal welfare science.

We will combine conceptual reflections with practical considerations for implementation in practice. First, we will introduce the concept of flow by outlining the characteristics of situations that induce flow states in humans and how these states are experienced. Entering a flow state requires striking a balance between "perceived action capacities" or skill, and "perceived action opportunities" or challenge. This is achieved by a series of just-manageable goals, clear feedback about the progress to achieve the goals, and the capacity to adjust the action accordingly. Humans report that the activity they are fully immersed in feels completely effortless and distorts the feeling of time.

Derived from the characteristics of flow in humans, we will propose how to study flow in non-human animals. We will introduce ways to induce flow and present considerations on how to assess whether it has been successfully induced, illustrating both with practical examples. For flow induction, we will focus on how to achieve the dynamic balance between skill and challenge considering differences at both the individual and species level. Moreover, we will discuss the role of physical activity in cultivating flow. For flow assessment, we suggest that the degree of mental engagement in an activity can be assessed by introducing increasingly attractive distractions that give the individual the opportunity to stop performing the activity. The extent to which these distractions are ignored will indicate the degree to which the individual experiences flow. We will illustrate the importance of considering other psychological states during which individuals may be absorbed in an activity to a similar degree, including obsession, addiction and stereotypic animal behaviour and describe how to differentiate between these states.

Selection for high performance altered behavioural flexibility, but not comprehension of physical and social cues, in goats

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 09:15: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 10:45: Emotion, Cognition and Behavioural Testing - Oral

Dr. Christian Nawroth [1], _Ms. Katrina Rosenberger_ [2], _Dr. Nina Keil_ [2], _Dr. Jan Langbein_ [1]

1. _Institute of Behavioural Physiology, Leibniz Institute for Farm Animal Biology, Dummerstorf, Germany,_ **2.** _Centre for Proper Housing of Ruminants and Pigs, Agroscope Tänikon, Ettenhausen, Switzerland_

Breeding farm animals for high performance likely had an indirect impact on other parameters, such as behaviour and cognition, due to re-location of resources to production traits (Resource Allocation Theory). We investigated the cognitive capacities of dwarf goats (not selected for high performance, 15 subjects) and dairy goats (selected for high milk yield, 18 subjects) in a visual discrimination and a reversal learning task (a proxy measure for behavioural flexibility), as well as in a cognitive test battery consisting of different physical and social cues. To increase the heterogeneity of our test sample, data were collected by two experimenters (each tested both groups of goats) at two research stations. All animals were reared and housed under similar conditions, and all procedures involving animal handling and treatment were approved by local authorities. In the visual discrimination task, goats were individually presented with two containers (black or white), only one of which was baited with a reward. All subjects received a maximum of 20 sessions, each consisting of 12 trials. Learning criterion was set at 10 or more correct trials in two consecutive sessions. Subjects that reached the criterion proceeded to the reversal task (rewarded contingencies reversed). In the cognitive test battery, goats could choose between two containers of the same colour, while only one was baited with a reward. Each subject first received a test battery of six different physical cues, followed by a set of six different social cues in a subsequent battery , to locate the baited container. Each subject received 12 test sessions in each test battery, totalling in 24 test trials for each of the test conditions. In the visual discrimination task, there was no difference in learning success between dairy and dwarf goats (LMM, sessions until learning criterion was reached (est ± SE), dwarf: 4.70 ± 0.43, dairy: 5.25 ± 0.39, P = 0.35). In contrast, dwarf goats were faster to reach the learning criterion in the reversal learning task compared to dairy goats (dwarf: 7.74 ± 0.62, dairy: 9.18 ± 0.60, P = 0.016). In the cognitive test battery, both selection lines did not differ in their test performance (GLMM, P > 0.4). Our results indicate that the selection for production traits might have affected behavioural flexibility in goats, while their comprehension of physical and social cues remained unaffected. Differences in behavioural flexibility between breeds should be considered in the design of future husbandry systems.

Performance of goats in a spatial detour and a problem-solving task following long-term cognitive test experience.

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 09:15: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 10:45: Emotion, Cognition and Behavioural Testing - Oral

Ms. Katrina Rosenberger [1], Dr. Michael Simmler [2], Dr. Jan Langbein [3], Dr. Nina Keil [1], Dr. Christian Nawroth [4]

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Cognitive research in long-lived animal species often involves using the same individuals in several experiments. Whether the participation in cognitive tests alters the performance in subsequent conceptually different tests is unclear. Thus, we investigated whether exposure to object-choice tests will affect the performance of goats in two subsequent cognitive tests. We conditioned three treatment groups: goats that were isolated for participation in human-presented object-choice tests and rewarded with food (COG treatment), goats isolated as for the test exposure and rewarded with food by the experimenter without being administered the object-choice tests (POS treatment), and goats that were isolated in the same test room but received neither a reward nor were administered the tests (ISO treatment). All three treatment groups were subsequently tested in the same two conceptually different tests, namely a spatial A-not-B detour test (ABT), assessing behavioural flexibility, and an instrumental problem-solving task (PST). In the ABT, goats had to detour a fence via a gap before and after relocating the gap. In the PST, goats had to open a container lid to access food. We tested dairy goats, selected for high productivity, and dwarf goats, not selected for productivity, each at two research sites (ET, DU) using the same protocol. In total, 108 animals were used for this study. All procedures involving animal handling were approved by the responsible authorities. Results were analysed with mixed effect logistic regression with selection line considered in the random effects structure. We did not find differences between our treatment groups in terms of their behavioural flexibility in the ABT (treatment contrasts: POS-COG: est=0.87, se=0.58, p=0.13, ISO-COG: est=0.73, se=0.73, p=0.19, ISO-POS: est=-0.14, se=0.58, p=0.81). Similar, no effect of treatment on the probability of the dairy goats to open the container was detected in the PST (POS-COG: est=-1.01, se=2.23, p=0.65, ISO-COG: est=1.34, se=2.45, p=0.58, ISO-POS: est=2.35, se=2.39, p=0.33). We observed large differences in performance with respect to the selection line and between sites. While dwarf goats never opened the container, dairy goats did to various extent depending on the site (average number of 4 possible trials opened: ET: COG: 3.78, POS: 3.22, ISO: 3.88, DU: COG: 0.00, POS: 0.43, ISO: 0.86). Our results suggest that cognitive test experience does not substantially affect the performance in subsequent tests, and highlight the importance of confounding factors such as selection line and research site as potential pitfalls when making between-subject comparisons in animal cognitive research.

Qualitative behaviour assessment of pigs' emotions prior to an agonistic encounter

Ms. Lucy Oldham [1], *Dr. Gareth Arnott* [2], *Dr. Irene Camerlink* [3], *Prof. Andrea Doeschl-Wilson* [4], *Ms. Marianne Farish* [1], *Prof. Francoise Wemelsfelder* [1], *Dr. Simon Turner* [5]

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Despite considerable research examining how environmental factors affect regrouping aggression in pigs, there remains a lack of understanding regarding the marked individual variation in aggressiveness. Animals' responses to the social environment depend on their emotional state. Aspects of personality may influence how they emotionally react to and learn from social encounters. We investigated the emotional expressivity of pigs in a contest, following a recent contest win or defeat. Aggressiveness was assessed in attack latency tests prior to contests. We predicted that following social defeat in a first contest, the less aggressive individuals would show a stronger negative emotionality in a second contest. The trial received ethical approval and incorporated strict endpoints.

Data from two attack latency tests (at 9wks age) were used to categorise individual aggressiveness (Agg- or Agg+). Videos were obtained of dyadic contests of pigs at 10 and 13 weeks of age. Observers (n=4) watched the initial 30 seconds of the second contest, i.e., when pigs entered the arena in which they had recently won (n=25) or lost (n=33). Observers used qualitative behaviour assessment (QBA) to score the pigs' emotional expression according to a fixed list of 20 descriptive terms.

QBA identified three principal components (PCs), accounting for 68% of the variation: PC1 (relaxed/content to agitated/tense), PC2 (fearful/ aimless to confident/sociable) and PC3 (lively/ positively occupied to listless/ indifferent). Mixed model analysis revealed that Agg+ pigs and females were more fearful/aimless (PC2): X^2=6.9, p=0.009 and X^2=9.5, p=0.002 respectively. PC1 and PC3 were unaffected by contest 1 outcome and aggressiveness but focal pigs were more tense/agitated if their opponent was male (X^2=8.4, p=0.004).

Sex differences in emotional expressivity may partly reflect contest outcome (males were more likely to win contest 1). QBA suggests that more aggressive pigs express negative emotionality at the start of agonistic encounters.

Phenotyping addictive-like behaviour towards toys in dogs using a behaviour test and questionnaire

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 09:15: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 10:45: Emotion, Cognition and Behavioural Testing - Oral

Mrs. Alja Mazzini [1], Ms. Katja Senn [1], Prof. Hanno Würbel [1], Dr. Stefanie Riemer [1]

1. Companion Animal Behaviour Group, Division of Animal Welfare, Vetsuisse Faculty, University of Bern

Introduction: Some dogs exhibit extreme reactions to toys (especially balls), which bear resemblance to a behavioural addiction. In relation to ball play, these dogs – 'ball junkies' in common speech – appear highly aroused, will not stop playing on their own, cannot easily be distracted, and may even lose interest in other stimuli or social interactions (Käufer, Und Weg Ist Er, 129–154, 2014).

Aim: This is the first study aiming to establish tools to identify addictive-like behaviour towards toys in dogs. In a behavioural test and a questionnaire, we aimed to assess whether behavioural addiction criteria after Griffiths (2015) are fulfilled – 1. craving, 2. lack of self-control, 3. tolerance, 4. salience, 5. mood modification, 6. withdrawal symptoms and 7. risk of relapse.

Methods: We tested 107 highly play motivated dogs. All dogs participated in the behavioural test containing eight subtests where behavioural addiction criteria can be expressed (e.g., losing interest in social interaction & food; continuation of playing under 'adversity' (owner leaving the room), trying to access the toy when inaccessible (on a shelf, in a box)). All owners also filled in our behaviour questionnaire, which included 15 questions assessing all seven behavioural addiction criteria (e.g., "My dog loses interest in social contact when playing with a ball/toy"). Behavioural addiction criteria in the behaviour test were assessed by a blinded coder, yielding an 'addictive-like behaviour score' (max. = 600; the cut-off point for addictive-like behaviour was set at 260). In the analysis, linear models were used to assess associations between the addictive-like behaviour score and the 15 questions (one model per question).

Results: Twenty-four of the tested dogs (N=107) were classified as 'ball junkies' based on the behaviour test. The models demonstrated very good agreement between the addictive-like behaviour score and 13 of 15 questionnaire questions. Ten questions had R^2 between 9.6% and 16.8% (p<0.001), and three questions had R^2 values between 4.2 and 7.8% (p<0.05).

Discussion: We were able to identify an addictive-like phenotype in our behavioural test battery and our questionnaire. In humans, the behaviour is diagnosed as an addiction if at least four criteria (out of nine, or 44%) are met (Albrecht et al. Psychosoc. Med 4, Doc 11 2007). In our study, the cut-off point for addictive-like behaviour was 260 out of 600 points (43%). Owners were able to properly assess their dogs' tendency for addictive-like behaviour towards toys in thirteen out of fifteen questions.

Influence of cold incubation on later life distress experiences.

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 09:15: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 10:45: Emotion, Cognition and Behavioural Testing - Oral

Mrs. Sara Verlinden [1] *, Dr. Mona Lilian Vestbjerg Larsen* [1] *, Mrs. Pauline Debontridder* [2] *, Prof. Tomas Norton* [1]

1. *KU Leuven, Department of Biosystems,* **2.** *KU Leuven*

The possibility to influence chicken behaviour by varying incubation temperature has shown promising results for animal distress research. In this experiment, the influence of cold incubation on later life distress was evaluated for three treatments: a control (C: 37.6°C, ED0-ED21), a slight decrease from commercial incubation temperatures, but representative in what is experienced in large, industrial incubators (IT, 36.6°C, ED13-18) and a simulated natural brooding (NT, 30°C for 30 min, ED13-ED18). Later life distress was tested via an emergence and an isolation test, which were approved by the KU Leuven ethical committee (n° P208/2020). On day 18 and 20, 10 chicks per treatment (5 males, 5 females) were randomly picked and placed one by one into a T-shaped box, which was closed off from light with exception of the exits. For a maximum of 3 minutes, latency to exit was recorded. On day 19, 10 chicks per treatment (5 males, 5 females) were randomly picked one by one. The animals were placed inside a container in which the bird experienced complete visual and auditory isolation from peers for 3 minutes. Vocalisations were counted by 2 observers independently. The test was done with and without the presence of a mirror. All statistical analyses were performed in R. Survival analysis for the emergence test was performed using a mixed effect Cox regression with right censoring. A 3.7 times higher hazard rate was found for treatment C compared to IT ($P<0.05$) with IT chickens emerging slower and having a lower chance of emerging. Vocalisations during the isolation test were treated as count data and analysed by a generalized linear mixed effect model with a Poisson distribution. A significant three-way interaction between treatment, sex, and mirror was found ($P<0.001$). A post-hoc test was conducted using Tukey HSD which revealed significantly a higher number of vocalisations for males in NT (73) compared to C (28) and IT (27), and without the mirror (90) compared to with the mirror (43). This experiment indicates that the presence of a mirror can reduce isolation stress and that a non-standard incubation can significantly change distress experience in later life as evidenced by an increasing number of vocalisation calls when isolated for a simulated natural incubation (NT) for males, or a lowered willingness to emerge from such isolation for a realistic industrial deviation (IT).

Do Buffalo Calves Speak Through Their Ears?

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 09:15: Emotion, Cognition and Behavioural Testing - Oral

Wednesday, 4th August - 10:45: Emotion, Cognition and Behavioural Testing - Oral

Dr. Rajashree Rath [1]*, Dr. Pawan Singh* [1]*, Dr. Madan Lal Kamboj* [1]*, Dr. Tushar Mohanty* [1]*, Dr. Sudip Adhikary* [1]*, Dr. Shwetambri Jamwal* [1]

1. *ICAR- National Dairy Research Institute, Karnal, Haryana, India*

Recent studies have shown that animals express emotions through their ear postures. Understanding how animals communicate their emotional feelings plays a crucial role in improving their wellbeing. To date no research has been conducted to assess the emotional state of Murrah buffalo calves in a cognitive task. In the present study, different ear postures (EP) of the buffalo calves (n=24;5 weeks age) was recorded in a reward-punishment task inside a Y-maze, where the calves were trained to visually discriminate between two colours-white versus black, till they acquired at least 80% correct choices in 3 consecutive sessions (12 trials per session). Initially, the calves were rewarded with milk in the hidden feeding bottle if they chose white colour and punished with an empty bottle if they chose black colour. After they learnt the initial task, the task was reversed (reversal learning) and now the calves were rewarded with milk if they chose black colour and punished with no milk if they chose white colour. The average frequency of occurrences of different EP of the calves was recorded at three different points of the Y-maze i.e. at entry point, at decision making point and at reward point in both the learning phases (initial and reversal). The EPs were recorded through CCTV camera 30 seconds before and after the calf reached each point of the maze. The data were analyzed (SPSS version 22) using repeated measures ANOVA. Number of EP changes at decision making point was significantly higher in reversal learning compared to initial learning (4.12±0.05 vs 1.90±0.03;P<0.001). The frequency of occurrences of different EPs didn't vary significantly between both learning phases; hence only overall results are summarized. At the entry point, the backward down EP was the most predominantly (8.61±0.25;P<0.001) evidenced EP signifying alertness of the calves while entering the maze. Similarly, at reward point, a backward up EP signifying a relaxed state of the calves while drinking milk reward was the most frequently (7.61±0.44;P<0.001) recorded. However, at the decision making point, the backward up EP was most predominantly (8.06±0.22;P<0.001) observed. The asymmetric EP was the second most frequently (4.64±0.65;P<0.001) noticed EP seemingly reflecting confused state of mind in the buffalo calves followed by axial (2.93±0.79). This provides the first evidence that EPs reflect various emotional attributes in buffalo calves. Therefore, ear postures can be used as a novel non-invasive technique to address welfare requirements of neonatal buffalo calves in future.

Plenary: Human Behaviour Change for Animal Welfare

Positive animal welfare: bridging the gap or raising inequalities worldwide?

Sunday, 1st August - 18:00: Plenary: Human Behaviour Change for Animal Welfare - Plenary talk

Wednesday, 4th August - 14:00: Plenary: Human Behaviour Change for Animal Welfare - Plenary talk

Prof. Jean-Loup Rault [1], Prof. Peter Sandøe [2], Prof. Quixi sonntag [3], Mr. Leopoldo Stuardo [4]

1. Institute of Animal Welfare Science, University of Veterinary Medicine, Vienna, 2. Department of Food and Resource Economics and Department of Veterinary and Animal Sciences, University of Copenhagen, 3. Department of Production Animal Studies, Faculty of Veterinary Science, University of Pretoria, 4. World Organisation for Animal Health, Standards Department, Paris

Positive animal welfare (PAW) is a quickly rising topic in animal welfare science, although its construct, definition and operational approaches are still debated, with a plurality of views and terms. Despite these scientific uncertainties, there is a growing interest in high-income countries to include more indicators of positive welfare in legislation, animal welfare assessment and accreditation schemes. Changes in some farming practices convey the idea of promoting PAW. For example, non-cage or free-range housing often emphasise providing animals more opportunities for positive experiences (e.g. natural behavior, autonomy), and demands for products or practices based on these 'alternative' systems are on the rise in high-income countries. Interestingly, extensive production systems or low-input animal management practices are common in lower-income countries, notably free-ranging livestock or village dogs, which fit some of the ideas underlying PAW. Nevertheless, welfare challenges such as neglect, diseases, animal abuse and other forms of suffering remain ubiquitous, especially where resources like veterinary care are limited. In the case of limited resource allocation, is there something to gain from investing in PAW, or will it detract from efforts to alleviate suffering? Providing animals with more freedoms of movements or opportunities for positive experiences, while often beneficial, also brings welfare risks (e.g., poorer health or greater mortality). Living conditions for animals in low-income countries provide examples of the delicate balance between welfare benefits (e.g. opportunity for natural behaviour) and risks (primarily health and survival). Is the tick-ridden, thin cow that has complete freedom of movement better off than the fat, confined animal? Is the free-roaming dog scavenging on human dumpsites happier than the apartment-living pet dog but alone during human working hours? These case examples also illustrate the inextricable ethical dilemmas involved in balancing initiatives to promote positive welfare and initiatives to avoid suffering. In our view, the growing focus on PAW could have a positive influence by stimulating a more balanced approach to animal welfare worldwide, promoting PAW while simultaneously working to alleviate suffering. However, this also requires accounting for human factors such as societal and cultural location-specific aspects to find solutions that also benefit and respect people whose livelihood is at stake too. The living conditions of humans and animals are inherently linked, and a balanced strategy for improving animal welfare should be developed for example using a one welfare approach.

Human Behaviour Change for Animal Welfare

Piglets' fear of novelty and humans is influenced by housing systems and human interaction

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 14:45: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 15:45: Human Behaviour Change for Animal Welfare - Oral

Ms. Megan Hayes [1] _, Dr. Lauren Hemsworth_ [1] _, Dr. Rebecca Morrison_ [2] _, Prof. Alan Tilbrook_ [3] _, Prof. Paul Hemsworth_ [1]

1. _The Animal Welfare Science Centre, The University of Melbourne,_ **2.** _Rivalea Australia Pty Ltd,_ **3.** _Centre for Animal Science, Queensland Alliance for Agriculture and Food Innovation, The University of Queensland_

In intensive pork production systems, fear can be a significant animal welfare issue and a practical issue for stock-people. This research studied the effects of lactation housing systems and human interaction on fear in piglets. We hypothesised that piglets from loose farrowing and lactation pens with opportunities for positive human interaction would demonstrate reduced fear compared to piglets from farrowing crates.

Forty litters of piglets were reared in either a farrowing crate (FC) or a loose pen (LP; PigSAFE system) which was larger, more structurally complex and offered greater opportunity for piglet-sow interaction. Litters received either routine contact (C) or opportunities for positive human contact (+HC; 3-min daily scratching/patting). At 2wk of age, the behavioural responses during 1-min consecutive exposures to an empty arena, a novel object (traffic cone), a human hand and a standing human were assessed in two male and female piglets per litter. Variables were analysed using linear mixed models.

Compared to LP piglets, FC piglets were faster to approach within 0.6m of the traffic cone (15.5 vs 30.8s; $F_{1,36}$=8.90; p=0.005) and the human hand (20.9 vs 34.9s; $F_{1,36}$=7.69; p=0.009). FC piglets were also faster to physically interact with the traffic cone (22.8 vs 34.5s; $F_{1,36}$=5.31; p=0.027) and the human hand (31.0 vs 42.9s; $F_{1,36}$=7.97; p=0.008). There was a tendency for FC piglets to be faster in approaching (24.1 vs 34.8s; $F_{1,36}$=3.86; p=0.058) and interacting (31.0 vs 40.6s; $F_{1,36}$=3.30; p=0.078) with the standing human. +HC piglets were faster to approach (24.0 vs 34.9s; $F_{1,36}$=4.21; p=0.048) and interact (30.4 vs 41.2s; $F_{1,36}$=4.49; p=0.042) with the standing human compared to C piglets. +HC had no significant effects on responses to the human hand or traffic cone. There were no significant effects on the time spent near, or the number of interactions with any stimuli, and no significant treatment interactions.

Contrary to the expected findings, these data indicate that piglets from farrowing crates show reduced fear of novelty and humans compared to those from loose PigSAFE pens. The PigSAFE system was more restrictive in terms of piglets' contact with humans and non-littermates which may have contributed to increased fear. In both housing systems, providing opportunities for positive human interaction reduced piglets' fear of an unfamiliar human, but only when the human was standing. Further research examining in detail the effects of the early physical and human environment on other behavioural as well as physiological indicators of stress is obviously warranted.

Interest in humans: comparisons between riding school lesson equids and assisted-intervention equids

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 14:45: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 15:45: Human Behaviour Change for Animal Welfare - Oral

Mrs. Noémie Lerch [1], Dr. Francesca Cirulli [2], Dr. Céline Rochais [1], Dr. Clémence Lesimple [1], Mrs. Estelle Guilbaud [1], Dr. Laura Contalbrigo [3], Dr. Marta Borgi [2], Dr. Marine Grandgeorge* [4], Dr. Martine Hausberger* [4]

1. *Univ Rennes, Normandie Univ, CNRS, EthoS (Éthologie animale et humaine) - UMR 6552, F-35000 Rennes, France,* **2.** *Section of Behavioural Neuroscience, Department of Cell Biology and Neuroscience, Istituto Superiore di Sanità, Viale Regina Elena 299, I-00161, Rome, Italy10, 35020 Legnaro (Padua), Italy,* **3.** *Italian National Reference Centre for Animal Assisted Interventions, Istituto Zooprofilattico Sperimentale delle Venezie, Viale Dell'Universita 10, 35020 Legnaro (Padua), Italy *: equal contribution,* **4.** *Univ Rennes, Normandie Univ, CNRS, EthoS (Éthologie animale et humaine) - UMR 6552, F-35000 Rennes, France *: equal contribution*

Animal-assisted interventions, and especially equine interventions, are more and more widespread. Whereas it is generally admitted that these practices have positive effects on the human side, very little is known about how animals perceive these activities. In particular, how horses perceive humans and associate them with emotional valences may depend on associations built during interactions. Thus, studies have shown that different factors can influence the human-horse relationship such as horse's individual characteristics, the repeated interactions with the caretaker, the riding techniques and the conditions of life.

In this study, 172 horses (from 12 riding centers) were submitted to a standardized human-horse relationship test, the motionless person test. They had all been involved in the same working practices for at least one year. Seventeen horses worked in assisted activities (EAI), 95 in "classical" riding school activities (RS) and 60 in both activities (EAI-RS). During the test, the experimenter entered the stall and stood with her back against the closed door, without interacting with the horse, during five minutes. All behaviours directed toward the experimenter were recorded. For each horse, the age, the sex, the type (horse or pony), the housing conditions and feeding practices (hay quantity/number of concentrate meals per day) were collected.

Important individual variations were observed in the number of behaviours directed toward the experimenter (0 to 51; mean±SE=8.3±0.8). A negative binomial model was used to test which factors influence this number. Activity, quantity of hay per day, type of equids, age and sex all seem to have an impact. The type of activity appeared as a major factor of influence: RS horses performed more interactive behaviours than both EAI (p=0.039) and EAI-RS (p=1.98e-05) horses. The feeding practices seemed to be the second most important factor (equids with more than 3kg of hay per day interacted more than equids with less than 3kg per day, p=0.013). Some individual characteristics also influenced horses' behaviours: the type (horses proved more interactive than ponies p=0.009), sex (geldings were more interactive than mares p=0.032) and age (3-15 year-old horses performed more behaviours than over 15 year-old horses p=0.032).

Horses working in animal-assisted interventions clearly proved less interactive with an unknown person. Reasons for these results remain to be further investigated, hypotheses can be a selected temperament characteristic, a result of a training or apathy due to the type of work. In any case, these results open new questions on the equine assisted practices.

Cats are more affiliative and display fewer signs of conflict and agonistic behaviour when humans adopt a more cat-centric approach during cat-human interactions

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 14:45: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 15:45: Human Behaviour Change for Animal Welfare - Oral

Dr. lauren finka [1], Ms. Camilla Haywood [2], Ms. Jo Puzzo [2], Ms. Lucia Ripari [1], Ms. Rae Foreman-Worsely [1]
1. Nottingham Trent University, **2.** Battersea Dogs and Cats Home

The domestic cat has the capacity to form amicable, mutually beneficial relationships with humans. However, human-directed aggression during cat-human interactions is seemingly commonplace, even amongst cats well socialised to humans. Interestingly, little research has investigated the potential role of human interaction styles on the nature of cats' behavioural responses in such contexts. The aim of this study was to determine whether exposing human participants to a brief training intervention, designed to encourage a more 'cat-centric' approach during cat-human interactions, had a positive impact on cats' behaviour. Domestic cats available for rehoming at Battersea Dogs and Cats Home, UK (n=100) were filmed interacting with (naïve) members of the public (n=120) for a maximum of six, five-minute sessions, balanced across two conditions (three 'control', three 'intervention'). Sessions took place over two consecutive days with a maximum of 3 per cat daily. During 'control' sessions, participants adopted their usual style of interacting with cats. For the 'intervention' sessions, participants were required to follow simple interaction guidelines, explained during a brief training intervention following their 'control' sessions. Guidelines were framed around a 'CAT' acronym, focused on providing the cat with choice and control ('C'), paying attention ('A') to their body language and limiting touch ('T') to their temporal and perioral regions. Cat behaviour and posture were coded across both conditions, applying an ethogram designed to capture a range of affiliative and agonistic behaviours, in addition to behaviours more generally associated with positive and negative valence. Measures were assessed for inter-coder reliability via interclass correlation coefficients (ICC2), retaining items with values of >0.5. Data were extracted from a total of 535 observations and behaviour values then compared between the control and intervention conditions via paired Wilcoxon tests. Compared to the control, cats displayed significantly greater (all $p<0.05$) frequencies and/or durations of affiliate and positively-valenced behaviours in the intervention conditions (e.g. tail waving, kneading, sniffing and rubbing person, ears forwards). In contrast, cats in the control condition displayed significantly greater frequencies (all $p<0.05$) of human-directed aggression (i.e. hiss/growl, cuff/swipe, bite) in addition to greater frequencies and/or durations of behaviours associated with conflict and negative valence (e.g. tail swishing, ears rotated/flattened, paw lift, rapid groom, head/body shake, freeze/crouch, avoid/move/turn away from participant). Results demonstrate the positive impact of practical interaction guidelines on cats' social behaviour and comfort during human-cat interactions, with the potential to reduce human-directed aggression and improve cat-human relationships in both home and rehoming contexts.

Behaviour modification for dogs who are fearful or neutral at the vet: The Academy's Husbandry Project

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 14:45: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 15:45: Human Behaviour Change for Animal Welfare - Oral

Ms. Kristi Benson [1] *, Dr. Zazie Todd* [2] *, Ms. Jean Donaldson* [1]

1. *Academy for Dog Trainers,* **2.** *Companion Animal Psychology*

Previous research has established that many dogs fear veterinary care, and these fears present barriers to veterinary care. Dog trainers regularly do behaviour modification for dogs showing fear of social stimuli such as veterinarians and staff, fear of environmental contexts such as veterinary offices, and fear of handling such as restraint. A standardized 4-week program of desensitization and counter-conditioning led to reductions in owner reports of dogs' fear (Stellato et al 2019). However, prior to the Husbandry Project described here there did not exist vetted protocols which had been broadly tested to address these fears in a veterinary context.

Over two testing phases, volunteers trained a series of stationing behaviours and conditioned emotional response training plans. The first phase included volunteers proficient at production-style dog training. The second phase was open to the public. Volunteer trainers were provided with training instructions and step-by-step plans, and were asked to submit data about their dog's progress through each behaviour or plan. Stationing behaviours were trained using prompt-fade 'production style' training (using standardized criteria to assess progress through set steps) based on the work of Marian and Keller Breland and Robert Bailey. Conditioned emotional response plans to change the dog's emotional state were trained using systematic desensitization combined with respondent conditioning. Phase 2 participants were also asked to fill out a qualitative survey of their impressions whether their dogs improved at the veterinary office if they had trained any of the plans. 43 participants filled out the survey.

Fifty-one trainers finished testing, of either 13 or 19 plans (6 plans were dropped mid-way). After testing, several more plans were discarded and all the plans were refined based on the real performance of the dogs and trainers, both at home and in veterinary offices, and released publicly. Dogs who completed the training plans were proficient at three stationing behaviours (stand, lateral recumbence, and sit) while accepting veterinary handling such as range-of-motion exams, vaccinations, eye/ear/mouth exams, and x-rays. Dogs also displayed clear positive conditioned emotional responses to veterinarians and staff, veterinary offices, being lifted onto exam tables, and veterinary implements.

Dog behaviour modification techniques including production-style training and classical conditioning function to decrease dog's fear of veterinary care. These techniques can be carried out efficiently and effectively by dog owners without formal education in applied behaviour change or dog training, an important boon for dog's health and welfare.

Understanding barriers to refining rodent handling and training techniques amongst laboratory animal professionals

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare - Oral

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Wednesday, 4th August - 15:45: Human Behaviour Change for Animal Welfare - Oral

Dr. Carly O'Malley [1], Ms. Raina Hubley [1], Dr. Carly Moody [2], Dr. Patricia Turner [3]

1. *Charles River Laboratories,* **2.** *UC Davis,* **3.** *University of Guelph*

Research rodents undergo frequent human-animal interactions. Animal training techniques such as habituation and positive reinforcement can reduce negative human-animal interactions, improve study data, and optimize animal health and welfare. In this study, we explored laboratory animal professionals' understanding, experience, and attitudes towards habituation and positive reinforcement training (PRT) with research mice and rats. Forty participants were interviewed across Canada and the US, including veterinary or Ph.D.-level (VP; CA=8, US=9; n=17), and non-veterinary and non-Ph.D.-level professionals (NVP; CA=9, US=14; n=23). Participants were asked open-ended questions, the interviews were transcribed, and NVIVO was used to identify themes in participant responses. Responses were compared across profession and country. Understanding of habituation and PRT was limited with 20.0% of participants providing the correct definition for both terms. PRT (30.0%) was better understood than habituation (10.0%). Half (50.0%) of the study participants had minimal or no experience with either method or were unsure. Participants indicated that the primary benefits of using habituation and PRT were reduced stress (65.0%), improved animal welfare (47.5%), and improved research data (45.0%). Many participants had no concerns about using these techniques (60.0%), but researcher buy-in (22.5%), time needed to implement a training program with these techniques (22.5%), and inconsistent or improper implementation (12.5%) were concerns. When comparing between professions, generally VP had a better understanding of the techniques (VP: 29.4% vs. NVP 13.0%) and felt that the techniques would improve research data and decrease stress but were concerned about training personnel to use the techniques properly and consistently while NVP were less likely to have concerns. When comparing between countries, CA participants generally showed a better understanding of the terms by providing correct definitions (CA: 29.4% vs. US: 13.0%) and had more experience using these techniques (CA: 70.6% vs US: 30.4%), compared to US participants. CA participants specifically mentioned welfare as the primary benefit of habituation and PRT, while US participants were more concerned about researcher attitudes and buy-in. The results of this study show that while laboratory animal science professionals recognize the benefits and barriers of using habituation and PRT, they have limited understanding and experience using these techniques, and that understanding, experience, and attitudes towards training techniques is influenced by profession and country. Educational opportunities on correct implementation of these techniques for research personnel would address the barriers to implementation and promote refinements to animal handling that will improve human-animal interactions.

Exploring the Relationship Between Human Social Deprivation and Animal Surrender to Shelters in British Columbia, Canada

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 14:45: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 15:45: Human Behaviour Change for Animal Welfare - Oral

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Previous studies identify owner-related issues, such as cost and housing, as common reasons for relinquishment of companion animals to animal shelters. It is likely that the burden of surrendering for owner-related reasons falls on those who are socially vulnerable (e.g., low income, unemployed); however, very few studies have assessed social determinants as a predictor of animal relinquishment. The present study used the Canadian Index of Multiple Deprivation (CIMD), which uses four factors of social vulnerability (Ethnocultural Composition, Economic Dependency, Residential Instability, and Situational Vulnerability) to predict risk of surrender for various reasons, of various species and breeds, and of various health statuses across British Columbia, Canada (n = 29,236). We found that CIMD factors predicted increased risk of surrender across many shelter variables. For further understanding of differences between areas in the province, the present study also analyzed the relationship between CIMD factors and animal surrender variables in two areas of interest: Metro Vancouver (n = 3,445) and Kamloops (n = 2,665), and plotted these relationships on a geospatial scale. We found that there were some similarities across areas, such as Situational Vulnerability predicting increased odds of surrendering pit bull-labeled dogs vs. all other dog breeds. There were also differences in predictors of animal surrender variables, suggesting that provision of animal services, such as veterinary care, for vulnerable groups may be specific to location. For example, whereas Ethnocultural Composition predicted increased risk of owner surrender for multiple owner-related reasons in Metro Vancouver, these same reasons for surrender were predicted by Residential Instability in Kamloops, indicating demographic differences that affect animal shelter service use. The results of this research validate the use of geospatial analysis to understand relationships between human vulnerability and animal welfare, but also highlight the need for further interventions in marginalized populations to increase retention of animals.

Emergency Fostering of Dogs from Animal Shelters During the COVID-19 Pandemic: Shelter Practices, Foster Engagement, & Dog Outcomes

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 14:45: Human Behaviour Change for Animal Welfare - Oral

Wednesday, 4th August - 15:45: Human Behaviour Change for Animal Welfare - Oral

Dr. Lisa Gunter [1], Ms. Emily Blade [1], Ms. Rachel Gilchrist [1], Ms. Jen Reed [2], Ms. Amanda Foster [1], Ms. Lindsay Isernia [2], Dr. Rebecca Barber [1], Dr. Erica Feuerbacher [2], Dr. Clive Wynne [1]

1. _Arizona State University,_ **2.** _Virginia Polytechnic Institute and State University (Virginia Tech)_

Between 4.0 and 5.5 million dogs enter animal shelters annually in the United States. One type of intervention that has been shown to improve the welfare of dogs awaiting adoption is human-animal interaction, particularly stays in foster homes. Prior research has demonstrated that fostering can reduce dogs' cortisol and increase resting activity. Additionally, temporary, trial, and foster-based adoption programs have been shown to reduce the likelihood of adoption failure.

In this presentation, I'll describe research conducted at 19 US animal shelters in which we investigated the emergency fostering of shelter dogs during the COVID-19 pandemic. During the study, 1471 dogs were fostered by 1110 foster caregivers for a total of 1702 foster experiences. Of these dogs, 92.4% had live outcomes (e.g., adoption or transfer to rescue), 6.0% were still in care, and 1.6% of fostered dogs had non-live outcomes (e.g., euthanasia).

To better understand the impact of the foster caregiver's pre-pandemic relationship with the shelter, caregivers were characterized as either being newly recruited community members or having had a prior relationship with the shelter (e.g., staff member, returning foster or volunteer). We found that new foster caregivers were 2.5 times more likely to adopt their foster dogs than those who had a prior relationship (χ^2 = 43.6, p < .0001). Conversely, only 12.0% of caregivers with a pre-pandemic relationship to the shelter adopted their dogs.

We then analyzed these relationships relative to the shelter's level of resources, defined as the annual operating budget divided by the number of animals taken into the shelter the prior year, which resulted in five resource levels. Low- and very low-resourced shelters relied more heavily on prior relationships for dog fostering during the pandemic while very high-resourced shelters recruited more community members to be new foster caregivers (χ^2 = 204.7, p < .0001).

Differences were also found in the outcomes of dogs based upon the shelter's resources (χ^2 = 614.2, p < .0001). Specifically, the lowest resourced shelters transferred more dogs out of their facilities during the pandemic while more resourced shelters rehomed dogs directly from their facilities at a rate of over 80%. To our knowledge, these findings represent the first reporting about the fostering of homeless animals during the COVID-19 pandemic. In total, they provide greater understanding of how monetary and human resources of animal shelters were utilized to affect the care and ultimately, the outcomes of dogs awaiting adoption during this time.

Social Behaviour

The effects of social interactions on heart rates of group-housed domestic horses

Sunday, 1st August - 18:00: Social Behaviour - Oral

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Wednesday, 4th August - 15:45: Social Behaviour - Oral

**Mrs. Denise Hebesberger** [1] , **_Dr. Jacob C. Dunn_** [2] , **_Dr. Dawn Hawkins_** [1] , **_Dr. Claudia A.F. Wascher_** [1]

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Over the last few years, group-housing of horses has become more popular. This is in line with current equine welfare guidelines that recommend housing systems that allow horses to socialise regularly. However, little is known whether agonistic interactions among group-housed horses constitute a source of social stress. Therefore, we assessed whether agonistic interactions among horses cause a stress response and whether affiliative interactions facilitate a calming effect.

We measured heart rates of 15 group-housed horses during 596 spontaneously occurring agonistic interactions, 416 short affiliative interactions such as sniffs, touches, and head rubs, and 37 grooming events when ranging freely in their fields. For comparisons, heart rate was measured during behaviours of similar physical activity, such as standing and walking. The horse groups have been established at least a year before data collection commencement and comprised different breeds.

This study received ethical approval from Anglia Ruskin University and followed ISAE[3] and ASAB[4] guidelines for research with animals.

The most frequent interactions were mild threats which corresponded to a heart rate increase of 1.56 ± 1.09 (median ± IQR) beats per minute. Thereby, heart rate did not differ from walking, a behaviour of similar physical activity level (Wilcoxon signed-rank test: n=14, V=0.241, p=0.241). Only around ~1% of all agonistic interactions were of high intensity, which facilitated a heart rate increase of 23.05 ± 18.32 (median ± IQR) beats per minute. Due to the low number of occurrences, only descriptive statistics are given. During short affiliative interactions, the mean heart rate did not differ from standing, a behaviour of similar physical activity (Wilcoxon signed-rank test: n=14, V=0.211, p=0.286). However, the mean heart rate during grooming was significantly lower (~8%) than during standing (Wilcoxon signed-rank test: n=8, V=26, p=0.046, r=-0.53).

These findings indicated that in established horse groups, agonistic interactions were mostly of low intensity and did not induce a significant stress response. High-intensity agonistic interactions, which were rarely occurring, corresponded to a pronounced increase in heart rate. Consequently, we recommend that horse owners regularly monitor behaviour among group-housed horses. Frequent occurrences of high-intensity aggression could have negative welfare implications, and a change in group composition or husbandry routines should be considered. The lower heart rate during grooming indicated a calming effect. This suggests that allowing horses to engage in mutual grooming may promote relaxation and positive welfare.

[3] International Society for Applied Ethology

[4] The Association for the Study of Animal Behaviour

Recurrence of agonistic interactions between littermates after mixing multiple litters at weaning

Sunday, 1st August - 18:00: Social Behaviour - Oral

Wednesday, 4th August - 14:45: Social Behaviour - Oral

Wednesday, 4th August - 15:45: Social Behaviour - Oral

**Ms. Nikolina Mesarec** [1] , **Dr. Janko Skok** [2] , **Prof. Dejan Škorjanc** [1] , **Dr. Maja PREVOLNIK POVŠE** [1]

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Weaning involves considerable stress and agonism due to the mixing of unfamiliar piglets/litters, each of which has already established dominance hierarchy prior to weaning. After mixing, piglets strive to establish a new order followed by agonistic interactions, usually between individuals from different litters. However, not much research attention has been paid to what goes on within a single litter in terms of the dynamics of interactions between littermates. Therefore, the objective of this study was to focus on the frequency of within-litter interactions (fighting and mounting), where two litters were weaned into two pens separated by an empty pen and connected by a narrow passageway that was opened 24h after weaning. There was 38% fighting within litter (WL) and 62% fighting between litters (BL) and 68% WL and 32% BL mounts. When litters were kept in separate pens, only a few interactions between littermates were recorded. After opening the passageways, not only BL, but also WL interactions increased significantly. WL fighting increased 6-fold on day 1 compared to day 0, then gradually decreased until the end of the observation period and stabilised at the initial level (pre-mixing). Mounting increased 7-fold from day 0 to day 1 and continued to increase in the following days. Relatively, the frequency of both WL fighting and mounting decreased from day 1 to day 7 (from 40% to 28% and from 82% to 50%, respectively), while the frequency of BL fighting and mounting increased (from 60% to 72% and from 18% to 50%, respectively). BL activities were equally represented in all pens. On the other hand, the vast majority of WL fighting (≈80%) and mounting (≈65%) occurred in the pens of origin (home pens), indicating some type of territoriality. No clear evidence to territoriality was found in the form of more frequent initiation of fights or mounts in home pens. Regarding the outcome of fights, a noticeable difference was observed between BL and WL interactions, i.e., a significantly higher percentage of draws in WL fights (50% of initiator wins, 41% of draws) compared to BL fights (80% of initiator wins, 11% of draws). The results suggest that mixing of litters after weaning destabilises them to a large extent and implies not only intense inter-litter interactions but also the recurrence of agonistic intra-litter interactions.

Do pigs show prosocial behaviours in a group service paradigm? A pilot study

Sunday, 1st August - 18:00: Social Behaviour - Oral

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Wednesday, 4th August - 15:45: Social Behaviour - Oral

Dr. Désirée Brucks [1] ***, Mr. Lukas Burg*** [1] ***, Prof. Uta König von Borstel*** [2] ***, Dr. Sébastien Goumon*** [3]

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Prosocial behaviours (PBs) are voluntary behaviours that benefit another individual. Research on PBs in farm animals is limited, despite its potential to promote positive welfare. Pigs are an interesting model species to investigate PBs as they show high social tolerance and engage in cooperative behaviours, i.e. cooperative breeding and problem-solving.

We tested two groups of sows (N1 = 63 gestating sows (17-52 months); N2 = 6 gilts (5 months)) in a group service paradigm. Each group was presented with an apparatus, which allowed one sow to make food available for another sow by pushing a sliding box with its snout, without receiving any food for herself. Pigs were first trained (4 sessions per group) to push the mechanism for gaining access to food, before being tested for their prosocial tendency in two test phases: (1) group service (food available) vs. empty control condition (no food available). To exclude the possibility that the mere presence of food triggers the manipulation of the box, in the second test phase (2), two further control conditions were implemented: blocked (access to food blocked) vs. empty blocked (access to empty food location is blocked). Each test phase lasted 5 days (1 session/condition/day). Data were analysed using GLMMs in R.

In the adult group, 24 sows regularly interacted with the apparatus. Both groups of pigs provided food to another (mean sows: 48%, gilts: 53% of trials in the group service condition). Across sessions, less participation was observed, if the apparatus was empty (GLMM: -0.28 ± 0.07, z = -3.84, p < 0.001) compared to the group service condition. Furthermore, when looking at only the last two sessions of each phase, during which the pigs should have learned about the mechanism, fewer pushes occurred in the group service condition compared to the blocked control (GLMM: -0.66 ± 0.18, z = -3.64, p < 0.001), while more pushing was observed in the blocked compared to the empty blocked control (GLMM: 0.95 ± 0.22, z = 4.30, p < 0.001). No differences between conditions and sessions could be detected for the group of gilts.

These preliminary results suggest that pigs provide food to another; however, whether these actions were governed by prosocial motivation or were rather due to individually motivated behaviours (e.g. exploration of apparatus, lack of inhibitory control) could not be completely disentangled. Nonetheless, the setup and paradigm are promising tools for investigating prosocial behaviours in pigs.

Relationship between dominance hierarchy formation and aggression social network properties in newly mixed pigs

Sunday, 1st August - 18:00: Social Behaviour - Oral

Wednesday, 4th August - 14:45: Social Behaviour - Oral

Wednesday, 4th August - 15:45: Social Behaviour - Oral

Dr. Simone Foister [1], *Prof. Andrea Doeschl-Wilson* [2], *Prof. Laura Boyle* [3], *Dr. Simon Turner* [4]

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In pigs, the aggression associated with establishing new dominance relationships with unfamiliar animals reduces welfare and productivity. Social groups of pigs differ in the total number of lesions from aggression that occur both in the short and long-term after regrouping. Social network analysis can use information on all dyadic interactions to quantify the network structure within a group. In previous work, the pen level aggression network structure was associated with pen level lesion rates. Specifically, there were fewer lesions indicative of on-going chronic aggression 3 weeks after regrouping in pens with large cliques of pigs which fought directly with each other within 24 hours of group formation. Conversely, pens with highly divided networks (high betweenness centralisation in which a small number of animals were located between subgroups which did not interact) had considerably more lesions 3 weeks after mixing. We hypothesise that groups with clearly established dominance hierarchies have large cliques and low betweenness. This was tested in 78 groups of pigs (15 pigs per group) formed at 8 weeks of age. Institutional ethical approval was granted and the study conformed to ISAE ethical guidelines. Aggressive interactions were extracted from video recordings by continuous observations for 24h after regrouping. The size of the largest fighting clique and fighting betweenness centralisation were calculated using R package *igraph*. All aggressive interactions where a conclusive win was identified (mean 101 s.d. 36.1 per pen) were used to quantify the linearity of the dominance hierarchy (by triangle transitivity and De Vries' improved linearity index), its steepness (using normalised David's scores) and its directional consistency index (DCI). The effect of the dominance metrics on fighting clique size and betweeness were analysed using mixed effects models with the systematic effects of breed, sex, mean body weight in the pen, and experimental batch. Pens with high steepness in their dominance hierarchy, indicating large differences in dominance between group members, had a significantly ($p<0.001$) larger clique size. No dominance metric improved the model fit for predicting betweenness centralisation more than a model simply containing systematic effects. The relationship between clique size and steepness suggests that decisive engagement in aggression when dominance relationships are first formed is likely to reduce the severity of long-term chronic aggression.

Maternal fed omega-3 fatty acids have sex specific effects on social anxiety in broiler chickens

Sunday, 1st August - 18:00: Social Behaviour - Oral

Wednesday, 4th August - 14:45: Social Behaviour - Oral

Wednesday, 4th August - 15:45: Social Behaviour - Oral

__Ms. Rosemary Whittle__ [1], Dr. Elijah Kiarie [1], Dr. Tina Widowski [1]

1. University of Guelph

Omega-3 fatty acids (n3s) are important for embryonic brain development, and in chickens, this can be supplemented through maternal diet to increase the ratio of n3s in the egg. Whilst maternal fed n3s can increase cognition, they can increase fearfulness, especially neophobia. Feeding n3s to broilers might increase fearfulness and decrease welfare due to fear being a negative affective state. We tested whether maternal fed n3s would increase social isolation anxiety of broilers. Ross 708 broiler breeders were fed a control diet or an isocaloric n3 diet, enriched with flaxseed, in the rearing (<16 weeks of age (WoA)) or laying period (>16 WoA). Roosters were fed a control diet. This created four maternal rearing-laying diet combinations: control-control, control-n3, n3-control, n3-n3. Breeders were housed in 8 pens, 2 pens per rearing-laying diet combination. Eggs were set at 31 and 34 WoA, creating two replicated trials. Offspring were housed in 48 identical floor pens in groups of 20 (10 males, 10 females) and were fed commercial broiler diet. A total of 283 chicks were tested in a social isolation test at 4-6 days of age. A chick was placed in an opaque soundproofed isolation box for 5 minutes. A camera and lights were fixed inside the box and the test was video recorded. Videos were analysed using The Observer XT 14 software. Number of vocalisations, escape attempts and time frozen were recorded. Data were analysed using a linear mixed effects model in R. There was a significant interaction between maternal laying diet and sex (F=5.766, p=0.017). Laying-n3 males vocalised significantly more than laying-control males (t=-3.039, p=0.015), laying-n3 females (t=-2.868, p=0.024) and tended to vocalise more than laying-control females (t=-2.574, p=0.054). There was no interaction between maternal rearing diet, laying diet and sex (F=0.157, p=0.692), rearing and laying diets (F=2.32, p=0.134) or rearing diet and sex (F=0.927, p=0.336) on the number of vocalisations. There was a significant interaction between maternal rearing diet and sex on the number of escape attempts (F=7.033, p=0.009). Rearing-control females tended to attempt to escape more than rearing-control males (t=2.573, p=0.053). There was no effect of rearing diet (F=0.319, p=0.573), laying diet (F=2.183, p=0.142) sex (F=0.0487, p=0.826) or interactions between them (F=0.509, p=0.477) on time spent frozen. In conclusion, maternal fed n3s affect offspring behaviour differently dependent on sex; males from mothers fed n3s in the laying phase vocalised most and showed the most social anxiety during social isolation.

Why can't we be friends? From aggression to affiliation in multi cat households

Sunday, 1st August - 18:00: Social Behaviour - Oral

Wednesday, 4th August - 14:45: Social Behaviour - Oral

Wednesday, 4th August - 15:45: Social Behaviour - Oral

Ms. Frania Shelley-Grielen [1]

1. AnimalBehaviorist.us

Domestic cats are our most popular pets. And while more households may have a single dog most cat owning households have more than one cat. (De Porter, Bledsoe, et al. (2019), Elzerman, De Porter, et al. (2020), Stella and Croney (2016)), More multi cat households may exist as cat owners can often be swayed by conventional wisdom that cats like humans have need of companionship of their own kind or be pressured to adopt more than just one cat. Such thinking can have negative welfare impacts on a species where territory, range and choice of social groups are highly significant. In their natural environment cats typically defend territory, socialize with family members or choose their own affiliates to socialize with (Crowell-Davis (2020), Turner (2014)).When we do the choosing this can translate to invading home territories with conspecific strangers and can create potential for considerable feline stress leading to idiopathic cystitis, inappropriate elimination, intercat conflict, aggression and often surrender or rehoming; all of which can have serious welfare concerns for cats and owners (Heath (2007), Salaman, Hutchison, et al (2000)).

A species specific appropriate introduction and integration process to enable successful new relationships is dependent on sufficient time and informed methodology. Identifying risk factors for feline stressors in the creation of multi cat households such as relationship history and number of cats, environmental resources, owner responses to behavior, etc. can be helpful. Conventional approaches rely on separating cats, providing an enriched environment, multiple resources and a gradual introduction process affording sufficient occasions for counter conditioning and desensitization (Crowell-Davis (2007), Ramos (2019)). Despite evidence to the contrary popular misconceptions remain as to the cat being aloof and unsociable (Crowell-Davis (2020), Turner (2013)). Such misconceptions may lead to substantial oversight in the development of behavioral treatment plans. While attention and company of an owner has been identified as a significant resource (Bradshaw (2013), Heath (2016)) it has not been formally studied in this process. My applied behavior work adds this intervention as a key step in the development of affiliative relationships in multi-cat households. Further application and research can show that having an inclusive species specific protocol to start from before problems and conflict become critical and call for intervention can make the difference between success and failure in creating feline friendships and affiliations.

Farm Animal Housing and Enrichment

Piling behaviour and smothering in British layer flocks: a mixed-methods investigation

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Smothering, leading to the suffocation of laying hens in loose-housed flocks, is an important welfare concern. The underlying cause of "creeping", the most problematic form of smothering, is piling behaviour (PB), where hens mass together in the litter area. PB characteristics (frequency, duration, animal number) have been described for Swiss flocks but not for British flocks employing different housing and management practices. In addition, experience-based constructs offering explanations for PB and smothering mechanisms have not yet been explored. To describe PB, the birds' behaviour on 20 loose-housed farms (7600±5800 hens (mean±SD), free-range:12, organic:8, producer organisations:2) experiencing repeated smothering episodes, was video recorded once (01/2020-08/2020) at the on-set (age:20.5±2.6 weeks (w), free-range:4, organic:5) or a later point in lay (33.0±6.9w, free-range:8, organic:3), in two shed corners, along walls, and three locations central in the litter area. Piling characteristics were assessed for one day per flock (08.30-16.00h) applying one-minute scan-samplings. PB was defined as ≥3 mostly immobile hens standing in the closest possible proximity with heads facing mostly in the same direction. To build an experience-based construct, 12 farmers (same farms, free-range:5, organic:7) were interviewed (ethical approval by The RVC, audio-recorded, semi-structured interviews, face-to-face:6, phone:6, 06/2020-12/2020) about their experiences with PB and smothering. The audio transcripts were analysed using qualitative content analysis. In the videos, 92 piles were observed (free-range:76/11, organic:16/4) lasting 21.9±30.8 min and involving 26±39 animals. Piles in corners and along walls (52/92) mostly occurred before noon (08.30-12.30h, 32/52) and were mostly preceded by hens synchronously performing various behaviours (e.g., floor-nesting, pecking, 42/52). In contrast, piles central in the litter area (40/92) mostly occurred around noon (10.30-14.30h, 26/40) and were mainly preceded by high local animal densities (19/40). Around the beginning of lay (piles:35, flocks:6), piles on free-range flocks (30/35, 4/6) involved more animals (47±60) compared to later in lay (piles:46/57, free-range:7/9, 19±18). The interviews (duration:29.14±10.18 min) revealed five clusters expressing farmers' views of factors associated with PB and smothering: 1) housing time, first night: unequal bird distributions, 2) beginning of lay, morning: synchronous laying of floor eggs in corners, 3) beginning of lay: crowding due to increased fearfulness related to hormonal changes, 4) after peak of lay, early afternoon: local dustbathing preferences related to litter quality and environmental differences, 5) throughout the laying period, occasional: panic events and routine changes upsetting birds. Overall, we found that PB and smothering have multiple origins and vary across different ages and locations.

Effect of loose pens with temporary crating on piglet crushing

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 19:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 20:45: Farm Animal Housing and Enrichment - Oral

Ms. Heng-Lun Ko [1] *, Dr. Déborah Temple* [1] *, Dr. Pol Llonch* [1] *, Prof. Xavier Manteca* [1]

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The temporary crating system is one of the alternatives to the farrowing crate that has been introduced recently. The study aim was to compare sow body movements related to crushing in three farrowing systems. In each batch, there were five conventional farrowing crates (CON), six SWAP and six JLF15 pens, which are the commercially available temporary crating systems. Four batches of crossbred Duroc sows were followed: 18 in CON, 23 in SWAP, and 23 in JLF15. One batch was followed in each season, from fall to summer. CON sows were crated from entry to weaning, while SWAP and JLF15 sows were crated from 1 day before expected farrowing date to 3 days after farrowing. Average crating days were 31.8 ± 0.5 in CON, 6.0 ± 0.4 in SWAP, and 5.3 ± 0.3 in JLF15. Crushing which caused piglets' death were confirmed by video recordings of surveillance cameras. There were 49 crushed piglets during the study: six over 191 live born (3.1%) in CON, 28 over 252 (11.1%) in SWAP, and 15 over 259 (5.8%) in JLF15. Crushing rate (i.e. number of crushed piglets per sow) in SWAP (1.2 ± 0.3) was higher than in CON (0.3 ± 0.1) ($P < 0.01$) and JLF15 (0.6 ± 0.2) ($P < 0.05$), and it was also higher in JLF15 than in CON ($P < 0.01$). Crushing rate in fall was significantly lower than in the rest of the seasons, including winter, spring, and summer (all $P < 0.01$). Crushing happened similarly when SWAP and JLF15 sows were crated (34.7%) or loose (40.8%) ($P = 0.54$). Sows in all farrowing systems overlaid piglets by three body parts similarly (trunk: 57.1%, hind legs and back: 32.7%, head and front legs: 6.1%) ($P = 0.49$). Furthermore, 30.6% of crushing happened when the sows used an aid from the pen as a support when changing posture. The percentage of using the aid but still crushed the piglets in CON was higher than in SWAP and JLF15 ($P = 0.05$). To sum up, there is a higher risk of crushing in temporary crating systems, but sows being crated or loose in these systems does not affect crushing rate. Sows change their posture differently between farrowing systems and seasons. Lastly, more research to improve the design of temporary crating systems and to encourage loose sows to use the pen features related to piglet protection is needed.

2019 Survey of antimicrobial drug use and stewardship practices in adult cows on California dairies.

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 19:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 20:45: Farm Animal Housing and Enrichment - Oral

Dr. Essam Abdelfattah [1] *, Dr. Pius Ekong* [1] *, Dr. Emmanuel Okello* [2] *, Dr. Deniece Williams* [3] *, Dr. Betsy Karle* [4] *, Dr. Joan Rowe* [5] *, Dr. Terry Lehenbauer* [5] *, Dr. Sharif Aly* [5]

1. Postdoctoral Scholar, School of Veterinary Medicine, University of California, Davis., 2. Assistant professor, Department of Population Health and Reproduction, School of Veterinary Medicine, University of California, Davis, 3. Dairy Production Medicine Clinician- Service Chief Veterinary Medicine Teaching and Research Center UC Davis, School of Veterinary Medicine, 4. Cooperative Extension, Division of Agriculture and Natural Resources, University of California, Orland, California, United States, 5. Professor, Department of Population Health and Reproduction, School of Veterinary Medicine, University of California, Davis

In January 2018, California implemented legislation (SB 27) requiring veterinary prescriptions for medically important antimicrobial drugs (MIADs) used in food-producing animals and were no longer sold over the counter (OTC) in CA. The objective of this survey was to collect information regarding herd demographic, antimicrobial drug (AMD) use, and stewardship practices on CA dairies one year after implementation of recent AMD regulations began. The survey was comprised of 44 questions mailed twice to the 1,282 licensed Grade A dairies in CA. A total of 131 (10.22%) unique and complete survey responses were received from 19 of 31 dairy-producing counties. The median ±SE herd size of surveyed dairies was 1,575 ± 181 (40.46%), 803 ± 163 (41.22%), and 262 ± 71 (18.32%) cows/herd for dairies in Greater Southern (GSCA), Northern San Joaquin Valley (NSJV) and Northern CA (NCA), respectively. Results showed that 93.55% of respondent dairies had a veterinary client-patient relationship (VCPR) which is required for obtaining MIADs, while the remaining respondents had a veterinarian observe cows on a regular basis which constituted a form of VCPR. The majority (83.20%) of respondents confirmed the use of OTC and/or prescription AMD on their dairies prior to Jan 2018. Approximately half (52.14%) of dairies had not made any changes since Jan 2018 regarding the use of AMD that were previously available OTC. Fewer than half (47.80%) of dairies made changes which included: treated fewer animals with AMD (20.83%); discontinued one or more AMD (11.66%), used the same AMD but decreased dosage and duration (14.46%), or treated more animals with AMD (0.83%). A quarter (28.57%) of study dairies confirmed usage or increased use of alternatives to AMD since Jan 2018 such as vitamins, minerals, herbal remedies, and vaccines. Responses to the survey questions identified 3 clusters. Clusters 1 and 2 were mainly composed of dairies in the NSJV and GSCA regions. Cluster 3 was mostly composed of dairies from NCA. More than 93% of dairies in clusters 1 and 2 were conventional, with 87.4% and 69.5% using blanket dry-cow therapy, respectively. In contrast, 77.8% of dairies in cluster 3 were organic and did not use AMD. Results of this survey identified regional and herd demographic differences in AMD stewardship practices on CA dairies post AMD regulation implementation that may guide future educational outreach efforts in California's dairy industry.

Evaluation of broiler chicken environmental enrichments for animal welfare benefits under commercial field conditions

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 19:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 20:45: Farm Animal Housing and Enrichment - Oral

Ms. Jessica Walsh [1] *, Dr. Martin J. Zuidhof* [2] *, Dr. Elijah Kiarie* [3] *, Dr. Kathleen Long* [1] *, Mrs. Chantal LeBlanc* [1]

1. *Maple Leaf Foods,* **2.** *PrecisionZX INc.,* **3.** *University of Guelph*

Broiler chicken environmental enrichments were evaluated under commercial field conditions to assess behaviour, production parameters (mortality, culling rates due to lameness, feed conversion ratio, and condemnations), leg bone attributes and pododermatitis in enriched flocks compared with unenriched flocks. Enrichment items were selected to encourage pecking, perching, hiding and resting behaviour and placed in commercial barns at a quantity of one item per 750 square feet of usable barn space. Trial one enrichments included combinations of mineral pecking blocks or straw bales with different types of perches and ramps. Trial two enrichments included grid ramps, plastic tunnels and plastic chains. Trial three enrichments included different mineral pecking blocks, plastic chains and ropes with metal washers. Broiler behaviour was recorded weekly in a pre-determined observation area and scan sampling performed using an ethogram. At the completion of each flock in trials one and two, right leg femur and tibia samples were analyzed for bone mass and ash content. Pododermatitis was scored using 200 paws in 20-minute increments throughout processing of each flock. Enriched birds from trial three were more active (P = 0.007) and performed more comfort behaviour (P < 0.001) compared with the control group. The proportion of birds performing comfort behaviour increased (P = 0.027) when provided slatted ramps and straw bales. Comfort behaviour is presumed to indicate a favourable mental state. The enrichment combination used in trial two increased tibia ash (P = 0.003) and femur ash (P < 0.001) as a proportion of bone mass and increased femur weight as a proportion of body weight (P = 0.007). Treatment groups provided with one type of mineral pecking stone had reduced pododermatitis index scores (P = 0.047). No significant differences were observed in production parameters for all trials. These results suggest that environmental enrichments can improve broiler welfare as indicated by behavioural, leg bone and pododermatitis outcomes.

Accessing elevated tiers in a complex housing system is affected by the presence of intact flight feathers in egg-laying chickens

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 19:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 20:45: Farm Animal Housing and Enrichment - Oral

**Ms. Renee Garant** [1], _**Dr. Bret Tobalske**_ [2], _**Dr. Neila Ben Sassi**_ [1], _**Dr. Nienke van Staaveren**_ [3], _**Dr. Dan Tulpan**_ [1], _**Dr. Donald Powers**_ [4], _**Dr. Alexandra Harlander**_ [3]

**1.** University of Guelph, **2.** University of Montana, **3.** Animal Biosciences, University of Guelph, Guelph, Ontario, **4.** George Fox University

Birds utilize their wings to explore various environments, a necessary skill for most animals. In addition to flapping-flight, wings are important for balance and play a role in temperature regulation. As animal welfare becomes increasingly important, egg-laying chickens are more commonly housed in large, multi-tiered systems that require coordinated wing-body movements to access elevated resources. Flapping-flight requires intact flight feathers (FF). Feather pecking, pecking directed towards the feathers of other birds, is a common problem in egg-laying birds. This behaviour can lead to large denuded areas, including the FFs. Currently, the relationship between intact FFs and mobility in laying hens is unknown. To investigate this, 12 floor pens were furnished with two platforms (70cm height), two feeders and two nest boxes (one of each fixed to a platform or on the ground), and two perches. One-hundred and twenty adult laying hens (60 brown-feathered strain; 60 white-feathered strain) were assigned to one of three treatments: FFs intact (control), bilateral primary FFs clipped (half clip), or bilateral primary + secondary FFs clipped (full clip) and distributed amongst the 12 pens (10 hens/pen). Using an RFID system, the total number of minutes spent accessing both feeders and nest boxes was recorded bi-weekly for 48-hour intervals for 8-weeks. Baseline measures of resource usage was recorded (week 0) before treatment application. We predicted that after treatments were applied, hens would spend less time accessing the elevated feeder and nest box if they received the half clip or full clip treatment. A repeated measures model was used for statistical analysis for each strain separately to determine the effect of both clipping treatments on elevated resource access. Clipping treatments resulted in a decrease in elevated resource access two weeks post-clipping for both strains, which remained throughout the trial. White-feathered full clip hens spent 37.3% less time at the elevated nest box (p=0.0004) and 41.8% less time accessing the elevated feeder (p<.0001), while brown-feathered full clip hens spent 58.49% less time at the elevated nest box (p<.0001) two weeks after treatments were applied. Before treatment application, control and full clip brown-feathered hens almost exclusively ate from the ground feeder. This resulted in the brown-feathered half-clip hens being the only group from this strain to show a decrease in elevated feeder use. Results from this study highlight that intact FFs are necessary for maintaining mobility in egg-laying hens living in multi-tiered housing systems.

Daily Morning Litter Restriction: Variation in Dust Bathing Patterns Among 4 Genetic Strains of Laying Hen

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 19:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 20:45: Farm Animal Housing and Enrichment - Oral

__Ms. Tessa Grebey__ [1] *, Dr. Janice Swanson* [1] *, Dr. Tina Widowski* [2] *, Dr. Janice Siegford* [1]

__1.__ Michigan State University, __2.__ University of Guelph

Global commercial egg industries are beginning to transition away from cages to instead house laying hens in cage-free systems, such as aviaries. These systems provide hens increased space and enrichment to encourage highly motivated behaviors, including litter for dust bathing. However, hens sometimes perform unwanted behaviors in these systems, such as laying eggs in litter. Farmers curb this behavior either by floor walking or restricting access to litter for part of the day to encourage egg laying in nests. However, previous research in our lab found hens of different genetic strains prioritize different behaviors at the same time of day. For instance, though chickens are thought typically to dust bathe in the afternoon, some strains may dust bathe in the morning. Morning litter restriction or disturbance may thus cause frustration in hens motivated to dust bathe earlier in the day. Therefore, we examined patterns of dust bathing among 4 genetic strains of laying hens (Hy-Line Brown [**HB**], Hy-Line W36 [**W36**], Bovans Brown [**BB**], DeKalb White [**DW**]) at 28 WOA in aviaries when kept from accessing litter each morning. Our goal was to assess variation in daily dust bathing patterns among these strains as a result of limited litter access. A total of 16 aviary units were used with 4 units/strain and 144 hens/unit. Ceiling-mounted video cameras recorded hen behavior on the open litter in each unit for three consecutive days from 11:35, when litter access began, until 20:00, when lights went off. Using video, every 5 minutes the number of hens dust bathing in the open litter area were counted. A strain by time-of-day effect was observed ($P<0.01$). Overall, more instances of dust bathing were observed on average in hens of white strains compared to brown strains (DW: 189.67±43.2, W36: 189.83±43.02; BB: 78.75±10.34, HB: 36.5±12.87). On average, hens of all strains displayed the highest percentage of their total daily dust bathing in the first 85 minutes after regaining litter access compared to any other time (DW: 46%, 85.5±14.0, W36: 41%, 77.75±22.9, BB: 37%, 29.42±4.84, HB: 50%, 18.33±6.98). These results suggest that hens of the two white strains were overall more motivated to dust bathe compared to hens of the brown strains, though hens of all strains dust bathed at the highest rate in the open litter area soon after regaining access to litter.

Farrowing crates to open pens for sows: Changes in behaviour and what it means

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 19:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 20:45: Farm Animal Housing and Enrichment - Oral

Mr. R.Cyril Roy [1]

1. Ceci Farm Animal Welfare Inc

When sows are made to farrow in open pens, they express more natural behaviour repertoire than those expressed in farrowing crates. For example, nest building before farrowing, increased locomotion behavior and more involvement in caring for piglets. Discussion on how this increased behavioral repertoire corresponds to more positive emotional state and a sense of freedom for the sows is limited. This article will discuss how an increased behaviour repertoire can impact emotional state of the sows. Moreover, will also discuss the relationship between natural behaviour repertoire and a sense of freedom in sows.

Psychology based studies in humans have provided ample evidence that behaviour can affect emotional state as much as emotional state affecting behaviour. A good example would be how physical exercise has been associated with positive emotional state in humans. As sows cannot express their emotions (feelings) in words, Dawkins (2000) suggested that emotional state in animals can be studied in three ways. A functional approach, where we measure physiological changes (dopamine, cortisol, serotonin and oxytocin). Use facial expressions and specific behaviour of the animal. Third, by using cognitive bias (positive or negative) exhibited by the animal. Douglas et al (2010) used cognitive bias to show that pigs raised in enriched environments are in better emotional state than pigs in barren environment. Pigs raised in enriched environment were not stressed when a new noise was introduced. This study suggests that sows raised in open farrowing pens could have reduced stress, fear, and increased optimism.

Open farrowing pens provide freedom for the sows to control their environment, to protect their offspring, and also move around for thermoregulation and other needs. One can argue that increased repertoire of the sow's behaviour in the open farrowing pens itself is an expression of increased sense of freedom. Sows are able to make more choices in relation to its well-being in the open pens. Sows can choose where to rest, where to eliminate and where to lie down to satisfy their thermoregulation needs. This increased range of choice can lead to a positive emotional state and a sense of more freedom.

Though farrowing pens come with positive welfare aspects for the sows, it will inevitably increase cost of production. Understanding the effects of increased behaviour repertoire exhibited by pigs in open farrowing pens on their positive emotional state will help pork producers to demand better price for their products from consumers.

Long hay provision in a bucket or a novel feeding device reduces abnormal behaviors in milk-fed dairy calves

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 19:00: Farm Animal Housing and Enrichment - Oral

Wednesday, 4th August - 20:45: Farm Animal Housing and Enrichment - Oral

Ms. Blair Downey [1], *Dr. Cassandra Tucker* [1]

1. *Center for Animal Welfare, University of California, Davis*

Many milk-fed dairy calves are not provided forage. In these settings, calves often perform abnormal behaviors, including tongue rolling and non-nutritive oral manipulation, that, based on their form, seem to mirror restricted foraging movements. Previous studies have found that feeding hay, often in a short chop (≤5cm), reduces abnormal behaviors. We assessed whether providing long (19cm) hay in 2 forms influenced time engaged in abnormal oral behavior. Twenty-seven Holstein heifer calves (n=9/treatment) were housed individually on sand bedding and fed ad-libitum starter grain and limited milk replacer (3.8-5.6 L/d step-up) via a bottle (C; ADG=0.58±0.31 kg; standard farm practice). Calves were given additional access to long hay provided in a bucket (H; ADG=0.70±0.36 kg) or in a novel polyvinyl chloride (PVC) pipe feeder (P; ADG=0.71±0.3 kg) from birth through 50d of age, when step-down weaning began. The 56x10.2cm PVC pipe feeder had four 6.4cm-wide openings that required the calf to insert her tongue into the pipe and curl her tongue to extract hay. At wks 4 and 6, all oral behaviors were directly recorded using 1-0 sampling at 5-s intervals for 24h. We measured ruminating, eating, drinking water, sucking milk, grooming, non-nutritive manipulation of non-feed items, tongue rolling, and repetitive (≥2x) tongue flicks. We analyzed the proportion of intervals spent performing each behavior using a generalized linear mixed model with week and treatment as fixed effects, and calf as a random effect. Both H and P calves spent more intervals ruminating than C calves (mean proportion of intervals±SE; H:0.25±0.008, P:0.25±0.01, C:0.15±0.01, p<0.001) regardless of treatment, likely due to their increased time spent eating (H:0.06±0.004, P:0.06±0.005, C:0.02±0.001, p<0.001). Calves fed hay spent fewer intervals performing non-nutritive oral manipulation than controls (H:0.06±0.005, P:0.05±0.004, C:0.09±0.008, p<0.01). While H and P calves spent equal amounts of time performing this behavior, H tended to spend more intervals consuming hay than P (H:0.05±0.005, P:0.03±0.00, p = 0.067) suggesting that the pipe feeder may reduce abnormal behaviors more effectively than hay in a bucket. Repetitive tongue flicks were similar across treatments (0.03±0.002, p=0.14) as was grooming (0.03±0.003, p=0.8), suggesting they may represent more normal behavior than non-nutritive manipulation. Tongue rolling was rare across all treatments. Overall, provision of hay, either in a bucket or novel device, promotes natural foraging behavior and reduces some abnormal oral behaviors in milk-limited dairy calves.

Welfare and Welfare Assessment

On-farm assessment of welfare status of dairy animals under extensive production system in Uttarakhand state of India

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Dr. Mayamitta Saini [1] , Dr. Madan Lal Kamboj [2] , Dr. Arun Kumar Mishra [1] , Dr. Ajmer Singh [1] , Dr. Kuppusamy Ponnusamy [1]

1. ICAR, 2. Principal Scientist

Conventionally animal welfare is considered a major issue in intensively managed animals. Recent reports highlighted that welfare of animals under extensive systems may be marred due to vagaries of climate and other management factors. Hill cattle in India are predominantly managed under extensive systems by allowing grazing on community lands where availability of forages, water, housing and climatic protection measures are highly variable and cannot be always ensured. The aim of this study was to assess the level of welfare of dairy animals at small, medium and large sized farms managed under extensive production system in the hill state of Uttarakhand. For this a total of 30 herds, 15 each from 2 districts (Tehri and Uttarkashi) of Uttarakhand were selected and blocked into 3 herd size categories as small (S = upto 5 animals), medium (M = 6-10 animals) and large (L > 10 animals). Welfare was assessed based on 20 indicators (10 inputs based and 10 output based) in 3 components (A-housing and other facilities B-feeds and feeding practices and C- performance, behaviour and health) using Integrated Diagnostic System Welfare by Calamari and Bertoni (2009) scale as modified by Kamboj and Kumar (2014). The data were analyzed using SPSS version 17.0 for significance of differences among mean welfare scores using one way ANOVA. Welfare scores of A out of 30 were lower (p<0.05) in L (3.50±0.17), than M (11.60±0.43) and S (13.00±0.54) farms. Scores of B out of 30 were also lower (p<0.05) in L (3.80±0.29) than M (7.00±0.65) and S (7.40±0.34) farms whereas scores of C out of 40 were similar in L (24.20±0.53), M (25.30±0.52) and S (24.20±0.85). Overall welfare score of L (31.5±0.70) was lower (p<0.05) than M (43.90±0.81) and S (44.60±1.29) farms and with an overall score of 40.00±1.24 across farm size categories. Mean welfare scores were negatively correlated with health score (-0.180), daily milk yield (-0.540) (p<0.01) and positively correlated with wet average (0.135) and herd average (0.144) milk yield. Principle Component Analysis of welfare indicators showed that 7 indicators were the most variable out of the 20 indicators studied. In conclusion welfare status of extensively managed dairy cattle was unacceptable (score<60) at most dairy farm in Uttarakhand. Highly compromised welfare indicators were system of housing & floor space; feeding & watering space; feeding & watering systems with frequency; availability of quality feeds & fodder; feeding practices, productivity and body condition score.

The effects of a commercially relevant composite stressor treatment on behaviour and physiological responses in beef cattle

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Dr. Miguel Somarriba [1] *, Prof. Rainer Roehe* [2] *, Prof. Alastair Macrae* [3] *, Prof. Richard Dewhurst* [2] *, Dr. Carol-Anne Duthie* [2] *, Ms. Kara Ernst* [4] *, Prof. Marie Haskell* [5] *, Dr. Simon Turner* [5]

1. Animal and Veterinary Sciences Group, Scotland's Rural College (SRUC) / Royal (Dick) School of Veterinary Studies and the Roslin Institute, University of Edinburgh, 2. Future Farming Systems Group, Scotland's Rural College (SRUC), 3. Royal (Dick) School of Veterinary Studies and the Roslin Institute, University of Edinburgh, 4. MSc student, Applied Animal Behaviour and Welfare MSc, University of Edinburgh, 5. Animal and Veterinary Sciences Group, Scotland's Rural College (SRUC)

The effects of chronic stress on the behaviour and physiology of beef cattle is poorly understood. We studied whether a composite treatment involving four commercially relevant stressors impacted the behaviour and HPA axis responsiveness in beef cattle. This study complied with UK Home Office regulations and ISAE ethical guidelines. Limousin (n=32) and Angus (n=32) crossbred steers (age 400 days SD 13) were assigned in a balanced way to a chronic stress (S) or control (C) treatment, each of four replicate groups. After an 8 week baseline period at floor space allowance of 8.72 m^2/animal, S steers experienced a reduced space allowance (4.35 m^2/animal) and weekly regrouping, transport for 20 min and isolation for 10 min, for the next 8 weeks (Stress period). For final 8 week recovery period, S animals returned to the baseline conditions. C remained in baseline conditions throughout the trial. Blood samples were taken at end of baseline, stress and recovery phases, and faecal samples were collected every 2 weeks. An ACTH challenge was performed at the end of the stress period using 0.5ug/kg of Synacthen Depot® with blood samples taken just before, 30 min post and 60 min post ACTH challenge. Behaviour was assessed using activity monitors, feed intake, agonistic behaviour at the feeders and affiliative behaviour in the home pen.

Linear mixed models found no significant differences in activity attributable to treatment; except for S showing significantly lower motion index (p<0.005) during the stress period, which would be expected given the smaller space allowance. Treatment did not affect agonistic or affiliative behaviours. Nonetheless, both treatments decreased agonistic interactions over time as expressed by frequency of head-butting (p<0.001) and pushing (p<0.001).

Plasma (p<0.05) and faecal cortisol (p<0.005) differed between S and C but differences were already present in baseline cortisol before the stress regime. The ACTH challenge showed no alteration to adrenal sensitivity in S animals. Similarly, no differences in feed intake or growth performance were found between the treatments.

Although some differences in behaviour were found, cortisol results suggest that the S treatment was insufficient to induce clear differences between groups attributable to chronic stress responses. This may indicate that beef cattle are resilient to repeated but predictable stressors. We found variation in stress responses within treatments indicating that some animals experienced more stress than others, highlighting that it is important to assess responses at the individual-level even when population-level evidence of stress is lacking.

Animal-based indicators for the evaluation of sheep welfare on-farm

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Mr. Giovanni Marcone [1], *Ms. Francesca Carnovale* [1], *Prof. David Arney* [1], *Prof. Giuseppe De Rosa* [2], *Prof. Fabio Napolitano* [3]

1. Estonian University of Life Sciences, Institute of Veterinary Medicine and Animal Sciences, 2. Dipartimento di Agraria, Università degli Studi di Napoli Federico II, 3. Scuola di Scienze Agrarie, Forestali ed Ambientali, Università della Basilicata

The application of accurate and reliable on-farm protocols is essential to evaluate the welfare of sheep. However, protocols which include a high number of measures are demanding in terms of time. Therefore, the aim of this trial was to use a small number of already validated, reliable, and feasible, rapid and non-invasive animal-based indicators (prevalence of leanness, fleece condition, fleece cleanliness, skin lesions, tail docking, lameness, hoof overgrowth, mastitis, whereas longevity was gathered from farm recordings) to compare the welfare on nine farms with dairy and nine farms with dual-purpose breeds to test a rapid and simple method of assessment. Farmers were also asked to score (1=not relevant, 10=very relevant) the relevance of eight animal welfare indicators for an animal. An overall farm score was calculated: the prevalence of affected animals was multiplied by the median relevance score given by all the farmers for each indicator; all indicator scores were then summed. The Least Significant Difference (LSD) test was used to locate differences among the eight indicators at $P<0.05$. Farmers scored mastitis (9.1 ± 0.5) as the most relevant welfare indicator, followed by leanness (8.4 ± 0.5) and lameness (8.1 ± 0.5). The least relevant indicator according to the farmers was docked tail (3.3 ± 0.5). Wilcoxon two-sample test showed that the prevalence of bad fleece condition was lower in dairy sheep ($P<0.05$), whereas dual-purpose farms had a higher prevalence of docked tail animals ($P<0.01$). The number of ewes with docked tails was higher in farms using manual milking, compared to mechanically milked sheep ($P<0.01$). Based on Spearman rank correlation test, ewes showing a higher prevalence of skin lesions had a lower body condition and also had longer longevity ($P<0.05$, $r_s=0.45$ and $P<0.01$, $r_s=0.57$, respectively), possibly due to increased likelihood of injury over a longer period of time. A positive correlation was found between hoof overgrowth and lameness ($P<0.01$, $r_s=0.56$). In addition, hoof overgrowth was positively correlated with fleece dirtiness ($P<0.05$, $r_s=0.46$). There was a tendency for a positive correlation between lameness and leanness ($P<0.10$). No differences between dairy and dual-purpose farms were detected in terms of the final score, which ranged from 33 (best welfare score) to 187 (worst welfare score). The results show that simplification of existing protocols allows evaluation of sheep welfare in different farming conditions reducing the time needed to carry out such evaluations. Identification of the indicators at high prevalences allow farmers to identify the main areas for their intervention at farm level.

The effects of heat stress on sheep welfare during live export voyages from Australia to the Middle East

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Ms. Francesca Carnovale [1], **Prof. Clive Phillips** [2]

1. _Estonian University of Life Sciences,_ **2.** _Curtin University Sustainability Policy_

One of the world's longest sea journeys with sheep transport is from Australia to the Middle East. There is a particular risk to animal welfare in voyages departing Australia in the Southern Hemisphere winter and arriving in the Persian Gulf in the Middle East after about 15 days, into the Northern Hemisphere summer, because of the rapid transition from cold to hot temperatures. The threshold temperature when welfare problems occur in sheep is not well understood. The objective was to determine more accurately critical thresholds for reduced welfare as a result of high temperatures, thereby facilitating improved control of heat stress risk.

Records of data obtained from 14 livestock voyages were provided by the Department of Agriculture and Water Resources of the Australian government. The mean number of sheep/voyage was 46,459 (± SD 25.61), with a range of 4,466 to 77,988. These voyages took place between 2016 and 2018 from the ports of Fremantle and Adelaide in Australia to ports in the Persian Gulf and the Red Sea. Sheep mortalities on each deck, and vessel cumulative mortalities, were recorded by the ship veterinarian and reported to the captain daily. Daily wet bulb temperature (T_{WB}), dry-bulb temperature (T_{DB}), and relative humidity (RH, in %) were measured on individual decks. A General Linear Model with stepwise regression was used to determine which of the environmental variables were related to mortality and identify relevant interactions. Mortality mainly increased between days 14 to 23 of the voyage and in July and August, with mean values of 0.14 % (± 0.25 SD) and 0.070 % (± 0.17 SD) respectively, compared with all other months. The increase in mortality in the month of July was associated with a high heat stress score and high deck wet bulb temperature, and this occurred between days 15 and 20 of the voyage. The five journeys that had Doha as the first destination had on average 0.13% ± 0.08 SD mortality when arriving at that port. The nine voyages that had other first destinations had on average 0.03% ± 0.02 SD mortality.

The study shows that heat stress is first evident at temperatures of approximately 27.5°C T_{WB} at the ship bridge. As mortality increased during the winter season of the southern hemisphere and during offloading at Doha, it is recommended to preferentially transport sheep from Australia at other times of the year and avoid Doha as the first stop.

Ad-lib fed finishing pigs perform oral behaviours usually associated with hunger in dry sows

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Ms. Laura Salazar [1], Dr. Emma Baxter [2], Prof. Alistair Lawrence [2], Dr. Rick D'Eath [2]

1. *Animal & Veterinary Sciences, 2 Scotland's Rural College (SRUC), Roslin Institute, Easter Bush, UK 2 The Roslin Institute, The Royal (Dick) School of Veterinary Studies, The University of Edinburgh, United,* **2.** *Animal & Veterinary Sciences, 2 Scotland's Rural College (SRUC), Roslin Institute, Easter Bush, UK*

Non-food directed oral behaviours in dry sows have been found to increase due to restricted feeding. However, these may have other causes different than food restriction such as exploratory behaviour, and underlying health conditions (e.g. gastric ulcers in horses). To test the possibility that oral behaviours can also have different causes in pigs we studied them in food restricted sows and non-food restricted finishing pigs both in straw bedded pens at SRUC's Pig Research Centre. We hypothesised that: 1) The frequency of oral re-directed behaviours would be higher in dry sows, 2) that these behaviours would also be observed in finishing pigs despite ad lib feeding, and 3) that some of the behaviours occur together.

Live behavioural observations (Observer XT14®) were carried out on 95 finishing pigs and 42 first- and second-parity dry sows in the morning and afternoon, resulting in 25 min/focal pig. All occurrences of resource-directed (rooting, licking, biting and nosing equipment, drink, root floor, straw chewing), pig-directed (nosing and licking) and self-directed behaviour (sham chewing, jaw stretching, tongue playing, wind sucking and snout twitching) were scored.

Most of the behaviours were significantly higher in dry sows (only nosing pig was higher in finishing pigs) ($p < 0.05$; GLMM) and, most importantly, all scored behaviours were observed in finishing pigs. Interestingly, jaw stretching, wind sucking, tongue playing, biting and nosing equipment, lick penmate, drinking and rooting were not significantly different. Among finishers, the lowest frequency behaviours (means ± CI) (and performed proportionally by the fewest pigs (%)) were jaw stretching [0.002±5.502 (2.11%)], wind sucking [0.004±4.741 (5.26%), snout twitching [0.010±1.902 (10.53%)] and tongue playing [0.017±1.994 (12.63%)]. Spearman's correlation (r_s=0.220-0.335; $p<0.05$) and PCA (explaining 37% of variation) showed that the association between behaviours was weak within finishing pigs. Among the rare behaviours, an association was observed only between jaw stretching and wind sucking (r_s=+0.290; $p = 0.004$).

Oral behaviours do occur in ad libitum fed finishing pigs. This opens the door for further research since these are unlikely to happen due to chronic hunger. We propose that these may be 1) related with exploratory behaviour, and/or 2) be associated with underlying health conditions such as gastric ulcers. Behaviours that were rare, highly variable and abnormal/self-directed are candidates for the second explanation [considering that gastric ulcers prevalence might be low at the research facility (Rutherford et al., 2018)]. Furthermore, this could question the origin of these behaviours in dry sows.

Assessment of Cattle Welfare and Ethical Practices in Akinyele Abattoirs, Ibadan

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Mr. Valentine Obiasogu [1]

1. Texas A&M University

The need to maintain meat production quality as well as ensuring welfare and good ethical practices in local abattoirs is of paramount importance, such that if not optimally employed can adversely affect quality operation and food safety and as a result cause downgrading of carcass and meat suitable for consumption. This study was carried out to assess the welfare and ethical practices involved in the cattle slaughtering process at Akinyele Abattoir, Ibadan.

Data collection was obtained using a design of codes for parameters to measure. Direct observation was made with the aid of a checklist and interviews with key people at the abattoir. Data obtained from each cattle presented for slaughter include: body conformation upon arrival, skin condition of the cattle, restraining method, the slaughter method employed (piercing or open), time of slaughter, time of processing, type of processing method employed (singeing or scalding), arrival time, breeds identification, sex, size, means of transporting the cattle to the abattoir. Result showed that 76.6% of the cattle were alive while 23.4% were either dead or slaughtered upon arrival at the abattoir, 82.3% of the cattle slaughtered were wheeled, while 17.7% were observed to walk down to the abattoir. Rickety cattle were observed as the most frequently slaughtered (51.8%), while 48.2% were meaty. Cattle without skin disease were the most frequently slaughtered (96.9%), while only 3.1% was observed to have a diseased skin. Only 12.8% of the animals brought for slaughter were restrained before slaughtering. While those that were not restrained had the highest percentage (87.2%), 92.5% of slaughter was carried out by open method, while 7.5% of the cattle were slaughtered using the piercing method. 88.4% of the carcass were processed by singeing, while 11.6 % were processed by scalding. Highest percentage of cattle slaughtered was on Friday (31.2%), while Saturdays, Thursdays, Wednesdays, Tuesdays, Mondays, Sundays had slaughter rates of 21.9%, 14.6%, 9.9%, 8.8%, 8.6% and 5% respectively. The population of White Fulani cow was significantly ($P<0.05$) highest among the entire breed observed across all time range, followed by Red Bororo cow while Kuri cow had the least frequency in the slaughter and processing activities at the abattoir and lack of proper record keeping. It is therefore recommended that animal welfare regulations should be made available and enforced at the local abattoir. Training of personnel and good record keeping at the abattoirs is also of utmost importance for quality meat production.

Objective determination and quantification of pain associated with digital dermatitis lesions in cattle

Ms. Anice Thomas [1], _Dr. Karin Orsel_ [1], _Dr. Edmond Pajor_ [1]

1. _University of Calgary_

Digital dermatitis (DD) is an infectious disease affecting cattle feet resulting in erosion and inflammation of the skin above the heel bulbs. Some cases of DD result in lameness, causing pain and significantly impact animal welfare. The aim of this study was to objectively quantify pain associated with DD lesions and determine the association between pain sensitivity, lameness, and lesion temperature. A total of 255 animals from 13 pens across 3 commercial feedlots were enrolled. All animals were assessed for: (1) lameness using the Step-Up Locomotion Scoring System, (2) DD using the DD M-stage system, (3) nociceptive threshold using pressure algometry, and (4) lesion temperature using thermal images. Lameness scores were assigned as animals walked four strides down an alleyway. All other measurements were obtained while animals were restrained in a squeeze chute with each hind foot lifted and secured with a rope assessed and scored separately. DD M-stages were combined to categorize feet as without lesions or with DD lesions. Further, DD lesions were classified as active or chronic. The statistical unit was foot. In total 116 of 510 feet had DD, of which 61 classified as active and 55 as chronic lesions. A multilevel mixed-effects tobit regression model was used to quantify pain sensitivity and its association with lameness score. Nociceptive threshold was measured in newtons (N) of force applied to the foot before the animal had a withdrawal response. DD lesions withstood 5.6N less pressure than feet without lesions (P <0.001). Active DD lesions were most sensitive withstanding 8.1N less pressure than feet without lesions (P <0.001) and 4.1N less pressure than chronic lesions (P = 0.004). Feet without lesions endured 4.1N more pressure than feet with chronic lesions (P <0.001). Moderate to severely lame animals withstood 3.1N less pressure than sound animals (P <0.001). Lesion temperature was analyzed using the Kruskal-Wallis H test and Dunn's test. Median maximum temperature (MMT) was higher in feet with DD compared to those without; $\chi^2(1)$ = 12.78, P <0.001. MNT was higher in active lesions (P = 0.011) and chronic lesions (P = 0.001) compared to feet with no lesions, however, no difference was observed between active and chronic lesions (P = 0.79). In conclusion, both active and chronic DD lesions are painful, and pain intensifies when animals are lame. Pain sensitivity is greatest in active DD lesions and associated with higher lesion temperatures.

The effects of xylazine sedation in 2 to 6-week-old calves disbudded with a cautery iron

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

**Ms. Cassandra Reedman** [1], **Dr. Charlotte Winder** [1], **Dr. Todd Duffield** [1], **Dr. Trevor DeVries** [1], **Dr. Kerry Lissemore** [1], **Dr. Ian Duncan** [1]

1. _University of Guelph_

The use of sedation may be recommended as best practice for disbudding, but there is little research in this area. The objective of this study was to evaluate the effects of xylazine sedation in conjunction with a local anesthetic and nonsteroidal anti-inflammatory drug (NSAID) in calves following cautery disbudding. One hundred and twenty-two female and male Holstein calves aged 13 to 44 d were enrolled over 9 blocks and randomly allocated to 1 of 2 treatments: 1) sedated: lidocaine cornual nerve block, meloxicam and xylazine, or 2) non-sedated: lidocaine cornual nerve block and meloxicam. Data were analyzed using mixed models with a fixed effect for baseline values and a random effect for trial block. Linear regression was used to assess continuous outcomes and logistic regression to assess binary outcomes. Sedated calves had reduced average milk drinking speed at 0 to 24h and 24 to 48h following disbudding compared to non-sedated calves (24 to 48h; -40.9mL/min, 95%CI: -76.8 to -4.9, P=0.03) but there was no difference between groups in total amount of milk consumed daily (P=0.86). Sedated calves had reduced pressure sensitivity (measured using an algometer) (P<0.01) at 0, 60- and 240-min after disbudding (0min; -0.37kgf, 95%CI: -0.49 to -0.25; 60min; -0.69kgf, 95%CI: -1.03 to -0.35; 240min; -0.72kgf, 95%CI: -1.16 to -0.28) but there were no detected differences between groups 24h after disbudding (P=0.42). During the disbudding procedure, non-sedated calves had 4.5 (95%CI: 1.5 to 13.2, P=0.006) times the odds of struggling more than twice compared to sedated calves. Three h after disbudding, non-sedated calves had a rate of playing 79 times higher compared to sedated calves (incidence rate ratio (IRR) = 79.2, P<0.01, 95%CI: 22.4 to 279.2), but 24 h after disbudding, sedated calves tended to have twice the rate of playing compared to non-sedated calves (IRR = 2.0, P=0.07, 95%CI: 0.93 to 4.3). The results indicate that xylazine sedation, in conjunction with a local anesthetic and NSAID, can reduce behavioural indicators of pain in calves disbudded with a hot iron, but also appears to impact suckling behaviour for 48h following sedation.

The influence of severity of gastric ulceration on horse behavior and heart rate variability

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Ms. Brittany Perron [1], *Dr. Ahmed Ali* [1], *Ms. Peyton Svagerko* [1], *Dr. Kristine Vernon* [1]

1. Clemson University

Despite the high prevalence of gastric ulceration in horses, little is known about the behavior and heart rate variability (HRV) indices associated with the severity of this condition. This study examined the effect of severity of gastric ulceration on behavior and HRV indices associated with pain in eight mature University teaching horses, in which ulcers were induced for a coinciding trial. Horses were divided into two groups (n=4) by the severity of gastric ulceration: severe ulcer group [S; scores 3-4], and a mild group [M; scores 0-2]. Horses were housed in 10'x12' stalls and fed 0.5% BW long-stem hay in slow-feeder nets and 0.25% BW concentrate twice daily with *ad libitum* access to water. Dietary modifications were made after endoscopy and horses were administered supportive treatment immediately post-data collection. Horses received a 24h rest period post-endoscopic examination before data sampling began. Behavior and HRV were collected for three consecutive days to account for day-to-day variation and optimize data validity. Behavior was recorded at three 2-h time points per day (Morning, Noon, and Evening) and analyzed in two 15-min increments an hour, totaling nine hours of data per horse. Polar® Equine V800 Heart Rate Monitors were used to record heart rate and HRV, later analyzed using Kubios® HRV and MATLAB® software. Mean heart rate and HRV indices, e.g. standard deviation of beat-to-beat intervals (SDRR) and root mean square of successive beat-to-beat differences (rMSSD), the low (LF; sympathetic tone) and high frequency (HF; parasympathetic tone) component of HRV, and their ratio (LF/HF; index representing the sympatho-vagal balance) were calculated and expressed as response values. The effects of gastric ulcer severity between groups on behavior and HRV were assessed using GLMMs with Tukey's Post hoc test applied to significant results (α=0.05) in R (version 3.3.1). Horses with severe ulcers (S) showed higher heart rate (63.6 beats) and LF/HF ratio (5.6%) and reduced SDRR and rMSSD (140.4, 37.19) when compared with M horses (53.3, 3.6, 189.9, 51.1), respectively, (all P≤0.05). S horses had more frequent eating bouts than M horses (26.6, 12.1 bouts; P=0.03). S horses displayed more abdominal kicks, tail switching, tongue activity and pawed more than M horses (22.3, 33.6, 15.2, 26.5 versus 9.2, 14.1, 4.2, 10.58 times, all P≤0.05). Therefore, horses with severe gastric ulcers showed a more stressed pattern of behavior and HRV indicators, suggesting these may be reliable in determining severity of gastric ulcers in horses.

An animal welfare assessment protocol for use in the Australian live export industry

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Prof. Teresa Collins [1] *, Dr. Emma Dunston-Clarke* [1] *, Prof. Trish Fleming* [1] *, Prof. Anne Barnes* [1] *, Prof. David Miller* [1] *, Dr. Renee Willis* [1]

1. *Murdoch University*

Throughout the Australian live export supply chain, livestock are exposed to different environmental and management conditions, as they are transported from farm to pre-export feedlots, on-board vessels, to destination feedlots and slaughterhouses around the globe. Until recently, mandatory industry welfare reporting focused on mortality rates; however, the absence of mortality does not guarantee an acceptable animal welfare experience. A welfare assessment protocol was developed and piloted for feeder and slaughter cattle and sheep undergoing sea transport from Australia. The aim was to develop a monitoring system that allowed a holistic approach to animal welfare, using the four principles and 12 criteria framework developed by Welfare Quality®. Additional assessment protocols for beef and dairy cattle and sheep, along with mandatory industry reporting were considered, resulting in a list of 74 welfare measures. These measures were piloted on eight consignments from Australia to destinations in the Middle East and South-East Asia. Principal Components analysis was used on animal-outcome data, with GLMM analysis used to determine whether variations in animal responses occurred between morning and afternoon, and across voyage days, and to test for influences of climatic and resource covariates. Analyses across several voyages led to the identification of five components of welfare that were consistent across the consignments studied; 1. Rest and activity, 2. Thermal responses, 3. Demeanour, 4. Feeding behaviour, 5. Human-animal interactions in addition to, 6. Health records. Although not all environmental, resource and management challenges were experienced throughout the eight pilot consignments, the authors contend it is likely that most livestock responses can be categorised under these components. Subsequently, a final list of measures (including 19 novel indicators) has been developed to address these welfare components. Implementation of these measures will enable the industry to monitor and manage animal welfare risks and facilitate industry transparency.

Piloting a welfare assessment protocol for sheep in preparation for sea transport

Sunday, 1st August - 18:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 19:00: Welfare and Welfare Assessment - Oral

Wednesday, 4th August - 20:45: Welfare and Welfare Assessment - Oral

Prof. Teresa Collins [1], *Dr. Emma Dunston-Clarke* [1], *Ms. Ursula Anthony* [1], *Prof. Trish Fleming* [1]

1. Murdoch University

Livestock are exposed to several stressors as they transit through the live export supply chain. Currently, there are no published protocols about how to assess the welfare of livestock in such a commercial setting. Australian sheep are raised in extensive systems; thus, the process of yarding, transport, and mixing can be stressful. Establishing methods to evaluate sheep behaviour during transit is an important step for welfare assurance. Wethers (n = 240) from four farms were identified with stock- paint and their behaviour observed, and video recorded pen-side at four time points; on farm (6-8h after mustering), upon arrival at the pre-embarkment feedlot (day 1), prior to road transport to the port (day 5), and after loading onto the vessel. An ethogram was used to assess sheep behaviour concurrently while sheep were filmed. Using Qualitative Behaviour Assessment, 12 observers scored the sheep using 10 terms per 45s video clip. Principal Component Analysis (PCA) was used to analyse 576 assessor scores. Repeated measures ANOVA and Tukey's post hoc analysis determined if PC scores significantly differed between locations, while Spearman's correlation determined if health and behaviour measures significantly correlated with PC scores. Sheep were scored as significantly more *agitated* and *nervous* on the farm than the other timepoints on PC1 (30.5% variation). Sheep were found to be significantly more *interested* and *alert* at the feedlot on PC2 (24.5% variation) than on farm or ship. More sheep were found to be eating at the feedlot locations ($F_{3,8}$ = 8.74, $p < 0.001$) and ruminating at the second feedlot timepoint and on the ship ($F_{3,8,}$ = 12.05, $p < 0.001$), compared to other locations. Developing protocols that focus on industry relevant species-specific animal-based measures, including demeanour, are needed to enable welfare improvement throughout the live export supply chain.

Plenary: Application of Technology to Applied Animal Behaviour and Welfare

Back to the future: moving towards more natural animal production systems, supported by 21st century technology

Sunday, 1st August - 18:00: Plenary: Application of Technology to Applied Animal Behaviour and Welfare - Plenary talk

Thursday, 5th August - 09:00: Plenary: Application of Technology to Applied Animal Behaviour and Welfare - Plenary talk

Prof. T. Bas Rodenburg [1] *, Prof. Saskia Arndt* [1]

1. *Faculty of Veterinary Medicine, Utrecht University*

Conventional animal production is under considerable societal pressure. Concerns such as animal welfare, climate change and resistance to antimicrobials are changing the way society is perceiving animal production. In response to those concerns, there is an ongoing debate on how to design sustainable and therewith societally acceptable animal production systems. Some fear that a move towards more natural animal production systems, also employing improved animal welfare conditions, would be like moving back in time and that animal farming would lose much of the progress that has been made since World War II. We feel these fears are unfounded and that progress can be continued by implementing 21st century technology in more natural animal production systems. These animal production systems will put the animal and its needs at the centre and will enable the animal to use its adaptive capacity to respond to challenges in its environment. Sustainable systems should be designed, that rely much less on antimicrobials and that allow good animal welfare without mutilations, such as beak trimming, tail docking or castration. These systems are more complex and costly for the farmer to manage, and these efforts should be rewarded by increased product value and consumer appreciation. A OneWelfare approach, recognizing the interactions between human- and animal welfare and of environmental impacts is needed. Modern technology will aid the animal and the animal industry in making the change towards more natural systems. Sensor technology enables us to track individual animals or groups of animals and record their activity or behaviour. In turn, this data will inform the farmer on the animals' interactions with the social and physical environment. This does not only give more insight into animal welfare and allows for its improvement by e.g. changing environmental conditions; Further progress in animal farming can be made by selecting 'best performers', not showing damaging behaviours, such as feather pecking, tail biting or aggression. Continuous monitoring of animals at the group or, if possible, at the individual level allows us to monitor animal welfare and provides us with early-warning systems of health and welfare problems. With the aid of 21st century technology, we can design more natural animal production systems that put the animal at the centre and that help to create a sustainable future for animal production.

Application of Technology to Applied Animal Behaviour and Welfare (2)

Automated activity recordings throughout life in broilers: heritability of activity and the relationship with body weight

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 09:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 10:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Ms. Malou van der Sluis [1] **_, Dr. Esther D. Ellen_** [2] **_, Dr. Yvette de Haas_** [3] **_, Dr. Britt de Klerk_** [4] **_, Prof. T. Bas Rodenburg_** [5]

1. _Animal Breeding and Genomics, Wageningen University & Research, the Netherlands; Animals in Science and Society, Faculty of Veterinary Medicine, Utrecht University, the Netherlands,_ **2.** _Animal Breeding and Genomics, Wageningen University & Research, the Netherlands,_ **3.** _Animal Breeding and Genomics, Wageningen University & Research, the Netherlands;,_ **4.** _Cobb Europe, the Netherlands,_ **5.** _Animals in Science and Society, Faculty of Veterinary Medicine, Utrecht University, the Netherlands; Adaptation Physiology Group, Wageningen University & Research, the Netherlands_

Broilers are commonly housed in large groups and have a uniform appearance, which makes it difficult to collect health, welfare and performance data at the individual level. However, individual activity levels of broilers have been suggested to be related to different health, welfare and performance traits and may therefore have potential to serve as a proxy for these traits. In the current study, we recorded broiler locomotor activity, i.e. distances moved, throughout life using a passive high frequency radio frequency identification (RFID) tracking system. The aim of this study was to estimate genetic parameters for locomotor activity in broilers and to investigate the relationship between body weight and activity over time. The RFID system consisted of a grid of 30 antennas underneath the bedding of the home pen, that could detect the presence of individual birds wearing an RFID leg tag. This tracking system provided information on birds' locations, i.e. antenna grid cells, over time, allowing for estimation of distances moved by individual broilers. In our previous work, we compared the recorded distances from the RFID system to distances on video and observed a correlation of r_s = 0.82 (95%-CI 0.61-0.92, p <0.001). In the current study, 387 purebred broilers, originating from 31 sires and 96 dams, were fitted with an RFID leg tag at one-day-old and their activity in the home pen was recorded continuously until slaughter age. Furthermore, we recorded the individual birds' body weight every week. The study was performed on a broiler farm in the Netherlands and data were collected under control of Cobb Europe. This study was not considered to be an animal experiment under the Law on Animal Experiments, as confirmed by the local Animal Welfare Body. To estimate genetic parameters for activity, a linear animal model was implemented using the average activity from day-old until slaughter. The overall average activity in broilers is moderately heritable (h^2 = 0.32 ± 0.11), suggesting a potential to select for increased activity. Moreover, a decrease in heritability was observed as the broilers aged. Furthermore, we studied the relationship between body weight and activity over time. The results indicate that selection for increased activity early in life does not directly result in selection for a reduced average daily gain. Given the expected relationship between activity early in life and leg health, the results of this project can potentially help to improve welfare of broilers.

Identifying movement sub-populations of laying hens within a commercially-relevant aviary

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 09:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 10:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Dr. Michael Toscano [1], Ms. Camille Montalcini [2]

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Recent work tracking individual laying hens has identified consistent movement and location patterns (MLP) within individuals with differences across animals. As part of a larger effort to understand MLP origins, a subpopulation of animals was observed to transition infrequently between aviary tiers in the immediate period following population. The current effort compared a subpopulation among those hens with the at-large flock to understand influential factors and implications for animal welfare. Eight laying pens (225 hens/pen) were populated with Dekalb White hens after being reared in four pen-specific treatments associated within a related study examining hatching on-farm (n=2 rearing pens/treatment; n=4 layer pens/treatment). At population, 132 hens were assigned a watch-size tracking device worn within a vest that registered the individual's movement within five distinct zones of the barn (i.e., top, middle, and lower aviary tiers; floor, wintergarden). After lack of transitioning between zones was observed in some animals, we retroactively classified animals as either: Non-Movers (NM; N=48; a minimum of one recorded day where no transitions were registered within the three days following population) or Movers (MO; N=84). Both classes occurred independent of pens, rearing conditions (i.e., on-farm hatch), or body mass. Tracking data was collected for 52 days from the day after population. Linear mixed-effects models (fixed factors: moving class, day from population, and interactions; random factors: penID, HenID) were used to compare classes over time for the percentage of time in each zone. In each zone, the main effect and interaction terms were an effective predictor (p<0.0001) indicating varying rates of change over time. Based on visualization of raw data, the majority of the NM hens registered more than 85% and 50% of their time in the top tier during the first 8 and 16 days, respectively, which continued to gradually fall over the observation period. In contrast, the majority of MO birds never exceeded 40% in the top tier. As NM birds began to transition more frequently, their distribution patterns remained visually distinct from MO birds with consistently lower daily percentages in the lower tier and floor areas. Interestingly, the daily percentage of time in the wintergarden between NM and MO was similar after the first 10 days of access. We also observed reduced later departures from the top tier with increasing age. Our data suggest that spontaneously emerging behavioural patterns of individuals appear early on, and, while initial differences appear to recede, certain aspects are retained.

Towards an automated classification of pig calls according to their emotional valence and behavioural context: a comparison of methods

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 09:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 10:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Prof. Elodie Briefer [1], Ms. Ciara C.-R. Sypherd [2], Dr. Pavel Linhart [3], Dr. Lisette M. C. Leliveld [4], Dr. Monica Padilla de la Torre [5], Ms. Eva Read [6], Ms. Carole Guérin [6], Dr. Veronique Deiss [7], Dr. Chloé Monestier [8], Dr. Jeppe H. Rasmussen [9], Prof. Marek Špinka [10], Dr. Sandra Düpjan [11], Prof. Alain Boissy [7], Prof. Andrew Janczak [5], Prof. Edna Hillmann [12], Dr. Céline Tallet [6]

1. Behavioural Ecology Group, Section for Ecology & Evolution, Department of Biology, University of Copenhagen, 2. Behavioural Ecology Group, Department of Biology, University of Copenhagen, 3. University of South Bohemia, Č. Budějovice, 4. Department of Agricultural and Environmental Sciences, Università degli Studi di Milano; Institute of Behavioural Physiology, Institute for Farm Animal Biology (FBN), Dummerstorf, 5. Faculty of Veterinary Medicine, Norwegian University of Life Sciences, 6. PEGASE, INRAE, Institut Agro, 7. UMR1213 Herbivores, Institut National de la Recherche Agronomique – INRA Theix, 8. Bureau ETRE, Bravant, 9. Institute of Behavioural Physiology, Leibniz Institute for Farm Animal Biology (FBN), 10. Czech University of Life Sciences, Prague, 11. Institute of Behavioural Physiology, Institute for Farm Animal Biology (FBN), Dummerstorf, 12. Animal Husbandry and Ethology, Albrecht Daniel Thaer-Institut, Faculty of Life Sciences, Humboldt-Universität zu Berlin

Emotions can affect vocalizations directly or indirectly through associated changes in the brain, lungs, larynx and/or vocal tract. As a result, vocal expression of emotion has been observed across species, and could serve as a potentially reliable and non-invasive indicator to assess animal emotions. In pigs (*Sus scrofa*), vocal expression of emotions has been relatively well studied. However, it is not known if the vocal indicators revealed in previous studies are valid across call types and contexts, and could therefore be used for an automated real-time monitoring of pig emotions on-farm. To investigate this question, we performed an analysis of an extensive and unique dataset of low (LF) and high frequency (HF) calls emitted by pigs of different breed, sex and age across many different commercial situations from birth to slaughter (7414 calls from 411 pigs). We first tested how four vocal parameters that represented a high amount of variance in the data (duration, amplitude modulation rate, spectral center of gravity, and Wiener entropy) changed as a function of the valence attributed to the contexts of production, and as a function of the contexts themselves, using linear mixed-effects models (LMM). We then tested two different automated methods of classifying the calls; permuted discriminant function analyses (pDFA) based on the four selected vocal parameters, and an image classification neural network based on spectrograms of the calls. The LMMs revealed that both the valence and the context affected all four vocal parameters in both LF and HF (p < 0.001 for all models). The neural network revealed higher classification accuracies compared to the pDFA, both for the valence (pDFA analysis: weighted average across LF and HF = 85.2% with a chance level at 55.87%; neural network = 91.5%) and context (pDFA analysis: weighted average across LF and HF = 24.4% with a chance level at 15.5%; neural network = 83.8%). Therefore, despite variability in age, sex, body size, and situation, the assumed emotional valence and the context of production can be correctly identified above chance levels, and particularly using a neural network to classify spectrograms of the entire vocalizations. These results suggest that an automated recognition system can be developed to monitor pig welfare on-farm and allow real-time discrimination of emotional states according to the valence and/or context of production.

Monitoring activity on an individual level of group-housed pigs using computer vision

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 09:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 10:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Ms. Lisette van der Zande [1], Dr. Oleksiy Guzhva [2], Prof. T. Bas Rodenburg [3]

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Modern welfare definitions not only require that the Five Freedoms are met, but animals should also be able to adapt to changes (i.e. resilience) and reach a state that the animals experience as positive. Resilience is defined as the ability to cope with or quickly recover from a perturbation. Measuring resilience is challenging since relatively subtle changes in animal behaviour need to be observed 24/7, which would make human observation impossible. Changes in individual activity showed potential in previous studies to reflect resilience. A computer vision (CV) based tracking algorithm for pigs could potentially measure individual activity, which will be more objective and less time consuming than human observations. The aim of this study was to investigate the potential of state-of-the-art CV algorithms for pig detection and tracking for individual activity monitoring in pigs. Pigs were first detected using You Only Look Once v3 (YOLOv3) and were tracked using the Simple Online Real-time Tracking (SORT) algorithm. Two videos, of seven hours each, recorded in a barren and an enriched environment were used to test the tracking algorithm. Three detection models were proposed using different annotation datasets: a model with young pigs where annotated pigs were younger than in the test video, a model with older pigs where annotated pigs were older than the test video, and a combined model where annotations from younger and older pigs were combined. The combined detection model performed best with a mean average precision (mAP) of over 99.9% in the enriched environment and 99.7% in the barren environment. Intersection over Union (IOU) exceeded 85% in both environments, indicating a good accuracy of the detection algorithm. The tracking algorithm performed better in the enriched environment compared to the barren environment, likely due to the larger space per pig. When false-positive tracks where removed (i.e. tracks not associated with a pig), individual pigs were tracked on average for 22.3 minutes in the barren environment and 57.8 minutes in the enriched environment. The average track length varied between 7.1 and 138.3 minutes. Thus, based on tracking-by-detection algorithm using YOLOv3 and SORT, individual pigs can be tracked automatically in different environments, but manual corrections may be needed to keep track of the same individual throughout the video.

Personality and birth characteristics of piglets reflect patterns of electronic feeder (ESF) use by their mothers

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There is growing evidence that the welfare of sows during pregnancy affects the behaviour and physiology of their offspring. Moreover, feeding behaviour patterns of sows fed by an ESF could be related to their social status, and consequently lead to differential welfare of individuals. It is thus possible that sow feeding behaviour patterns, if related to welfare, might be associated with piglet characteristics. This study investigated associations between patterns of ESF use by gilts and offspring birth characteristics and behaviour. Gilts (n=51; 8 replicates) were housed in a dynamic group, and fed with an ESF. We used data automatically collected by the ESF to determine the order of entry in mid-pregnancy (d57), and to calculate the average duration of each ESF visit per gilt throughout pregnancy. Offspring were weighed and scored for vitality (0=least vital, to 4=perfect) and intra-uterine growth retardation (IUGR; 0=none, to 3=severe) at birth. They were subjected to a back test (BT) at 2wks of age, followed by an open field test (OFT) at 3wks of age. Regression analysis was performed (PROC MIXED or GLIMMIX; SASv9.4) to determine associations between patterns of ESF use and offspring measures. Later ESF entry and longer ESF visit durations were both associated with lower IUGR scores ($F_{1,621}$=10.31; P=0.001; $F_{1,620}$=4.00; P=0.046). Later ESF entry was also associated with reduced latency to first struggle ($F_{1,551}$=4.55; P=0.033), and a higher frequency of vocalisation during BT ($F_{1,566}$=6.77; P=0.010), and also a higher frequency of freezing behaviour during OFT ($F_{1,53}$=5.47; P=0.023). Longer ESF visits were associated with reduced OFT exploratory behaviour ($F_{1,134}$=4.15; P=0.044), and increased frequencies of running ($F_{1,36}$=4.37; P=0.044) and walking ($F_{1,127}$=5.20; P=0.024). Delayed entry to the ESF (reduced access to resources), and more time spent inside (protected environment), could be related to dominance hierarchy position; these gilts produced offspring with a proactive-like personality profile and less growth retardation. Thus ESF use patterns, which could be related to the welfare status of gilts, appeared to also be related to offspring traits.

3D cameras to measure tail posture on commercial farms: lameness, tail and ear biting are associated with low tails

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 09:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 10:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Dr. Rick D'Eath [1], Dr. Simone Foister [2], Ms. Mhairi Jack [3], Ms. Nicola Bowers [4], Mr. David Barclay [5], Dr. Emma Baxter [6]

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Behavioural changes in pigs can indicate poor health and welfare. Previously, we showed low tail posture indicated tail biting using a machine vision system using 3D cameras over the feeder. Other research suggests low tails may indicate negative affective states/poor welfare more generally.

Here we tested these ideas in commercial practice- a 3D camera system recorded tail posture from 1692 pigs in 41 production batches of mean ± sd) 42.4 (±16.6) days in length over 17 months at 7 diverse grower/finisher commercial pig farms. Farm visits were made every 14 (±10) days to score injury and ill health.

Although 22% had scratched tails, severe tail biting was rare; overall only 6% had tail wounds and 5% partial tail loss. Linear modelling of tail posture found considerable farm differences, and also large batch effects, even in the same pen. This may be due to earlier variable experiences of the pigs prior to their entry into project pens. The proportion of tails held low (0°, 47% of detections) or mid (1-45°, 21%) decreased over time (days in pen), while tails high (45-90°, 32%) increased.

Adding tail injury to models showed associations with tail posture: worsening tail injury, and tail loss increased the proportion of pigs detected with low tail posture and decreased high tail posture. More pigs with no tail injury meant more high tails, and tail swelling was linked with tails down.

Unexpectedly, lameness had the greatest effect on tail posture- more low tails were observed when a greater proportion of the pigs were scored with lameness or ear injury. This is consistent with the idea that low tail posture could be a general indicator of poor welfare. In contrast to this suggestion though, flank biting injuries appeared to increase high tails, while ocular discharge was associated with increases in both high and low tails.

Our results show for the first time that perturbations in the normal time trends of tail posture are associated with tail biting and other adverse health/welfare events in pigs at diverse commercial farms, forming the basis for a precision livestock farming decision support system.

INFLUENCE OF GENETICS AND LIGHT DURING INCUBATION ON STRESS RESPONSIVITY IN YOUNG LAYING HENS

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 09:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Thursday, 5th August - 10:45: Application of Technology to Applied Animal Behaviour and Welfare (2) - Oral

Ms. Maëva Manet [1], Ms. Saskia Kliphuis [1], Dr. Rebecca Nordquist [1], Dr. Vivian Goerlich [1], Mr. Lucas Noldus [2], Prof. Frank Tuyttens [3], Prof. T. Bas Rodenburg [4]

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Light during incubation is a promising intervention to improve chicken welfare. More specifically, a cycle of alternating green light and darkness reduces fearfulness in poultry. However, this has mainly been shown in studies of broiler chicks, whereas the impact on laying hens is unknown. As the developmental stage has a major impact on the ability to cope with stressors at adulthood, we investigated the effects of light during incubation on the stress sensitivity of pullets of two common layer hybrids: ISA Brown and Dekalb White. In addition, to fully comprehend their stress responsivity in both experimental settings and in their home-pens, we tested a new video tracking system on control laying hens in their home-pen in pilot studies.

For the main research, half of the eggs were incubated in standard darkness and the other half in a green light:dark cycle of L12:D12 throughout incubation, resulting in a 2*2 design. Animals were reared in 20 pens of non-mixed treatments, and individual behavioural measurements were performed to compare experimental treatments on the pullets' stress responsivity. In parallel, the video tracking system was tested on control laying hens, using ArUco codes for identification of each bird, and monitoring their location and direction in both day and night situations.

A cox model was used to determine effects of incubation, hybrid and their interaction. Testing revealed an effect of genetic background and a tendency of light during incubation in a voluntary approach test. ISA Browns pecked at the food offered by a human faster than Dekalb Whites (N = 189, p < 1,84e 05), and within each hybrid, light-incubated pullets tended to peck at the food faster than dark-incubated ones (p = 0,0981). The relevance of human-pullet interactions to poultry farming makes these results promising in terms of improving chicken welfare by reducing their fear of humans.

Finally, the pilots revealed both location and direction of identified individuals can be tracked from as early as 7 weeks old. The system will be implemented in the next batch to further highlight the effects of light during incubation and genetic background on stress responsivity in pullets, for example by monitoring their perch use or their behaviour synchronisation level, important for this highly-social species.

Light being an easy adjustment to bring to hatcheries, the results from our next batch will tell whether implementing a lighted incubation system in the industry can improve laying hen welfare significantly.

Welfare of Working Animals

Impact of Mounted Loads on Welfare of Working Equids

Sunday, 1st August - 18:00: Welfare of Working Animals - Oral

Thursday, 5th August - 10:45: Welfare of Working Animals - Oral

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In developing countries, there are approximately 112 million working equids (horses and donkeys) and most of them are subject to overloading. Overloading is associated with serious welfare problems. Developing a deeper understanding of safe loading capacity of equids is important for both effective performance and welfare. Carrying loads that are beyond the normal abilities of equids have negative effects on working equid, including causing gait asymmetry or lameness. It is important to determine how to carefully quantify the load-carrying capacity of working equids. Traditionally, measurement of the amount of 'bone' was used, and more recently gait symmetry has been identified as a potential marker for loading capacity. There are many options to assess the effect of loading on an animal's body, but these have been inconsistently applied making it difficult to reach a consensus. We summarise current knowledge of load-carrying ability for horses and donkeys and the different parameters used to determine the effect of loading on these equids. Assessment of stride parameters and gait kinematics provides insights into adaptations to loading and may help determine loading limits. Physiological factors such as the ability to regain normal heart rates shortly after working is an important tool for equine fitness assessment. Oxidative stress, plasma lactate and serum creatine kinase activity are reliable biochemical indicators of loading ability. For monitoring stress, salivary cortisol is superior to serum cortisol level for assessment of hypothalamus-pituitary-adrenal axis and is related to eye temperatures, but this has yet to be interpreted in terms of load carrying ability in equids. An equine ethogram has been used to assess pain-associated behaviors in horses, which may be useful when used by trained assessors. More recently, a grimace scale for pain has been developed for use in donkeys, although this has not yet been used in the field. There are also concerns about the validity of ethograms for use in working donkeys due to the stoicism of these animals. The use of the equine ethogram has demonstrated an induce behaviors associated with musculoskeletal pain and temporary lameness in horses. Further research is needed to develop evidence-based guidelines for maximum loading in equids. Quantified loading limits or indicators of overloading could be used by stakeholders working with equids to limit overloading and to improve the welfare of these animals.

Real-time aggression activates stress axis but not serotonergic system in police working dogs

Sunday, 1st August - 18:00: Welfare of Working Animals - Oral

Thursday, 5th August - 10:45: Welfare of Working Animals - Oral

Ms. Elena Gobbo [1], _Dr. Manja Zupan Šemrov_ [1]

1. _Department of Animal Science, Biotechnical Faculty, University of Ljubljana_

During training and in everyday life, police working dogs are often confronted with unpredictable and threatening situations. Behavioural responses to such situations, often in the form of fear and aggression, can be stressful and potentially detrimental to the dog welfare, but evidence to support this assumption is lacking. To investigate neuroendocrine activation during an actual act of aggression, German and Belgian Shepherds dogs (n = 16) used as police working dogs and aged between one and three years were tested in a standardized behavioural test called Socially Acceptable Behaviour. The dogs were subjected to 16 subtests. Based on test performance during each subtest, the dog was assigned an aggression and anxiety score. Scores were cumulative, with a higher final score representing a higher level of aggression and anxiety. Using a predefined ethogram, behaviours related to aggression (e.g., attacking, snapping, staring) and fear (e.g., fleeing, lip licking, whining) were also observed. Saliva samples were taken just before and just after the test, and changes in the primary stress hormone cortisol and the inhibitory neurotransmitter and modulator of well-being serotonin were observed. We predicted an increase in cortisol concentration and a decrease in serotonin concentration in dogs that showed higher levels of anxiety and aggression. Contrary to expectations, correlation analysis showed that dogs with a higher aggression score had a greater increase in cortisol concentration (p < 0.03), whereas no such changes were observed in dogs with a higher anxiety score. Serotonin concentration was not associated with aggression, anxiety score, or related behaviours. The results suggest that our police dogs had increased physiological stress, measured as increased salivary cortisol concentration, during frequently expressed aggressive act performed in real time, but neither aggression nor fear could be associated with neuromodulation, measured as salivary serotonin concentration.

Go back to the foster family every weekend: what is the impact on stress of future guide dogs in an ongoing training program?

Sunday, 1st August - 18:00: Welfare of Working Animals - Oral

Thursday, 5th August - 10:45: Welfare of Working Animals - Oral

Ms. Fanny Menuge [1], Dr. Míriam Marcet-Rius [2], Ms. Camille Chabaud [2], Ms. Eva TERUEL [2], Dr. Cécile Bienboire-Frosini [2], Ms. Galice Kalonji [2], Ms. Cécile Berthelot [1], Dr. Tiago Mendonça [2], Mr. Eric Lascar [3], Prof. Patrick Pageat [2]

1. IRSEA, **2.** IRSEA (Research Institute in Semiochemistry and Applied Ethology), **3.** Frederic Gaillanne Foundation

Forty % is the failure rate of guide dog. Many studies try to detect as soon as possible dogs with undesirable behaviours, but very few considered the specific context of development. Their training program could lead them to undergo repeated separations every Monday with their foster families.

The aim of this study was to evaluate this weekly separation and its impact on the dogs' stress and welfare. The study protocol was approved by the French Ministry of Research (APAFIS#24626-2020031113263522 v2). Nine potential guide dogs in an ongoing training program participated in this study, over a period of three weeks. Salivary cortisol and behaviours, as passivity, lip licking, head movement, and play behaviour of the dogs were collected at several days of the week, to compare the day of separation vs. other days. Blood samples were also taken once a week to assess the level of oxytocin, prolactin, serotonin, and the neutrophil/lymphocyte ratio. Parameters were analysed using GLMM with SAS 9.4 software.

The results showed a significant increase in salivary cortisol concentration at the time of separation (GLMM; DF = 2; F = 10.31; p < 0.0001). Besides, the dogs were more passive (GLMM; DF = 2; F = 7.53; p = 0.0090) and "head movements" were less expressed on Friday (GLMM; DF = 2; F = 5.12; p = 0.0141). An increase in serotonin level during the 3 weeks of testing was also observed (GLMM; DF = 2; F = 4.87; p = 0.0224).

These results could be interpreted as the dogs were more excited on Mondays, and calmer at the end of the week. Monday seems to be a day of re-contextualisation, which could have an impact on the performance of dogs in training. The result concerning serotonin level suggested that the dogs seem to be able of adapting to this kennel environment without developing chronic stress.

This study raising the question of the relevance of returning to their foster family on weekends. Go back to the foster family could be pertinent to allow the dog to keep a link with a family context, and all the advantages that this implies, like socialisation. A study will be carried out on dogs staying at school on weekends, to compare these two education contexts in terms of welfare and performance. Other ways could also be considered, as returning to the foster family each evening, to relieve the stress of separation.

Releasing elephants from overnight tethers: impacts on behaviour and welfare

Sunday, 1st August - 18:00: Welfare of Working Animals - Oral

Thursday, 5th August - 10:45: Welfare of Working Animals - Oral

Dr. Natasha Clark [1] **_, Dr. Ellen Williams_** [2] **_, Dr. Clare Frances Ellis_** [1] **_, Mr. Jake Rendle-Worthington_** [3] **_, Dr. Lisa Yon_** [1]

1. *University of Nottingham,* **2.** *Harper Adams University,* **3.** *Director of 'We Are All Mammals' and Project Leader of 'Zambezi Elephant Welfare And Conservation Trust'*

Within the elephant tourism industry, chaining or tethering elephants is still a relatively routine practice, despite the known negative impacts. Historic reasons for chaining have centred around fear of aggressive interactions between elephants, and risks of elephants roaming into human-inhabited areas or causing destruction to surrounding areas. Research on removing circus elephants from tethers has indicated positive changes in elephant welfare; however, opportunities to monitor behavioural change in elephants removed from tethers is rare. Semi-captive elephants at a tourist facility in Zimbabwe were taken off overnight (~12 hours) and put into small bomas, as part of a new strategy at the facility to improve elephant welfare.

Behavioural data were collected on four male African elephants, from December 2019 to January 2020, between 18:00 to 06:00, using instantaneous scan sampling from video footage, with a 5-minute inter-scan interval. Data was collected for three nights at three time periods: Phase 1 – tethered; Phase 2 – four weeks post-release from tethers; Phase 3 – eight weeks post-release from tethers. Behavioural changes were analysed using general linear models with quasibinomial error structures.

Proportion of time engaging in lying rest was lower when elephants were tethered (mean±SD, 20±18%) than one-month post-release from tethering (50±14%) ($p < 0.05$). Proportion of time spent engaging in abnormal repetitive behaviours did not significantly differ between conditions or between individuals ($p > 0.05$). However, while not significant, there was a trend in the reduction of stereotypies when elephants were no longer tethered (4±6% observations tethered compared to 2±2% off tethers). Although not statistically significant, affiliative social behaviour improved from 1±1% on tethers, to 2±2% post tethering, with the greatest improvements seen in the pair-housed elephants. Individual variation was seen in positive social interactions, standing rest, and locomotory behaviour. Behavioural changes were indicative of improved welfare (e.g. reduced stereotypies, increased lying rest). No overt problems were encountered during the management change.

Monitoring behavioural change at this facility enabled the opportunity to document the impact of the release from chains on elephant behaviour and welfare, providing clear evidence for recommendations for changes in management practices in tourist facilities in range countries. To improve elephant welfare on a worldwide scale, we strongly advocate implementation of these less restrictive management practices at elephant tourist facilities, enabling greater elephant choice and freedom of movement, specifically minimising periods of time on tethers in the daytime, and reducing restrictive overnight management, which prevents elephants in engaging their natural behavioural repertoire.

Welfare Assessment of Working Horses and Their Owners Perception in Fashir and Zalingei, Darfur, Sudan

Sunday, 1st August - 18:00: Welfare of Working Animals - Oral

Thursday, 5th August - 10:45: Welfare of Working Animals - Oral

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Abstract: Horses in developing Countries are playing an important role in people's livelihood, which are mainly owned by poor people to use for transportation and agriculture. Despite their contributions, horses in Sudan as well as in Darfur still suffering from malnourished, subjected to different conditions of hardships like walking long distance continuously, unkindness, poor management conditions, harsh environmental conditions, over-use, limited veterinary awareness and various zoonotic disease, therefore; horses' welfare in Sudan is still neglected if compared with development countries. However, there are no records about horses' welfare in Darfur. Present study aims to assess and compare working horses' welfare issues in two statewide of Darfur and to scan the owner's conception of their horses. A protocol was assessed indirect parameters (owner questionnaire) and general characteristic with direct parameters (sex, age, health, and behavior of horses). A total of 150 horses (Zalingei=100, Fashir=50) and 150 owners were investigated. Results showed that, there is a significant difference in body condition score, which thin= 23.33% (Fashir=34%, Zalingei=18%) and fat=20% (Fashir=12%, Zalingei=24%), and 20% (Fashir=24%, Zalingei=18%), 42% (Fashir= 62%, Zalingei=33%), 38.66% (Fashir=70%, Zalingei= 23%) Nasal discharge, dirty coat condition and present external parasite respectively. In addition, 40% (Fashir=14%, Zalingei=53%), 44.66% (Fashir=72%, Zalingei= 31%), 66% (Fashir=76%, Zalingei= 61%) depressed attitude, Indifference approximation test and accept chin contact respectively. Moreover, 74.66% (Fashir=30%, Zalingei=97%), 55.33% (Fashir=16%, Zalingei=75%) had no trimming practice and no veterinary consultation respectively. Yet, there were no significant differences and lower prevalence of skin wound, skin scare, biting, kicking and shoeing practice between two regions. The conclusion is, although the lack of horses' welfare in both two states of Darfur, but Fashir state suffers from welfare problems in direct parameters more than Zalingei state, yet there are higher indirect parameters problems in Zalingei than Fashir. Education, training, extension and veterinary service, owner awareness and further research have been needed to improve Horses' welfare.

Keywords: horse; welfare; Darfur.

Early Life and Maternal Care

Farm animal welfare through adoption of automation rearing system in Dairy Farms

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

Dr. Mahadevappa D Gouri [1], Dr. PRASANNA BASAVARAJU [2], Dr. Abhijeeth Kumar [3], Dr. Vivek M Patil [4]

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Background: The Indian dairy industry has progress consistently ever since the White revolution of the 1970s, making India, the world's largest and fastest producer of milk with 17 per cent global share. The welfare of animals is being compromised on many occasions under traditional rearing system. At the same time, the Indian dairy market is expected to double within the next 10 years, primarily driven by over 16-20 per cent growth in value added dairy segment. To catch this high growth potential and to meet the rising demand, a sustainable, welfare proof and strong dairy production system will be critical.

Methods: A study was conducted between December 2018 and February 2019 at four different dairy farms. The farms were identified based on rearing systems practiced. The farms were divided into two groups where the first one (n=10 dairy cattle) utilized automatic rearing systems (the ARS farms), while the second group (n=10) had conventional rearing systems (the CRS farms).

Result: Based on the results, the effect of different rearing systems on the average lactation yield in the fourth lactation was significantly higher ($P\pounds0.05$) in automatic rearing system (ARS). The intervention of men was minimum in ARS system; this might have resulted in increase in milk yield due to better animal welfare, and expression of natural behaviour patterns and also social contact patterns. Further, the reproductive performance of the ARS houses had better age at first calving and service period as compared to conventional house type with significant difference. By using an ARS it is possible to save time and achieve greater flexibility. The experiment indicates less man power minutes required for routine daily work like feeding, watering and milking in automatic rearing system as compare to conventional rearing system. A significant ($P\pounds0.01$) reduction in working time by comparison with a different feeding, watering and management system however can only be expected in the case of sizeable herds. Thus the results suggest that the animals maintained in ARS system had better welfare when compared to the animals under conventional rearing system (CRS). In principle an ARS can be a good opportunity for optimizing working time and workload in dairy farming.

Don't forget the dams. Stress reactions of dairy cows to two different weaning and separation methods in cow-calf-contact systems

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

Ms. Anina Vogt [1], Prof. Susanne Waiblinger [2], Dr. Kerstin Barth [3], Prof. Uta König von Borstel [1]

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The study's aim was to investigate stress levels of dairy cows nursing their calves when the pairs were separated with two different methods. Weaning and separation took place over three weeks using either the two-step method with a nose flap (NF, full-time contact > 2 weeks access to mother with nose flap > 1 week fence-line contact, n=18) or gradual reduction of contact time between cow and calf (GR, full-time contact > 1 week half-day contact > 1 week morning-contact > 1 week fence-line contact, n=18). Vocalisations, searching behaviour (moving up and down the fence or standing at the fence, head elevated with eyes and ears focused in direction of the calf) and cow-calf-interactions (CCI; licking, rubbing, nose-calf-contact) were observed for 5 hours/day on 4 days/week using continuous behaviour sampling (only vocalisations) or scan sampling (3min intervals). Lying behaviour was monitored via accelerometers from day -28 till +28 relative to the start of weaning. Faecal samples were collected twice weekly in the morning from day -1 till +23 for analysis of cortisolmetabolites (CoM). Preliminary statistical analysis was conducted using (generalized) linear mixed models with SAS 9.4.

GR cows vocalized more frequently (LSM±SE: 6.1±1.7 vocalisations/30min) than NF cows (2.1±0.6, p=0.002) during the treatment phase. There was a difference in temporal distribution of vocalisations, as GR vocalised most during the third week of the treatment (16.4±4.4) and NF most during the first week (4.6±1.4, p≤0.001). Equally, GR cows searched more for their calves (5.1±1.4% of scans) than NF (2.0±0.6% of scans, p=0.007). CoM increased at the beginning of the first week (Day 2= +4.85±1.03ng/g, p=0.005) and third week (Day 16= +3.87±1.03ng/g, p=0.05) of the treatment phase compared to baseline in both groups, which did not differ from each other (p>0.05). There was no difference (p> 0.05) in the proportion of CCI, the percentage of lying time or number of lying bouts per day between the groups. These preliminary findings suggest a slightly lower stress level in cows whose calves were weaned with the NF, as indicated by the lower number of vocalisations and proportion of searching behaviour in NF cows. However, this lower stress level in NF cows compared to GR is not reflected in the other investigated indicators and might alternatively result from the lower degree of physical separation from the calf during the NF treatment, which might entail a reduced need for communication of the cows while still being stressed.

Effects of on-farm hatching on layer chick welfare and cognitive flexibility

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

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Layer chicks are currently transported early in life, experiencing immediate post-hatch food and water deprivation and various transport-related stressors. Since they are only temporarily exposed, the experienced stress could be sub-chronic. However, as chicks are transported when only one day of age (DOA), this early life stress (ELS) may affect subsequent learning and cognition. ELS can impair initial memory retention, while sub-chronic stress may improve cognitive flexibility. Taken together, the direction, magnitude and type of effects of transport-related ELS and resource deprivation (RD) on long-term learning and cognition remain unclear. Novel on-farm hatching (OFH) methods, eliminating post-hatch RD and transport, would provide opportunities to improve layer chick welfare. The aim of this exploratory study was to investigate the acute and long-term effects of OFH compared to conventional methods. Dekalb White layer chicks were subjected to either the OFH treatment (n=47), with *ad libitum* access to feed and water, or temporary post-hatch RD and eight hour transport (RDT; n=42). Physical and behavioral measures were collected to examine short-term effects of the treatment procedures. Subsequently, the effects of OFH and RDT on cognitive flexibility were assessed by testing chicks in a Y-maze with reversal-, attentional-shift- or extinction- paradigms until 81 DOA. RDT compared to OFH chicks had higher odds of poor reflexes (OR=2.31, 1.47<95%CI<3.66) and a lower body mass immediately before and after transport (p<0.001; $F_{2,258}$=9.7). Additionally, a tendency for OFH being heavier than RDT chicks was observed up to 81 DOA. Differential behavioral patterns of feeding, drinking, resting and wing-assisted running between treatments were detected during 20h following transport and RD. The majority of birds learned the initial association in the Y-maze between a reward and location (77.08% of n=19-29/treatment) or light cue (91.30% of n=11-12/treatment), although no treatment effects were detected. Only a limited number of birds reached the subsequent learning criterion in the location reversal (24.32% of n=13-24/treatment), the light-to-location attentional-shift (47.62% of n=10-11/treatment) or the extinction paradigm (80.00% of n=3-7/treatment). No treatment effects were found, although a tendency of OFH performing better in the attentional-shift than RDT birds was observed (p=0.08; $F_{1,19}$=2.79). In conclusion, acute effects of transport and RD were found on behavior and health parameters compared to OFH procedures, and body weight may be marginally decreased up to 81 DOA. No long-term effects on learning and cognitive flexibility were identified and future studies with increased power should provide further clarification.

Use of light cues encourages use of ramps in the early life of laying hens

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

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Provision of ramps in aviaries during the rearing phase has been shown to increase transitions between tiers and decrease the prevalence of keel bone damage in the laying phase. Given the long-term benefits of early ramp use, we aimed to utilize the chick's innate preferences for light cues to encourage earlier and increased ramp use during their early life. We compared two light cues: an LED strip placed vertically on the ramp that blinked in a sequential manner simulating a small moving particle (T1), flickering LED strips that were placed horizontally at the top and bottom of the ramps (T2), and a control (C) that had non-operational LED strips on the ramps. We used 12 identical pens (n=4/treatment), which had two vertically stacked tiers connected by two ramps with 22 Lohmann Selected Leghorn chicks per pen. The birds got access to ramps from three days of age (DOA). Light cues were provided in 10-minute bouts for approximately 30% of the total light period per day until 70 DOA. Using video cameras mounted overhead, we counted the number of inter-tier transitions using ramps and the number of active use (walk/run, wing assisted inclined running) of the ramps that did not result in a transition by scan sampling recorded videos. We also collected the same behaviours when the light cues were off for T1 and T2 to obtain a within cue treatment comparison. GLMM analysis revealed that the overall number of transitions increased with age (β= 0.007, 95% CI [0.0003, 0.013], p = 0.04). Compared to C birds, T1 birds (β = 0.163, 95 % CI [-0.126, 0.452], p = 0.27) showed slightly more and T2 birds (β = -0.153, 95% CI [-0.45, 0.143], p = 0.31) slightly fewer transitions. Within treatment comparisons showed that both T1 and T2 performed more transitions (β = 0.176, 95% CI [-0.009, 0.362], p = 0.08) as well as more active behaviours without transitions (β = 0.379, 95% CI [0.062, 0.696], p = 0.02) when the cues were on compared to when the cues were off. Within light cue treatment comparison also showed that T2 birds performed fewer active behaviours on the ramps (β = -0.553, 95% CI [-0.948, -0.159], p = 0.005) than T1 birds. Our results suggest that light cues in general lead to more transitions and more active behaviours on ramps, especially during the first three weeks of chicks' life.

EARLY LIFE EXPOSURE TO ENVIRONMENTAL CHOICE AFFECTS BEHAVIOURAL DEVELOPMENT IN LAYING HENS

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

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Living in environments providing variety, and the opportunity to select preferred substrates for different activities, may be more rewarding than living in simpler environments. Furthermore, in choice-laden environments, early learning about rewarding substrates for different activities may have long-term organisational effects on behaviour. We investigated these hypotheses in laying hen pullets reared in environments offering one litter type and one perch type (No-choice condition) or four litter types and four perch types (Choice condition). We placed 364 Bovans Robust chicks into 16 pens, half assigned to each condition (Period 1, Week 1-4). After four weeks, all groups experienced an environmental change and half of the pens providing each condition were switched to the opposite condition (Period 2, Week 5-15). After 11 more weeks, each group was moved to a new pen in the laying house, where all pens were the same (Period 3, Week 16-27). We assessed levels of satisfaction within groups based on the frequencies of behaviour associated with positively-valenced (Play, Dustbathing) vs negatively-valenced (Vigilance, Aggression, Severe Feather Pecking) affective states. Generalised linear mixed models and Wald Chi-square tests (DF=1) showed that Choice in Period 1 resulted in more Play (sudden runs/spars; mean±SE for Choice vs No-choice, 0.66±0.04 vs 0.54±0.04 % of scans; X^2=5.61, P=0.018), less Dustbathing (vertical wing shakes/head rubs; 0.09±0.04 vs 0.29±0.06 % of scans; X^2=7.90, P=0.005) and less Severe Feather Pecking (0.15±0.04 vs 0.43±0.08 pecks/scan; X^2=12.93, P<0.001) in Period 1, together with less Aggressive Pecking (0.67±0.1 vs 1.02±0.13 pecks/scan; X^2=4.98, P=0.026) in Period 3. There was no effect of Period 1 condition on behaviour in Period 2. Choice during Period 2 resulted in more Dustbathing (0.25±0.02 vs 0.18±0.02 % of scans; X^2=6.80, P=0.009) and less Severe Feather Pecking (0.61±0.08 vs 0.96±0.12 pecks/scan; X^2=7.09, P=0.008) in Period 2, as well as more Dustbathing in Period 3 (0.37±0.44 vs 0.24±0.04 % of scans; X^2=4.70, P=0.03). Vigilance was unaffected by exposure to environmental choice in any period. In support of our hypotheses, the results indicate that the opportunity to choose between different litter and perch types during rearing (Period 1 or 2) was mostly associated with higher levels of pleasurable behaviour and less aversive behaviour, both at the time when offered and in adulthood (Period 3) when all birds were living in a similar environment. We conclude that environmental choice had long-term effects on behavioural development and positive effects on laying hen welfare.

Which is more stressful: physical or visual separation of hen from chicks?

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Nigerian indigenous chickens still exhibit their natural behavioural repertoire such as broodiness and post hatch care of chicks. Previous studies by the author have reported the changes in behavior and physiology of Nigerian indigenous hens during brooding and also physiological responses of mother hen to short term separation from her chicks. The behavioural responses of the mother hen to physical and visual separation from her chicks from the previous study by the author is reported here. In the study, 15 hens and 3 cocks randomly assigned to three deep litter pens (five hens and one cock per pen) were used. Hens were allowed to lay their eggs in nest boxes and accumulate a clutch of eggs which they later incubate (brood) naturally. After hatching, mother hens and chicks were transferred to a brooding pen and provided with feed and water *ad libitum.* Mother hens and chicks were left undisturbed for the first seven days post hatch. The separation study started at 8 days post hatch. Mother hens were subjected to two forms of short-term separation namely physical (PS: wire mesh was used to separate the mother hen from her chicks on days 8 and 16 post-hatch) and visual (VS: mother hens were separated from their chicks using trampoline on days 12 and 20 post-hatch) for a period of 10 mins (from six mother hens) in a test arena already partitioned into two sections (one for the mother hen and the other for her chicks). The behavior of each mother hen was recorded with the use of digital camera only on days 8 (PS) and day 12 (VS). The behaviour extracted from the video playback were frequency of sitting, pacing, body shaking, pecking the test arena, escape attempt, movement towards the chicks, movement away from the chicks, defecation and preening. Data was subjected to Mann-Whitney U or Independent T test of IBM SPSS. Separation type had no significant effect ($P>0.05$) on all the behavioural parameters measured except the frequency of pacing which was greater (U=4.000, P= 0.026) when mother hens were subjected to VS than PS from their chicks. In addition, there was a tendency (U=7.500, P = 0.093) for mother hens to sit more in the PS than VS. The increased pacing observed in mother hens during VS is indicative of increased stress experienced by the mother hen because she can't see her chicks but could only communicate through vocalization.

Benefits of a novel socialisation protocol on commercially bred dogs

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

Ms. Victoria McEvoy [1] *, Mr. Uri Baqueiro Espinosa* [2] *, Mr. Andrew Crump* [3] *, Dr. Gareth Arnott* [1]

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To meet growing demand, more dogs are now being bred in large-scale commercial breeding establishments (CBEs). However, there is mounting evidence that puppies reared in these CBEs have limited exposure to people and novel stimuli affecting their development during the primary socialisation period.

We were granted access to a commercial breeding establishment (CBE), where we tested the potential benefits of a novel socialisation protocol. We hypothesised that puppies exposed to the protocol would show less fearful behaviours towards novel objects and a novel person than those receiving socialisation efforts currently undertaken in the CBE. We exposed 29 CBE puppies to a socialisation treatment spaced over six to eight weeks of age and kept a control group of 29 puppies in baseline conditions. Litters were split, with one half receiving the socialisation treatment and the other half only experiencing baseline conditions. The socialisation involved an escalating protocol of exposure to novel stimuli, for a total of five days. At eight weeks, all puppies were subjected to a battery of tests in a gridded arena involving novel objects and a novel person. Each test was filmed, and the videos analysed by a researcher blind to the socialisation treatment using BORIS video coding software.

Preliminary analysis has showed that socialised puppies were found to be more active; they crossed significantly more lines in the testing arena (Welch; $t= -4.18$, $df= 23.0$, $p= 0.0004$) and had a higher frequency of walk events (Welch; $t= -2.66$, $df= 22.5$, $p= 0.014$). They also spent significantly less time in the initial square of the testing arena (Wilcoxon; $W= 137$, $p= 0.0008$), had a decreased latency to approach a novel person (Wilcoxon; $W= 149$, $p= 1.73e-05$) and time spent with the novel person was higher in the socialised group (Welch; $t= -4.43$, $df= 20.9$, $p= 0.0002$). Socialised puppies had significantly longer durations of tail wagging (Welch; $t= -3.38$, $df= 22.1$, $p= 0.003$) and shorter durations of the tail being lowered (Wilcoxon; $W= 125$, $p= 0.011$), and they also had significantly shorter durations of a lowered posture (Wilcoxon; $W= 145$, $p= 0.0003$).

This study aimed to address current knowledge gaps regarding levels of socialisation required to produce less fearful dogs capable of coping in the family home. It is hoped that this research will help enable the creation of appropriate and practical socialisation protocols that will inform welfare enhancement programmes for dogs in a range of environments, including CBEs.

Growing up without a mom: early social deprivation affects goat kids' social behaviour

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

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Although early social deprivation has been shown to disrupt neonates' development, separating young animals from their dams shortly after birth is a common practice in dairy farming. We investigated the effects of maternal deprivation on goat kids' social behaviour. Twenty female kids were raised together with their dams (DR kids) in a herd of lactating goats and kids, while twenty female kids were separated from their dam three days after birth and artificially reared together (AR kids). At weaning, each treatment group was split in half and moved into two new pens where they were mixed with the other treatment group. Before weaning, social behaviour was observed live by continuous focal sampling for 5 min twice a day per kid, recording the three socio-positive behaviours rubbing, allogrooming and play-fight, and agonistic behaviours with and without physical contact. The role of the focal kid as receiver or initiator and its partner's identity were recorded. After weaning, 15 sessions of 10 min live continuous behaviour sampling were performed per day using the same ethogram, and individuals lying in physical contact were also recorded through scan sampling. Before weaning, DR kids showed more allogrooming (estimated probability of occurrence ± standard error DR kids: 0.55 ± 0.39, AR kids: 0.16 ± 0.23; $p < 0.01$) but less play-fighting than AR kids (DR kids: 0.02 ± 0.39, AR kids: 0.18 ± 0.17; $p < 0.01$). After weaning, when treatments were mixed in the same pens, DR kids gave and received more allogrooming and rubbing than AR kids ($p < 0.01$), and DR kids dominated more agonistic interactions, both with and without physical contact, than AR kids ($p \leq 0.01$). Other behaviours did not significantly differ between treatments. Overall, the greater occurrence of play-fight in AR kids before weaning may be linked to the absence of their dams, as play-fight did not differ between treatments after weaning. Dam-reared kids dominated more agonistic interactions after weaning, and showed more rubbing and more allogrooming, suggesting that DR kids may be more socially interactive than AR kids. As positive social behaviours such as rubbing and allogrooming have been shown to be linked to positive affective states and are often used as positive welfare indicators, our results suggest that DR kids may have higher welfare than AR kids after weaning.

Sow and Piglet Behaviour and Weight: Implications of Different Ages of Weaning

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

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Weaning age affects both behaviour and physiology in piglets. Weaning earlier than the age of 21 days has been shown to increase aggressive behaviours, belly-nosing, plasma cortisol, growth and feed intake. The effects of weaning age on sows within the span used in commercial piglet production (3-6 weeks) have not been investigated thoroughly when sows and piglets are housed and managed under the typical conditions in Swedish piglet production. This pilot project investigates the effects of weaning age on the behaviour and weight of piglets and sows under conditions similar to Swedish commercial production. The project also investigates potential conflicts between the needs of the sow and piglets during the nursing period. Sows with piglets housed in individual loose housing pens were weaned 3 (n=5), 4 (n=5) and 5 (n=5) weeks after farrowing. Behaviour was videotape recorded from farrowing until six weeks after farrowing. The sows' weight and backfat thickness were registered at farrowing and weaning. Piglets were weighed at birth and week 3, 4, 5, 6 and 9 after birth. Sow and piglet health was monitored throughout the project. The sows were of Yorkshire breed, and the piglets had Hampshire sires. The videos were analysed with both continuous observations and scan samplings.

The results of this study indicate that piglets weaned at 21 days of age spend more time standing up, eating solid food, fighting, belly nosing and mounting after weaning than piglets weaned at 35 days of age. Piglets weaned at 28 days of age were belly nosing more after weaning than those weaned at 35 days of age. Piglets weaned at 21 days of age had a significantly higher growth rate between 28 days and 9 weeks of age than piglets weaned on days 28 and 35. There were no statistically significant results regarding the sows on behaviour, weight, or backfat thickness. However, the descriptive statistics show that sows weaned from their piglets on day 35 had less backfat than those weaned on days 28 and 21. They also showed that sows spent less time having snout contact with the piglets and laid down less the longer they stayed with the piglets. Since this is a pilot study, the results found should be interpreted with caution. However, the results show a need for further research to confirm whether these findings apply to larger populations in Swedish production systems.

Effect of Brooding Compartment Design on Physical Abilities of Laying Hen Chicks

Sunday, 1st August - 18:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 14:00: Early Life and Maternal Care - Oral

Thursday, 5th August - 15:45: Early Life and Maternal Care - Oral

Ms. Ana Rentsch [1] , Dr. Alexandra Harlander [1] , Dr. Lee Niel [2] , Dr. Janice Siegford [3] , Dr. Tina Widowski [1]

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Rearing environment and genetic variation can affect behavioural and physical development. Successful navigation of cage-free laying hen housing (e.g. aviaries) requires both physical and cognitive navigation skills that develop early in life. Laying hens raised in rearing aviaries (RA) can have different experiences depending on the design of the brooding compartments (BC) where chicks are confined for the first few weeks. In this study, we raised 4 flocks of brown and white laying hens in 3 different commercial RA as well as in conventional rearing cages (CC). The BC of aviary 1 (A1) is furnished with 2 low perches, A2 with a raised platform and 3 perches at various heights and A3 offers a large open concept BC with a raised platform and 6 perches at various height. We wanted to know whether rearing style or genetic strain affects physical navigation skills of 5-week-old chicks.

Individual chicks were placed in front of a see-through-hurdle separating them from conspecifics with 2min to cross and be socially reinstated. 1470 chicks were tested in one of 5 tests: 3 jumping heights (30, 45, 60cm) and 2 jumping heights (45, 60cm) with the addition of a ramp (90cm). For each test, latency to walk, successful crossing and all (jumping) attempts at crossing were measured. Data were analysed in R and R Studio using generalised linear mixed effect models.

Overall, there were progressively fewer successful crossings as hurdle height increased. Strain interacted with rearing environment affecting crossing success (p<0.05) with whites being more successful than browns while brown CC and brown A3 were least successful. When ramps were added to the test, neither rearing style nor strain affected crossing rate. A3 and A1 chicks had the longest latency to walk (p<0.001 and p<0.05 respectively) with browns taking longer than whites (p<0.05). The number of jumping attempts made by birds that did not cross was affected by rearing style, with CC showing the most and A3 the least (p<0.001). CC chicks had low crossing success but the highest rate of crossing attempts. Once a ramp was added success rates did not differ, meaning that early access to perches and platforms did not affect ramp use. Chicks reared in A3 showed lowered motivation for social reinstatement through longest latencies and least attempts. This suggests that early environment affects both physical ability and motivation to jump a hurdle for social reinstatement with browns being more affected than whites.

Management of Free-Roaming Animals

Assessing the impact of free-roaming dog population management through systems modelling

Sunday, 1st August - 18:00: Management of Free-Roaming Animals - Oral

Friday, 6th August - 14:00: Management of Free-Roaming Animals - Oral

Dr. Lauren Smith [1] **_, Dr. Rupert Quinnell_** [1] **_, Dr. Conor Goold_** [1] **_, Dr. Alexandru Munteanu_** [2] **_, Dr. Sabine Hartmann_** [2] **_, Dr. Paolo Dalla Villa_** [3] **_, Prof. Lisa Collins_** [1]

1. _University of Leeds_, **2.** _VIER PFOTEN International_, **3.** _World Organisation for Animal Health and Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale"_

There are an estimated 700 million to 1 billion dogs (_Canis familiaris_) globally, of which around 75% are free-roaming. Populations of free-roaming dogs may present issues to humans and other animals by spreading disease, predating on wildlife and livestock, and competing and hybridising with wildlife. Free-roaming dogs may also experience health and welfare problems themselves. Dog population management is widely conducted to mitigate these issues through culling, sheltering, fertility control and interventions encouraging responsible dog ownership practices. There is a need to assess the impact of dog population management methods in terms of their effectiveness, efficiency, and sustainability. This study uses a system dynamics modelling approach to investigate the impact of dog population management on free-roaming dog population size, welfare, and financial costs. The model divided the dog population into the subpopulations: (i) intact free-roaming dogs (including owned and unowned); (ii) neutered free-roaming dogs; (iii) shelter dogs; and (iv) owned (restricted, non-street) dogs. We compared different management methods applied annually or continuously at three levels of coverage (20%, 40%, and 70%) over a five-year (short) and a continuous intervention period for 70-years of model simulation time.

The results show that methods targeting multiple sources of population growth, such as a combination of fertility control and responsible dog ownership interventions, have the greatest potential to reduce free-roaming dog population sizes over longer periods of time, whilst remaining cost-effective and beneficial to dog welfare. Over the continuous intervention period, the overall highest reduction in street dog population size (90% reduction) was achieved by combined fertility control and responsible dog ownership applied continuously at high coverage. Over the five-year intervention period, culling was more effective at reducing population size (77% reduction) but, in comparison to methods involving fertility control, the population returned more quickly to an equilibrium population size once management had ended. This study highlights the importance of considering the interaction between dog subpopulations as a dynamic system when assessing the impact of dog population management methods. Future dog population management would benefit from identifying the causes of population increase (e.g. abandonment of owned dogs) to ensure that population management efforts reduce and maintain free-roaming dog numbers at low levels. We also present an R Shiny application based on this systems model that allows organisations to assess the potential impact of dog population management interventions when applying local dog population parameters.

Identifying research priorities for canine surgical sterilisation programmes: What are the unanswered questions?

Sunday, 1st August - 18:00: Management of Free-Roaming Animals - Oral

Friday, 6th August - 14:00: Management of Free-Roaming Animals - Oral

Ms. Abi Collinson [1], *Dr. Marnie Brennan* [1], *Dr. Rachel Dean* [2], *Dr. Jenny Stavisky* [1]
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Canine surgical sterilisation is a core component of free-roaming dog population management (DPM) worldwide. There are often a number of intended aims associated with sterilisation such as reducing or stabilising the population, improving dog health and welfare, and reducing human-dog conflict. However there are few published studies reporting the outcomes and impacts of such programmes, making it difficult to assess if and how these aims are achieved. It is important that research conducted is relevant to those who are in a position to act on the findings. This study aimed to engage stakeholders working with free-roaming dogs to identify evidence gaps related to the impact of canine surgical sterilisation, and prioritise these into a list of the 10 most important research questions.

The James Lind Alliance (JLA) Priority Setting Partnership (PSP) framework was adapted. Questions about the impact of sterilisation were gathered via an online survey targeted at those working in DPM. Thematic analysis was used to form collated indicative research questions (CIRQs), followed by an evidence search to ensure that these questions had not been answered by previous research. These questions were ranked in an interim prioritisation survey to create a shortlist to be taken forward to a Delphi process for final prioritisation. A total of 152 participants from 59 different countries and representing work with free-roaming dogs in 96 different countries completed one or more stages of the study. Responses to the initial survey contained 644 individual questions. Thematic analysis resulted in 49 CIRQs, of which 47 remained after the evidence search. Following interim prioritisation, 26 questions were taken forward to the Delphi process where participants reached a consensus on the top 10.

The results suggest that questions related to the impact of sterilisation on dog population size and turnover are of highest importance. The other prioritised questions concerned effects of sterilisation on dog-bite incidents, rabies control and human behaviour change. The process highlighted the existence of a large number of uncertainties regarding the most effective way to implement sterilisation programmes, as well as the subsequent impacts on free-roaming dog populations. The novel use of this methodology enabled the priorities to be identified and shaped by people with direct experience of implementing canine surgical sterilisation programmes, and as such this methodology is an important resource for directing future research that will be applicable to those working in this field.

Is there hope beyond fear? Effects of social rehabilitation on unsocialized stray dogs

Sunday, 1st August - 18:00: Management of Free-Roaming Animals - Oral

Friday, 6th August - 14:00: Management of Free-Roaming Animals - Oral

Ms. Miriam Casaca [1], **Dr. Tatiana Magalhães** [2], **Prof. Per Jensen** [3], **Dr. Anna Olsson** [4], **Dr. Ana Catarina Vieira de Castro** [5]

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Unsocialized stray dogs live freely in urban areas with limited/no direct human contact. In many places, such dogs are captured and apprehended in shelters. We aimed to determine if unsocialized stray dogs can be rehabilitated and develop the skills needed for successful adoption. Unsocialized stray dogs (Stray Group, n=6) and 12 socialized shelter dogs (C1: Control Group 1, n=6; C2: Control Group 2, n=6) were included. Stray and C2 dogs went through 40 days of social rehabilitation and leash training protocols, comprising desensitization, counterconditioning, and positive reinforcement techniques. All groups were tested following Valsecchi et al's (Anim. Welfare, 16:178, 2011) Temperament Test at three-time points. Sociability towards humans (Sociability Test – ST) and leash behaviour (Leash Test – LT) were tested before any intervention (ST1), after social rehabilitation (ST2, LT1) and after leash training (ST3, LT2). At each time point, dogs were tested once with a 'familiar' person – who performed the rehabilitation and training, and a second time with an 'unfamiliar' person. Tests were video recorded and analysed by four observers, with each dog being attributed a score reflecting its sociability level and ability to walk on a leash. The rehabilitation sessions were recorded every ten days to analyse the dog's body posture over time. Results showed that the sociability scores for Stray increased significantly from ST1 to ST3, both for the familiar [$\chi^2_{(2, N = 6)}$ =10.333, p=0.006] and unfamiliar person [$\chi^2_{(2, N=6)}$ =10.000, p=0.007], whereas they did not change for C1 and C2. Additionally, there was a change in Stray dogs' body posture across training sessions, with dogs displaying less fearful [$\chi^2_{(4, N=6)}$ =18.655, p=0.001] and more neutral body postures [$\chi^2_{(4, N=6)}$ =14.800, p=0.005]. For leash behaviour, no significant changes were found from LT1 to LT2 for neither group. Importantly, there was large individual variation for Stray Group, with some dogs having their behaviour unaffected by rehabilitation, while others improved substantially. Our study, in line with previous literature, suggests that dog human interactions can be improved through training for unsocialized stray dogs who do not present extreme fear and/or aggression towards humans. In conclusion, there may be hope beyond fear!

Management of free-roaming dogs at a Chattogram Veterinary School of Bangladesh

Sunday, 1st August - 18:00: Management of Free-Roaming Animals - Oral

Friday, 6th August - 14:00: Management of Free-Roaming Animals - Oral

Dr. Mohammad Rashedul Alam [1] **_, Dr. Tuli Dey_** [1] **_, Dr. Sreekanta Biswas_** [1] **_, Dr. Md. Tanvir-Ul- Alam_** [1] **_, Dr._**
Shourav Datta Roni [1] **_, Dr. Sabiha Zarin Tasnim Bristi_** [1] **_, Dr. Foysal Ahmmed_** [1] **_, Dr. Aslam Hossain_** [1]

1. _Chattogram Veterinary and Animal Sciences University_

Free-roaming dog populations have **been** reported as both animal welfare and public health problems in developing countries including Bangladesh. In Bangladesh rabies is a public health problem, ranking third globally after India and China. Therefore, an effective intervention is necessary to control free-roaming dogs to ensure their welfare as well as rabies elimination. A humane method of dog population management using a Catch-Neuter-Vaccinate-Release (CNVR) program was started on the Chattogram Veterinary and Animal Sciences University (CVASU) campus. The aim was to reduce the proliferation of **the** free-roaming dog population by **the** neutering and **eliminating** the risk of rabies through vaccination. Dogs were caught by a dog catching team from the CVASU campus and its surrounding **area**, who brought them to the university hospital. On the day of surgery, dogs were anesthetized by infusion using a xylazine - ketamine combination. Surgeries were done by the surgery team with proper anaesthesia and asepsis. Post-operative antibiotic treatment was given to the males for 5 days and to the females for 7 days. Adequate analgesic and antihistamine were also provided for 5 days. A single dose of ivermectin was given as an ectoparasiticide. Vaccination was done before releasing the dogs into the area from where they were caught. A total of 32 dogs have been neutered surgically, 18 male dogs were castrated and 14 females were spayed. The average body weight of the dog was 20 kg. Dogs were provided food 3 times daily. A 'V' shape **ear notch** was given to each dog to identify them as neutered and vaccinated. The results suggested that sterilization may be able to reduce the free-roaming dog populations, which, in turn, will ensure a better ecosystem for both humans and animals. Moreover, the fighting and resulting injuries caused to the dogs will also be reduced because they are generally more docile after neutering. This is the first systemic CNVR program in the Chattogram Veterinary School of Bangladesh allowing veterinary students to develop these specific surgical techniques, which are also OIE required day 1 skills. Moreover, they are now competent veterinarians who in the future will hopefully work to control the free-roaming dog populations and eliminate rabies throughout the country, while improving the welfare of free-roaming dogs. This CNVR program will continue to operate in the Chattogram region. The results suggest the importance of working with other veterinary schools in Bangladesh to develop similar programs.

Application of Technology to Applied Animal Behaviour and Welfare posters

Smart ear tags for monitoring seasonal variation of heifers' behaviour and production: a pilot study.

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Ms. Lydia Lanzoni [1], Dr. Matteo Chincarini [1], Mrs. Annamaria Iannetta [1], Prof. Isa Fusaro [1], Prof. Melania Giammarco [1], Ms. Marisol Parada Sarmiento [2], Dr. Michael Odintsov Vaintrub [1], Dr. Damiano Cavallini [1], Prof. Giorgio Vignola [1]

1. University of Teramo, Faculty of Veterinary Medicine, 2. University of Teramo, Faculty of Veterinary Medicine and University of Sao Paulo, Faculty of Veterinary Medicine and Animal Science

Accurate observation of animals contributes to good farming practice, allowing farmers to monitor health, behaviour, and welfare. However, monitoring large herds can be difficult. Therefore, recent technological advances of Precision Livestock Farming are useful, in association with farmer's experience, to monitor animals. In Mediterranean dairy farms, seasonal temperature variation can greatly impact animal's productive and reproductive performance. During hot summer weather, animals may experience heat-stress, which in turn can negatively affect their welfare. The objective of the study was to evaluate the seasonal variation of cows' production and behaviours with an ear-tag-based accelerometer system (Smartbow-MKW Electronics GmbH©2021 Zoetis Services-LLC) during early lactation. Twenty-six Holstein Friesian heifers, farmed in a mountain herd, were divided into a summer (n=13) and autumn (n=13) group based on calving-season. Each animal was equipped with the devices, which registered principal behaviours (Lying, Standing and Ruminating) and activity level. Individual behaviours and milk production data were recorded daily for the first sixty days after calving. Information on milk quality was obtained from the monthly control made by the Italian Breeders Association and reproductive intervals were recorded. Data have been analysed with parametric and non-parametric methods after controlling distribution. The environmental temperature was calculated for the two groups (summer: 16.0±2.03°C, max 29.8±2.80°C; fall: 6.36±3.03°C, max 16.7±4.84°C). Results showed that animals calving in summer laid down (p<0.001) and ruminated less (p<0.001) but were more active (p<0.001). The higher level of activity, the reduction in lying, and the rumination time of the summer group could be linked with a greater discomfort caused by higher temperature. A positive correlation was found between the daily milk production and behavioural activities (lying: r_s= 0.705; *p<0.001;* ruminating: r_s= 0.704, p<0.001). Regardless of such a correlation, no difference was found in reproductive intervals, milk yield, or quality. A possible explanation for such a discrepancy could be that the reduction of behavioural activity of the summer group remained within physiological ranges reported in the literature for heifers. This could be due to the optimal farm management which mitigated the effect of the summer temperature with automated ventilation systems. Furthermore, the farm was located at an altitude (1073 m) that ensured relatively low temperatures even in the summer. Although further studies involving a higher number of animals are needed to explore productive individual features, these preliminary results suggest that PLF devices could have a strong potential in helping farmers monitoring individual behavioural variation also in large herds.

A deep learning-based method to assess pain on horses using the facial expression recognition by video image.

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Mr. Gabriel Lencioni [1], **_Prof. Adroaldo Zanella_** [2], **_Prof. Rafael Vieira de Sousa_** [3], **_Mr. Edson José de Souza Sardinha_** [3], **_Prof. Rodrigo Romero Corrêa_** [4]

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The use of the Horse Grimace scale (HGS) is dependent on a human observer, who most of the time doesn't have availability to evaluate the animal for long periods of time and must also be well trained in order to apply the evaluation system correctly. In addition, even with adequate training, the presence of an unknown person near an animal in pain can result in behavioral changes, making the evaluation process more complex. As a possible alternative, the automatic system will be able to observe horses at all times and detect pain quickly, resulting in an earlier diagnosis and more rapid treatment for the affected animals. The aim of this study was to develop and evaluate a machine vision algorithm to assess the pain level on horses through facial expressions, using an automatic computational classifier based on the HGS and trained by machine learning method. This study was based on images of facial expressions of 7 horses that underwent castration, collected through a video system positioned on the top of the feeder station. These videos were processed through a software in order to automatically detect and extract frames of each horse at different moments, resulting in 185 000 images, that were then manually analyzed in order to use only the ones that were in the best position to evaluate pain level. This process resulted in 3000 images that went through a labelling process, where the images were evaluated according to the pain level shown on each one and then used to build a pain facial image database that was used with deep learning methods to train the computational pain classifier. The machine vision algorithm was developed through the training of a Convolutional Neural Network (CNN), resulting in models that presented an overall accuracy of 80% while classifying pain on three levels: not present, moderately present and obviously present. While classifying between two categories such as pain not present and pain present, the overall accuracy reached 93.3%. Although there are some improvements to be made in order to use the system in daily routines, the model showed to be promising and capable of assessing pain on images of horses automatically through facial expressions, collected from video images. The protocol was reviewed by the Ethics and Animal Use Committee (protocol number 6603170419). All clinical pain-relief protocols were followed and nothing was withheld for the purposes of this study.

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Individual Behavior tests vs. automated PLF system: An example from broilers

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Dr. Sabine Gebhardt-Henrich [1] , Dr. Marian Dawkins [2], Dr. Ariane Stratmann [1]

1. *ZTHZ,* **2.** *University of Oxford*

Behavior tests on individual animals in order to assess animal health and welfare are time consuming and provide an estimate at a specific point of time. In contrast, automated technology can assess health and welfare continuously. We tested if the automated camera-based technology 'Optical Flow' correlated with the outcome of a social reinstatement test and the latency-to-lie test. In 20 commercial flocks of around 25 day-old Ross 308 broilers of both sexes, 16 birds per flock underwent two social reinstatement tests and a latency-to-lie test and were weighed and scored for pododermatitis and hockburn. From continuous overhead videos of the flocks from which the birds came, mean, variance, skew and kurtosis were calculated for 18 of these flocks. These optical flow records on day 28 were correlated with the corresponding flock's mean of the behavior tests using Spearman rank. General linear models were conducted on log-transformed durations. In the social reinstatement tests with and without obstacles, the time to reach flock mates at the end of a runway correlated positively with the skew (without obstacles: $r_S = 0.71$, P < 0.001; with obstacles: $r_S = 0.70$, P < 0.003) and kurtosis (without obstacles: $r_S = 0.61$, P < 0.01; with obstacles: $r_S = 0.63$, P < 0.005, all N = 18) of optical flow. That means that birds from flocks with a high skew (i.e. the mode is lower than the mean) and kurtosis (i.e. more extreme values than in a normal distribution) took more time than birds from flocks with a lower skew and kurtosis. In the latency-to-lie test, birds that remained standing longer came from flocks with a greater mean ($r_S = 0.57$, P < 0.01, N = 18) and variance ($r_S = 0.57$, P < 0.01, N = 18) of optical flow than birds that sat down sooner. Heavier birds were slower in the social reinstatement test (with obstacles: $F_{1,236} = 5.93$, p = 0.016; without obstacles: $F_{1,282} = 3.63$, p = 0.058, N = 20) than lighter birds but neither pododermatitis nor hockburn affected the outcome of the tests. This study demonstrates that the automated system using optical flow on flock level correlated with the behavior tests performed on a small sample of individual birds. Thus, technological systems can help to assess animal health and welfare in fast-growing broiler flocks continuously over the flock's cycle and thus provide the possibility of early interventions.

Validation of a photography-based method to measure the size of chicken combs

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Ms. Klara Grethen [1] , Ms. Laura Candelotto [2], Dr. Yamenah Gomez [3], Dr. Michael Toscano [3]

**1.** Center for Proper Housing: Poultry and Rabbits (ZTHZ) Division of Animal Welfare, VPH Institute, University of Bern, Burgerweg 22, 3052 Zollikofen, Switzerland, **2.** Center for Proper Housing: Poultry and Rabbits (ZTHZ) Division of Animal Welfare, VPH-Institute, University of Bern, Burgerweg 22, 3052 Zollikofen, Switzerland, **3.** Center for Proper Housing: Poultry and Rabbits (ZTHZ), Division of Animal Welfare, VPH-Institute, University of Bern, Burgerweg 22, 3052 Zollikofen, Switzerland

Measuring the size of non-geometrical features of animals is a vital aspect in animal research as body parts can provide crucial information on an individual's age, welfare, and the status within a group. A chicken's comb is one example of such an important feature: Its colour and size are indicators of the animal's health, androgenic hormone concentrations and reproductive success. Additionally, the size has been reported to positively correlate with dominance in both males and females. Previously established approaches to measure comb size included: weighing the comb, estimating it in discrete categories, and most commonly, calculating the product of the longest and highest part of the comb (L*H). Due to several shortcomings of these methods, i.e. invasiveness, extended handling time, imprecision, more recent efforts employed imaging software to measure comb sizes from photographs, but the reliability and comparability to established methods remains unclear. Therefore, we developed a protocol using a frame to standardise head positions in the photographs, which were then evaluated with the open software ImageJ. First, the validity was evaluated by using three geometric shapes (square = 29.5 cm², triangle = 18 cm², rectangle = 50.15 cm²) which yielded high precision (N = 10, mean difference to actual size = 0.19 cm², CCC = 0.99). To estimate how positioning affected the reliability of the results, we assessed comb sizes of 15 hens (Dekalb White, 47 WoA), each positioned 3 times by 2 different experimenters (N = 90 photos). Reliability was high within and between handlers (CCC = 0.99, GLMM). Comparing comb sizes of the photograph- and L*H method found they were highly correlated (r(13) = 0.93, 95%-CI [0.79, 0.98], p < 0.001, Pearson), indicating that if animals were ranked by comb size, the order resulting from the methods was very similar. However, the L*H method (M = 46.63 cm², SD = 9.03 cm²) overestimated comb sizes (t(14)= 16.02, 95%-CI [13.67, 17.89], p < 0.001, paired t-test) compared to the photo method (M = 30.85 cm², SD = 6.56 cm²). Additionally, there was a trend in the data that the larger the comb, the more its size was overestimated by the L*H method (slope(L*H ~ Photo)= 1.28, where 1 would indicate no over- or underestimation, LM). Due to the greater precision and reduced handling time we suggest employing photography-based evaluations if possible and to evaluate data from the L*H method on an ordinal scale only.

College campus cat: Exploring PetPace-collar data and survey data to measure physiology and physical activity

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Dr. Joni Delanoeije [1], Prof. Patricia Pendry [2], Ms. Els Helena Karel Anna Peeters [3], Prof. Christel Moons [4]

1. FEB Antwerp Campus & Work and Organisation Studies, Faculty of Economics and Business, KU Leuven, Leuven, **2.** Human Development, College of Agricultural, Human and Natural Resource Sciences, Washington State University, Pullman, Washington State, **3.** SALTO Research Group Agro- and Biotechnology, Odisee University of Applied Sciences, Sint-Niklaas, **4.** Department of Nutrition, Genetics and Ethology, Ghent University, Merelbeke

Smartcollars function as non-invasive tools to measure animals' physiological responses and physical activity in naturalistic settings. The current study describes PetPace smartcollar data collected in a college campus cat with owner-provided survey data to compare data collected in the context of campus visits of the cat with the cat's behavior at home. First, heart rate variability (HRV) and physical activity are compared between campus days and days at home. Second, associations between smartcollar data and survey data are explored.

Continuous 24-h smartcollar data and daily survey data were collected during 55 days, of which 3 days during campus visits. The smartcollar provided continuous (i.e. every 2 to 15m) data about HRV and physical activity (except 2-3h charging time every 3-4 days). HRV was calculated using vasovagal tonal index and physical activity was measured with a tri-axial accelerometer. The owner provided survey data at the end of each day about perceived stress and physical activity in the cat. Smartcollar data were aggregated on the day level and merged with the survey data.

First, the collar measured higher HRV, indicating lower stress, on campus days (Mdn = 9.2) compared to days at home (Mdn = 9.0); the distributions differed significantly (Mann-Whitney U = 26.00, p < 0.05). Second, interestingly, we found no significant Kendall's tau-b correlations between collar-measured HRV and survey-reported stress (τb = .18, p = .16).

While exploratory, our study is the first that examined associations between a cat's 24-h physiological data and daily survey data collected in home and campus contexts. Since significant differences were found between HRV at home and on campus, which were not explained by survey data, this study provides evidence that methodological approaches to examine cats' stress may benefit from incorporating HRV and physical activity through smartcollar measurement rather than through owner-provided survey data alone. The main limitation is that observations were made in one individual. Future studies may benefit from exploring these relationships in larger sample sizes to account for measurement dependencies.

Walden Operant Fish Tank: Automated equipment to assess positive fish welfare

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Mr. Alejandro Rodrigo [1]*, Mr. Carlos Esparza* [1]*, Mr. José N. Moreno* [1]*, Mr. Yancarlo Ojeda Aguilar* [1]*, Dr. Laurent Avila-Chauvet* [1]

1. Walden Modular Equipment

The newest trend in animal welfare focuses on studying not only negative affective states but also positive affective states. To assess positive welfare in fish, three main study domains have been proposed: 1) Stimulus valence (i.e., the motivation to have or avoid a specific material outcome), 2) Emotional control (i.e., the motivation to manage or control the environment), and 3) Exploration/Inhibition (i.e., the motivation to learn, explore, and engage in cognitively stimulating activities). Until now, little research has centered its attention on the last two domains. Here we propose a piece of low-cost equipment for studying behavior-dependent feeding schedules set by the fish or by the researcher. The Walden Operant Fish Tank (WOFT) is an automated feeder wherein the delivery of a positive up-coming event (i.e., food) depends on the swimming behavior of the fish across an underwater ring with an attached proximity sensor. The WOFT allows the fish to control when the food will be available (Domain 2) or let them engage in cognitively stimulating activities by learning basic pre-programmed schedules of reinforcement (Domain 3). The apparatus also supports alternative schedules programmed by the researchers using Python. One of the main features of the WOFT is its comprehensive data output, with which the researcher can measure relevant foraging welfare indicators such as the feeding rate, the latency of feeding, the activation of the self-feeders, and the total feeding time. We believe that implementing this technology in laboratories will allow researchers to more effectively assess fish welfare.

Prototype for non-invasive studies of the thermal comfort zone of broiler chicks.

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Mr. Bruno Emanoel Teixeira [1], **Ms. Amanda Azevedo** [2], **Mr. João Victor Mós** [3], **Dr. Evandro Oliveira** [4], **Mr. Gabriel Oliveira** [2], **Dr. Vinícius dos Santos** [5], **Dr. Sheila Nascimento** [2]

1. University of Brasilia, Faculty of Agronomy and, **2.** University of Brasilia, Faculty of Agronomy and Veterinary medicine, **3.** University of Bra, **4.** University of Maringá, **5.** Federal Institute of Brasilia, Campus Planaltina

The use of prototypes can be a viable alternative to climate chambers in studies related to physiological responses of chickens on thermal comfort or stress. Thus, in this work, a prototype was developed to measure simultaneously physiological and behavioral parameters with non-invasive techniques, with great potential of use, low cost, and advantage that he can be used for several purposes and applicability for all the rearing of broiler chickens. Therefore, the aim of this work was the proposal of a low-cost and mobile prototype for the study of broiler chicks thermal comfort and behavior. The prototype was idealized and constructed through a partnership between the University of Brasília and the Federal Institute of Brasília. A mobile clear acrylic prototype (92% light transmittance) was constructed, with 6 mm thickness, 1.25m x 1.25m x 0.81m (length, height, and width, respectively), and 1.0125 m^2 floor area. The prototype was placed on a support at a 44 cm distance from the floor of a masonry room - 3.28mx 2.93mx 2.84m (length, width, and height; in that order), completely sealed to avoid external meteorological interference. Inside the prototype, two 150W infrared lamps were installed to maintain the prototype internal temperature constant and to simulate a heating system. In the prototype, a thermographic inspection window was installed to the measurement of body surface temperature of the animals with the aid of an infrared camera. Two Arduino systems were installed - one for measuring the air temperature and relative humidity of the prototype in 1-minute intervals and the other for the measurement of the temperature near the infrared lamps configured to drive the infrared lamps and to warm up the birds when the temperature inside the prototype is not achieved and turned off when the required temperature is reached. The prototype has the advantage of being low cost, with transparent material, thus, it is possible to analyze the animals' behavior in real-time, and it is possible to achieve the thermal profile of them through the infrared camera without the intervention in their behavior and thus avoid a stressful management approach. The prototype proposes studies on several environmental factors and how animals behave in the face of varied thermal conditions. Finally, the use of the prototype can be expanded for other livestock animals and to improve the research and work methodologies in the animal welfare field.

Livestock Informatics Toolkit: Data science tools for characterizing complex behavioral patterns across multiple sensor platforms

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Ms. Catherine McVey [1], *Dr. Fushing Hsieh* [2], *Dr. Diego Manriquez* [3], *Dr. Pablo Pinedo* [3], *Dr. Kristina Horback* [1]

1. *Department Animal Science, University of California Davis,* **2.** *Department of Statistics, University of California Davis,* **3.** *Department of Animal Science, Colorado State University*

Large densely sampled sensor datasets can contain a range of complex stochastic structures – nonstationarity, cyclicity, autocorrelation, etc. Accommodating such features in a conventional linear model can be challenging when working with a single data stream, but can become a logistical impediment in attempting to aggregate information across multiple asynchronous sensor platforms to building a more complete picture of an animal's behavior. The Livestock Informatics Toolkit in R provides a suite of algorithmic tools that combine the flexibility of information theoretic inference with the power of machine learning. The utility of this analytical pipeline in facilitating between-sensor inferences is demonstrated using data from a 6-month feed trial conducted on a closed herd of 185 mix-parity organic dairy cows. Milking order, or the sequence in which cows arrange themselves as they enter the parlor, was extracted from RFID logs from 80 morning milkings. Additionally, hourly time budgets were recorded continuously over a 42 day period via CowManager ear tag accelerometers for five mutually exclusive behavioral states: active, highly active, nonactive, ruminating, and eating. In evaluating the overall time budgets, we show that for datasets where true replication is not present, simulation techniques may provide a proxy estimate of the robustness of an observed empirical pattern, which can be used to create clearer visualizations of behavioral tradeoffs. In analyzing milking order data, we demonstrate that information entropy, a discrete alternative to variance that is robust to outliers, can provide a clearer estimate of between-animal differences in behavioral consistency when working with inherently noisy sensor records. When data is collected over extended observation windows, behavioral patterns can shift and evolve at both the individual and herd level. Such dynamics can be recovered using data mechanics algorithms, which simultaneously explore behavioral patterns on both the temporal and social axes. In the analysis of milking order records, these algorithms can differentiate between subgroups of animals that systematically shift their milking position from those that are simply inconsistent in queueing behavior. Similarly, progressive changes in daily time budgets can be recovered and the tradeoffs between behavioral axes readily visualized. Finally, we demonstrate that permutation tests based on mutual information can be used to recover statistically significant associations (alpha=0.05) in complex behavioral patterns across sensors platforms by revealing that cows in the center of the queue had more balanced time budgets, while cows at the front and end diverged in time spent eating and nonactive.

Combining different animal welfare assessment methodologies to improve welfare of a Japanese black bear: human ratings and behavioural observations by humans and computer vision with deep learning techniques

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Dr. Yumi Yamanashi [1], Mr. Nobuaki Yoshida [2], Ms. Tomoko Matsusaka [1]

1. Kyoto City Zoo, 2. Advanced Science, Technology & Management Research Institute of Kyoto

Assessment of animal welfare is important for its effective improvement. Behavioural observations were often used in such situations, but it is impossible to observe all animals in a collection at the same level, often due to the lack of relevant resources. Therefore, practical methodologies to efficiently monitor the behaviours and welfare states of these animals are needed. In this study, we compared three animal welfare assessment methodologies to investigate the changes in the behaviours and welfare of a female Japanese black bear living in the Kyoto City Zoo, Japan. The first approach was through human ratings using a welfare assessment sheet. This assessment sheet comprised of questions on the environment, husbandry routines and state of the animal. The zoo staff (N = 23; including keepers, vets and researchers) input the scores into the assessment sheet before and after implementing several environmental enrichments (May 2019 and March 2020). The second and third approaches were based on behavioural observations by humans and behavioural estimation by AI, respectively. These behaviours were recorded every 5 min by 2 observers through an infrared camera attached at the ceiling of the outdoor enclosure between September 2019 and February 2020 (over 1000 hrs of videos were analyzed). The same recorded videos were also analysed using feature values extracted from video frames with deep learning techniques. The results revealed that all the methodologies detected changes in the welfare states of the animal. However, variations in the details existed among the methodologies. Human ratings using the assessment sheet detected improvements in environment and behaviours. Although human rating was useful in detecting changes in the environment and planning enrichment, the ratings of animal states were improved while the behaviours (such as stereotypy) did not change so much. Both behavioural observations by humans and behavioural estimations by AI detected behavioural changes. The concordance rate between the human behavioural observations and AI observations was approximately 77%. Besides, by incorporating information about the spatial location of the animal into the AI observations, the rate improved to approximately 84%. Considering the fact that the concordance between 2 human observers was approximately 85%, AI behavioural monitoring seems promising for assessing behaviours. However, the accuracy of AI behavioural estimation fluctuated across months for some behaviours. These results together suggest that selecting and combining appropriate assessment methodologies in each purpose based on the strength of each approach are important.

The Digital Pig: Automatic Systems for Behavior Detection in Weaned pigs

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

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On-farm animal welfare assessment of pigs has until now been conducted by using welfare protocols. However, except for some observations of fear towards humans, behavioural indicators have been difficult to include without using time consuming video recordings. New digital technology has made it possible to autimize the recognition of behaviours and body postures associated with different mental states. In our study, the goal was to perform a stepwise study of an automated system for behavioural recognition of pigs. In the first part of the study, the aim was to recognize individual pigs in groups and their body parts (head/ear, and tail) with high accuracy by use of machine learning algorithms for object detection based on Feature Pyramid Network (FPN) architecture. Our dataset (n=600 images) was annotated in Labelbox (approx. 8000 pig postures) from 2D (720p) video recordings of groups (n = 12-15) of weaned pigs. The FPN based automated object detection recognized each individual pig with an accuracy of 96% IoU (Intersection over Union), the tail with 77% IoU and heads with 66% IoU, thereby already achieving human level accuracy. As predicted, accuracy of pig detection in groups was the highest, while head and tail detection accuracy were lower. As pigs are social animals, they spend most of their time lying in proximity to, or over pen-mates, and this made their tails/heads less detectible. Therefore, it is more efficient to scan for pig/tail/head during periods where the pigs are most active. As the first trial with Labelbox was relatively time-consuming, in the second part of the study we performed a YOLOv4 neural network analysis. By training a YOLOv4 neural network with only 30 annotated images of our dataset for detecting and counting negative (straight tail) and positive behavioral indicators (curled tails), we were already able to recognize straight vs curled tails with a high level of accuracy (90% IoU). In the future, we would like to develop a surveillance system relying on RGB-digital cameras for pig behaviour detection and tracking. Given a tight-space constraint structure of a pig farm, we will develop a camera system that communicates with a central computer and a program that automatically tracks specific behaviours on an individual level that is indicative of positive and negative welfare. The development of an on-farm, automated pig recognition system will bring animal welfare assessment to another level, by implementing early warning system for positive/negative behavioral indicators.

Assessing Eye temperature, an indicator for stress levels in young buffalo bulls using IR thermometer

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

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The study was undertaken with an objective to determine diurnal changes of the eye temperature of buffalo young bulls under different shelter management to determine the effect of heat stress using Infra red thermometer. Twenty four buffalo bulls were randomly divided into two groups, each group comprising of 12 animals based on age (16–18 months) and body weight (Control = 301 ± 8.24 kg and Treatment = 311.45 ± 6.24 kg). The control group was housed under normal management practices, and the height of the shed was 10 ft. and width was 12 ft. with concrete floor. Whereas, the treatment group was housed in shed having 15 ft. height and 25 ft. width along with rubber mat as flooring and the total area provided for each animal in both the groups was 45.96 sq. feet. Treatment bulls were also provided with dairy fans and mist cooling in day time to ameliorate heat stress. The thermal humidity index (THI), floor and roof temperature variation of the shed was recorded. The eye temperature of bulls was measured at six hourly interval at 1.00, 7.00, 13.00 and 19.00 hrs for five days to evaluate the effect of different housing on the animals' thermal status under hot dry summer conditions. Results revealed that the THI of treatment shed was significantly ($P < 0.01$) lower than the control at different times. The floor and roof surface temperature of the treatment shed was significantly ($P < 0.05$) lower than the control shed. Diurnal patterns of eye temperature measured in both the groups showed increased eye temperature in control group bulls compared to treatment group. The eye temperature at 7.00 hrs was similar in both groups, whereas it was significantly higher ($P < 0.01$) at 13.00 and 19.00 hrs. The heat stress in the buffalo bulls was exhibited by increased eye temperature. Thus, the variation in the eye temperature can be effectively used as an indicator of heat stress and the dairy fans and mist cooling along with rubber mat flooring can be utilized to ameliorate the heat stress in the buffalo bulls.

Non-invasive endocrine monitoring applied to conservation, welfare and behavioral studies of wildlife.

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Ms. Veronica Cantarelli [1], Dr. Gabriela Mastromonaco [2], Ms. Christine Gilman [2], Dr. Marina Ponzio [1]
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Traditionally, studies on reproductive biology and the response to stress have been based on the determination of endocrine activity of hormones associated with these processes in plasma, along with behavioral studies. However, the collection of blood samples itself constitutes a procedure that can modify plasma glucocorticoid levels and in turn, negatively impact the expression of the hypothalamic-pituitary-gonadal/adrenal axis and in turn the behavioral activity of the studied animals. In addition, plasma levels of certain hormones fluctuate widely as a result of pulsatile secretion and/or circadian rhythms and therefore, each blood sample provides a static data of a parameter that is changing, so multiple samples would be needed to have a reliable notion of long-term hormonal secretory activity. Non-invasive hormonal monitoring allows us to measure the metabolites of steroid hormones in different matrices, such as feces, urine, saliva, hair, feathers, egg yolk etc. The steroids of interest are extracted from the matrices using methanol, and the resulting supernatant is assayed using polyclonal antibodies in an enzyme immunoassay. The main benefit of these techniques lies in the fact that its use completely avoids the stress of animal handling and restraint associated with the collection of blood samples and the risks associated with repetitive venipuncture. This is particularly important when dealing with wild animals in captivity or when also recording behavioral data. Furthermore, sample collection can be performed during long periods of time and finally, the type of assay used is relatively simple, efficient and easy to adapt from one species to another.
Using these techniques, we were able to evaluate, both in the wild and in captivity, aspects as diverse as reproductive cycles, seasonal variations, sexual and behavioral differences associated with hormones, association between hierarchical positions, effects of environmental toxins on the endocrine function, stress and, even more, the effects of human activities on animal welfare. However, the implementation of laboratory techniques associated with this discipline emphasizes their prior validation, aspects that will be considered in this dissertation.

Automated detection of facial expression in sheep as an early indicator of disease

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

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The use of facial expression as a welfare assessment tool in animals has recently increased. There is a need for automating this process for two reasons 1) removal of human interference on the expression of affective state, and 2) giving the producer an early indicator system allowing for individual assessment and treatment in a timely manner. The latter is important for not only improving welfare but also increasing sustainability on farm. Together, the authors have been working on the development of an automated system of facial expression detection in sheep and exploring its use as an early indicator of disease as well as monitor of disease progression. Using a hierarchical model composed of Convolutional Neural Networks (CNN) a dataset of 1306 images were assessed to identify facial landmarks. The landmarks were then used to normalise and extract key facial features that could be used to predict pain. Eight videos of 4 different sheep recorded at the time of an initial diagnosis of acute mastitis (n=2) or pregnancy toxaemia (n=2), and then again 42 days after treatment were used for disease progression analysis. Pain scores were higher (0.89) in videos showing initial stages of treatment, reducing to 0.59 after the treatment at 42 days. The decline was detected for all four animals consistently. The CNN-based facial expressions detection and analyses were effective in processing sheep faces through a variety of head poses including frontal and side view. This pain assessment method is the first to apply this pose-based feature extraction model and demonstrates that it is possible to detect changes in the facial expression of sheep based on their current health status. An automated system such as this has significant potential to improving the welfare of sheep through increased use of technology, optimising treatment strategies and hopefully increasing sustainability to animals on farm.

WUR Wolf - A Facial Recognition System for Animal Welfare 2.0

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

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Scientific studies of farm animals' minds are skewed towards primarily traits that are easier to quantify than emotions. In addition, human biases pose a barrier to fully exploring and understanding the emotions of animals. For example: as humans we often rely on language to make sense of emotions and misconstrue an animal's expression of emotions from the framework of human emotional expression. Emotions help individual farm animals to form and navigate social relationships. Understanding animal emotions is a key to unlocking methods for improving animal welfare. Knowledge on how farm animals feel is an absolute requirement in developing complete animal welfare auditing tools.

Emotions consist of both a valence (positive vs. negative) and arousal (high vs. low) dimension. Currently researchers use physiological measures by collecting blood samples or saliva to look for cortisol, lactate, oxytocin and other hormones or biochemical markers in determining emotional valence and/or arousal in farm animals. However, many of these methods are invasive. Researchers also use behaviour such as body postures and vocalizations as indicators of farm animals' mental states. Here we present a Wageningen University technology that automatically measures farm animal emotions to overcome the subjectivity associated in human based measures; to reduce manhandling of animals and animal-based experiments; and to establish non-invasive ways to assess good and poor welfare of farm animals from their positive and negative emotional states.

The Artificial Intelligence based facial coding platform developed and named after the mascot WUR Wolf has the ability to extract features such as eye white, ear postures and facial cues in determining the mental make up of the farm animals such as cows and pigs. Python based machine learning algorithms measures the facial features and correlate with the established indicators of the positive, neutral and negative emotions of cows and pigs from the acquired data set. The facial coding platform is expected to enhance the capacity of modern animal farming in preventing, monitoring and controlling animal diseases including emerging risks, and provide integrated approaches for animal welfare.

Pilot study of the use of fiducial marker detection for automatic animal behaviour monitoring in an animal shelter

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

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Independent researcher

Monitoring behaviour in animal care facilities such as an animal shelter is critical for ensuring health and welfare. Additionally, collecting detailed behavioural data is an essential component of most shelter-based research. Both shelter staff and researchers typically collect data in-person or through video to record maintenance behaviours such as food and water intake and litter box use, as well as exploratory and hiding behaviour. These approaches can be time-consuming and involve trained observers, proving to be a barrier to needed data collection and individualized care.

An alternative approach may be to utilize computer vision technology as an accessible, simple, and low-cost behavioural data collection method to monitor individual cat behaviour in shelters automatically. We used the OpenCV fiducial tag library ArUco to generate unique barcodes printed on a customized lightweight cotton sleeve attached to standard breakaway collars, which created identifiers automatically recognized in video output. Two cameras placed within the cat housing room, including above the litter box and food and water bowls, recorded cats (n=3) continuously for 27 hours. The video streams were then subjected to code that captured individual IDs and timestamps within defined regions of interest, such as the food bowl. A trained observer also coded the videos. Cohen's kappa was run to determine if there was an agreement between human observation and video detection output for the presence or absence of a cat within the regions of interest. Results demonstrated high accuracy between computer vision

detection and human observation for eating behaviour ($\kappa = 0.863$) and

the presence of the cat at the food bowl ($\kappa = 0.651$). Due to a limitation in the human ethogram used for preliminary analysis, this result is expected to increase in accuracy.

These preliminary results suggest that computer vision technology may be beneficial for shelter research and animal care applications. This will be confirmed by ongoing data collection including additional cats that will be presented. The use of this technology presents further widespread opportunities for many areas of animal behaviour and welfare research. Specifically, for applications involving species that allow for easy marking, such as wearing a collar, applications that require continuous identification of individual animals and monitoring animals in complex environments.

Relevance of individual hens early movements as predictors of subsequent health and movements, within a commercial aviary

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

**Ms. Camille Montalcini** [1], **Dr. Yamenah Gomez** [2], **Dr. Bernhard Völkl** [3], **Dr. Michael Toscano** [2]

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Previous work suggests that hens exhibit movement and location patterns (MLPs) in cage-free housing that associates with their health. We aimed to explore development of these patterns (through their first two months in a laying barn) and their relationship to welfare indicators (as assessed on the seventh month). As part of a larger study evaluating on farm hatch, 4'800 chicks were reared in an Inauen Natura rearing barn. At 16 weeks of age, all animals were transferred to an on-site laying barn containing a Bolegg Vencomatic Terrace aviary split into 20 identical pens, each containing a total of 225 animals of which eight were used for the current study with 18 focal animal per pen. On the population day, a backpack was assigned to each focal hen containing an active tracking tag which distinguished five zones per pen, including: the three stacked tiers of a commercial aviary (top floor, nestbox, lower floor) as well as the littered floor underneath, and an outside, covered winter garden. A low frequency tracking system was used to record transitions across the five zones from the day after the transfer to the laying barn (day 1) until the 53rd day. MLPs were explored through individual daily variables, including the percentage of time spent in each zone and the total vertical travelled distance (TVTD). Initial observations showed that on average across pens, 36% (+/-11% SD) of animals show no transitions during at least one of the first three days, a value reduced to 2% (+/-3% SD) after 30 days. Although adaptation was variable, our results revealed consistency in individuals' MLP from day 1 onwards. For instance, individuals' TVTD on day 1 correlated with individuals' TVTD on day 53 (Pearson coefficient=0.17, p<0.05). Furthermore, using a linear model we demonstrated an association between the mean percentage of time in the winter garden during the first 53 days and feather coverage status. More specifically, birds spending more time outside during the first weeks were more likely to have greater subsequent feather coverage (p=0.014). No associations between early movement patterns were found with subsequent KBF severity. Overall, our results suggest that individuals' MLPs had begun to develop immediately after being transferred to the laying barn and that the first two months of movements could serve as predictor of subsequent feather coverage.

Bite-o-Mat: validation of a potential early detection device for tail biting

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

**Ms. Josefine Eisermann** [1] _, Dr. Antonia Patt_ [1] _, Dr. Helen Schomburg_ [1] _, Dr. Jonas Knöll_ [1] _, Prof. Lars Schrader_ [2]

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Tail biting is a common problem in pig production that not only impairs animal welfare but can also have negative economic consequences. Most research focusing on the prevention of tail biting addresses underlying causes. Complementary approaches targeting early detection are increasingly investigated and can help to mitigate the negative effects of tail biting by implementing preventive intervention measures. Changes of manipulative behavior have been shown to be promising indicators for early detection of tail biting. We developed and validated an automatic device ("Bite-o-Mat") that allows detecting individual manipulation behavior of group-housed pigs during the rearing and fattening period. The Bite-o-Mat consists of a single point load cell recording the load from manipulations of an enrichment material (rope) and an UHF-RFID antenna detecting pigs fitted with corresponding ear tags in the vicinity of the device. For the validation and development of the device and its automatic algorithms data of 12 hours across 6 days for a rearing (8 pigs) and a fattening pen (5 pigs) were used. Continuous data were complemented with all event sampling of video recordings identifying manipulations of the rope and the presence within or outside the reading area of the antenna. A total of 596 (rearing) and 277 (fattening) manipulations were observed. Injuries of the tail were not systematically assessed. Analyses revealed that loads measured by the single point load cell during manipulations can be distinguished from times without manipulations, i.e. the mean (rearing: $F_{1,1039}=20.91$, p<0.0001, fattening: $F_{1,501}=49.4$; p< 0.001), maximum (rearing: $F_{1,1039}= 35.38$, p<0.0001; fattening: $F_{1,501}=8.84$; p=0.003) and minimum load (rearing: $F_{1,1039}=73.35$, p<0.0001; fattening: $F_{1,501}=38.62$; p<0.001). Additionally, the identity of pigs in the set reading area can be detected by the antenna (rearing: sensitivity=0.53, specificity=0.89, accuracy=0.61, precision=0.8; fattening: sensitivity=0.61, specificity=0.99, accuracy=0.84, precision=0.96). Based on these results, an algorithm for the automatic detection of manipulation events was developed using half of the data recorded by the single point load cell. The algorithm was validated against the manually evaluated video recordings using the remaining half of the data showing that manipulations can be detected automatically (rearing: sensitivity=0.60, specificity=0.87, precision=0.55, accuracy=0.81; fattening: sensitivity=0.60, specificity=0.93, precision=0.58, accuracy=0.88). Similarly, pigs in the vicinity of the device can be automatically identified using frequency of detection by the UHF-RFID antenna. In conclusion, this study shows that the Bite-o-Mat allows to automatically assess individual manipulation behavior of group-housed pigs and might be a promising tool for the early detection of tail biting.

A novel boar pheromone induced prepubertal gilt estrus behavior

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

**Ms. Catherine Hixson** [1] _**, Ms. Courtney Archer**_ [1]_**, Dr. Arlene Garcia**_ [1]_**, Dr. Robert Knox**_ [2]_**, Dr. John McGlone**_ [1]

1. _Texas Tech University,_ **2.** _University of Illinois_

Many gilts are induced into puberty by either hormone therapy, boar exposure or both. The use of boars on farm may compromise boar and gilt welfare. This study sought to determine if the pattern of onset of puberty using a new pheromone, as a natural therapy, was similar to previously published hormone induced patterns. In this study, the boar pheromone mixture BOARBETTER (BB) was used alone and delivered daily to 30 gilts. Gilts (aged 5 to 6 mo.; 62.4±0.6 kg BW) were randomly assigned and tested in different barns with either individual spray of BB (4 mL/delivered by spray bottle) on the snout 1x/d (n = 15) or pen administration (32 mL/delivered by fogger) 1x/d (n = 15). Mounting data were characterized from video from d 0 to 29. At the end of the study period, reproductive tracts were harvested from gilts (aged 6.5 m) to assess ovarian development and visible signs of cycling, such as number of corpora lutea. A linear regression model was used, with days after treatment started vs. number of mounts. Overall, the model produced an R^2 = 0.99, P < 0.001. However, the slopes of cumulative mounting behavior differed for gilts that were sprayed vs. fogged. The regression equations for each treatment group were: Spray: mounting = 1.35(d) + 1.35, R^2 = 0.99, and Fogger: mounting = 2.13(days) – 5.33, R^2 = 0.98—the slopes of the lines differed (P < 0.01) with Fogger gilts mounting less than Spray gilts in the first 10 d, then mounting more than Spray gilts after d 10. In contrast to hormonal therapies, which cause a spike in estrus behaviors 5 to 8 d after administration, BB gradually stimulated a linear estrus response. However, average number of mounts was not predictive of ovarian development, as Spray gilts mounted less frequently than Fogger gilts (mean = 22.3, SE = 1.5 vs. mean = 27.7 mounts, SE = 2.5; t(59) = -6.1, P < 0.001), but cycled more (100% vs. 93%; SE = 0.06; t(29) = 1.72; P < 0.05) than Fogger gilts. BB causes onset of puberty, but in a pattern that differs temporally to hormone induced patterns. Pheromone technology may offer a more uniform, natural, and non-hormonal method of stimulating and identifying puberty in gilts and thus, may improve welfare of boars and gilts.

Detailed analyses of sexual behaviors of weaned sows exposed to a live boar or a new sexual pheromone

Sunday, 1st August - 18:00: Application of Technology to Applied Animal Behaviour and Welfare posters - Poster

Ms. Courtney Archer [1], *Ms. Catherine Hixson* [1], *Dr. Arlene Garcia* [1], *Dr. John McGlone* [1]

1. *Texas Tech University*

Most commercial sows are bred by artificial insemination with a teaser boar providing fence-line contact. The objectives of this work were to determine, (1) if pre-weaning sow performance predicted sexual behavior after weaning, and (2) if the sexual behaviors which induced the Locked Up (LU) response by a live boar were the same behaviors as when a novel pheromone was used instead. LU is rigid stillness the sow demonstrates during estrus behavior. A total of 59 weaned sows known to be in behavioral estrus experienced a live boar and the new pheromone BoarBetter (BB) in random order. Physical traits of each sow were collected pre-weaning (wean weight, litter size, gestation length) to determine a correlation between pre-weaning performance and sexual behavior during estrus. A randomized complete block design was used with sows as blocks since they experienced each treatment (boar vs BB). Video recordings with observational data collection were reviewed to quantify detailed sexual behaviors while treatments were applied. In objective 1, stepwise regression was used to identify the sow litter performance variables (piglets weaned, weight change, etc.) that might predict a weaker or stronger sexual behavioral response when detecting LU. In objective two, regression analyses were used to determine the relationship between sexual behaviors that predict LU, to determine if the model for sexual behavior was the same when a live boar was utilized in comparison to BB therapy. All sows were provided both treatments on the same day of her estrus detection with a one-hour wait period in between each treatment. For objective 1, the only pre-weaning variable that was inversely related to LU (R < 0.01) was gestation length. The other production data did not predict the strength of the sexual behavioral responses. Sexual behaviors observed included pricked ears, chomping, vocalization, standing still, and latency from back pressure to LU. The regression models for sexual behaviors that predicted LU were different for Boar vs BB. Boar exposure treatment found pricked ears, vocalizations, standing still, chomping, and previous gestation length (model R^2 = 0.88, P < 0.001). Sows in the BB treatment found standing still, latency to lock up, chomping, and previous gestation length (R^2 = 0.88). While both a live boar and BB induced many similar sexual behaviors, some differences in the expression of behavioral estrus were observed. Breeders will benefit from understanding slightly different signs of sexual behaviors based on the stimulation provided (boar vs. BB).

Welfare of Animals used in Research and Teaching Posters

Is chronic carbon tetrachloride treatment perceived as a chronic stressor by laboratory mice?

Sunday, 1st August - 18:00: Welfare of Animals used in Research and Teaching posters - Poster

**Ms. Megan Boddy** [1] _**, Mrs. Grace Charlotte Laws**_ [1] _**, Mr. Dominic Jon Moska**_ [1] _**, Mr. Matthew James Craven**_ [2] _**,
Dr. Timothy Boswell**_ [2] _**, Dr. Tom Victor Smulders**_ [1]

1. _Biosciences Institute, Newcastle University,_ **2.** _School of Natural and Environmental Sciences, Newcastle University_

The Carbon Tetrachloride (CCl_4) mice model, used in liver fibrotic studies has not been associated with severe long-term consequences. However, research suggests evidence of oxidative stress and inflammatory responses which may lead to chronic stress. Thus, it is important to research effects of CCl_4 on welfare. To test the effects of CCl_4, Adult Hippocampal Neurogenesis (AHN) was used as a proxy measure of chronic stress. Research suggests chronic stress affects AHN in the subgranular zone (SGZ) of the dentate gyrus (hippocampus), specifically in the ventral hippocampal pole (vHp), involved in emotion (including stress) processing. We hypothesise CCl_4-induced liver fibrosis is a source of chronic stress and we predict CCl_4-injections should reduce neurogenesis in the hippocampus, especially in the vHp. To provide context to our predictions, we compared 12 mice (part of a liver fibrosis study) injected with CCl_4 intraperitoneally biweekly at 2 μL (CCl_4/olive oil, 1:3 [v/v])/g/body) for 8 weeks, to 13 mice exposed to unpredictable chronic mild stress (UCMS), known to reduce neurogenesis in the hippocampus. 15 Control mice were kept in their home cages with only regular husbandry. Male c-Rel fl/fl mice were used. If CCl_4 induction aligns with the effects of UCMS, then CCl_4 may be detrimental to mice welfare. Open Field experiments tested for anxiety and immunohistochemistry detected the proteins Doublecortin (DCX) and Brain-derived neurotrophic factor (BDNF), both markers of adult neurogenesis. Open field experiments showed that the UCMS group spent significantly less time in the centre of the open field (i.e. they were more anxious) compared to the CCl_4 group and Controls ($p < .001$) with no difference in activity levels ($p = .082$). UCMS mice entered the centre of the open field less frequently ($p < .001$). Body mass was also lower for UCMS mice ($p = .012$). Unexpectedly, however, the frequency of faecal pellets was higher for Controls ($p = .016$). UCMS mice have lower DCX in the ventral hippocampus compared to controls ($p = .001$) and DCX was not lower in the CCl_4 group ($p = .335$). A main effect of treatment was found in BDNF staining ($p = .036$). UCMS mice have darker BDNF staining than the other two groups in both dorsal and ventral hippocampus ($p = .025$), and CCl_4 mice did not differ from Controls ($p =.918$). Our data suggest that CCl_4-induced liver fibrosis is much less stressful than UCMS, and therefore potentially not a severe welfare problem.

Practical resources for improving the welfare of animals in research, testing and teaching

Sunday, 1st August - 18:00: Welfare of Animals used in Research and Teaching posters - Poster

Prof. Adrian Smith [1]

1. Norecopa

There has never been a greater need for a global clearinghouse of information on how to improve the welfare of animals used in research, testing and teaching, and how to implement the 3Rs (Replacement, Reduction and Refinement).

Norecopa's staff have been working since 1991 to collect resources for this purpose. This began with production of the NORINA database of alternatives to animal use in teaching and training. The 3,000 products cited in NORINA cover education at all levels, from school dissections through undergraduate teaching to the training of scientists and animal technicians involved in animal experiments (https://norecopa.no/NORINA).

NORINA is just one of several databases embedded in Norecopa's website, which today has over 9,000 pages of 3R-resources. These include a collection of over 400 international guidelines for planning, conducting and reporting animal research (https://norecopa.no/3RGuide)

Norecopa, in collaboration with British scientists, has published comprehensive guidance on how to plan scientifically valid, reproducible and translatable preclinical studies. The guidance is called PREPARE, and consists of a checklist with 15 main topics, as well as webpages which contain more details and links to international resources about each topic (https://norecopa.no/PREPARE).

Norecopa's website also acts as the host of several international activities. One of these is the International Culture of Care network (https://norecopa.no/coc), which aims to improve communication between all involved in animal research, and increased wellbeing of both animals and personnel. Norecopa also maintains an overview of global 3R centres (https://norecopa.no/global3R).

The Covid-19 pandemic has resulted in an huge increase in the number of online meetings and webinars. Norecopa maintains a comprehensive global Webinars and Meetings Calendar of events relevant to animal research (https://norecopa.no/calendar). Norecopa also issues an English-language newsletter 7-8 times a year, for those who wish to keep informed of the latest advances within animal research, testing and welfare (https://norecopa.no/newsletters).

More information is available on Norecopa's website: https://norecopa.no

Acute effect of fluid control on the welfare of laboratory rhesus macaques

Sunday, 1st August - 18:00: Welfare of Animals used in Research and Teaching posters - Poster

Ms. Janire Castellano Bueno [1]*, Ms. Alexandra Paraskevopoulou* [1]*, Ms. Letitia Sermin-Reed* [1]*, Mr. Sam Groves* [1]*, Mr. Nathan Kindred* [1]*, Ms. Mathilde Jay* [1]*, Ms. Aleksandra Czeszyk* [1]*, Ms. Josephine Panafieu* [1]*, Ms. Julie Safourcade* [1]*, Ms. Susanna Carella* [1]*, Mr. Christopher Miller* [1]*, Prof. Melissa Bateson* [1]*, Dr. Colline Poirier* [1]

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Rhesus macaques are widely used in biomedical research due to their phylogenetic proximity to humans and their ability to perform complex cognitive tasks. Some studies require a large number of trials and therefore a high motivation from the subjects. To achieve this, fluid availability can be controlled in the home cage, and subsequently used as a reward during experimental tasks. Whilst previous studies have shown no significant physiological impact on the animals, the potential psychological effect of this routine procedure is still debated. Using an unprecedented sample size of 21 socially-housed adult macaques (5 females and 16 males), this study aimed to investigate the acute effect of fluid control on macaques' welfare using a behavioural approach. We recorded home-cage behaviour of animals enrolled in fluid control protocols due to their participation in unrelated neuroscientific and behavioural experiments. The protocols involved a maximum of 5 consecutive days of fluid control followed by a minimum of 2 days of free access to fluid. During the fluid control condition animals had controlled access to fluid in their home-cages (17 – 50% of their individual *ad libitum* consuption) and unlimited access to fluid as a reward during the experiment. Behaviour was recorded in the early morning for 45 minutes/day. Two conditions were investigated: after at least 24 hours of fluid control and after access to fluids *ad libitum*. Animals' affective state was assessed by quantifying the frequency of (1) pharmacologically-validated behavioural indicators of anxiety (i.e. self-scratching, body shaking and self-grooming); and (2) behaviours suspected to indicate a negative acute affective state but still lacking proper validation (e.g. pacing, yawning, Inactive not alert behaviour). 504 hours of video footage were analysed, covering up to 6 years of intermittent fluid control which was performed as part of unrelated ongoing experimental protocols. Using generalised linear mixed models and a within-subject mean-centring approach, we disentangled the between- and within- subject effects of fluid control and controlled for the effect of time. Bonferroni correction was applied to control false positive results. We found no effect of fluid control on the frequency of any behaviour ($p = 0.16$ to 0.75) nor any indication of habituation or sensitisation over years ($p = 0.04$ to 0.75). This study suggests that the fluid control protocol, as implemented in this study, does not have a negative impact on the acute affective states of macaques as measured using behavioural outcomes.

The effects of training for behavioural tests on chicken welfare

Sunday, 1st August - 18:00: Welfare of Animals used in Research and Teaching posters - Poster

Ms. Johanna Neuhauser [1] *, Dr. Sara Hintze* [2] *, Ms. Luca Secker* [1] *, Ms. Hannah Kanwischer* [1] *, Prof. Jean-Loup Rault* [1] *, Dr. Janja Sirovnik* [1]

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Behavioural tests are commonly used to assess animal welfare; however, they often require training prior to testing. Some tests, for example, the cognitive judgement bias test, require habituation to various elements of testing, and shaping to perform operant responses. Such training might affect the animal's welfare, which could in turn influence the validity of behavioural tests that require training as welfare assessment tools. To investigate the effect of training on chicken welfare, two groups of laying hens were used in a preliminary study: 1) treatment (training; n=8), and 2) control (no training; n=7), with both groups housed in a single pen and thus receiving identical housing and management conditions. Treatment chickens underwent 19 sessions of daily training, consisting of habituation and shaping for a spatial Go/No-go judgement bias test with trial self-initiation (Hintze et al., Sci. Rep. 8: 5104, 2018). Habituation included handling, transport in a box from the home pen to a training arena, social isolation, moving elements within an arena, and eating from goal-boxes. Shaping involved associating pecking at a trial initiator (suspended bell) with a primary reinforcer (food) provided with a reward stick. Welfare was individually assessed before and after treatment chickens received training using a battery of behavioural tests: emergence and open field, novel object, response to standing human and tonic immobility tests. Data were analysed using linear mixed-effects models, with 'treatment' (control, trained) and 'welfare assessment time point' (first, second), and their interaction as fixed effects, and individual chicken as random intercept. Half of the treatment chickens (n=4) progressed to shaping. No statistically significant interaction effects were found; however, descriptive analysis showed an effect of training on escape behaviour. During the first welfare assessment, the percentages in chickens showing escape behaviour were comparable between groups in the open field (both groups: 0%), novel object (control: 29%, training: 36%), and response to standing human tests (control: 14%, training: 12%). In the second assessment, however, only control chickens showed escape behaviour (42%, 57% and 42% of control chickens in the three tests, respectively). A reduction in escape behaviour may indicate that training had a positive effect on fear-related aspects, and the lack of statistically significant differences could be attributed to the small sample size. Thus, two additional batches of chickens will be studied to increase the statistical power. Furthermore, we will investigate whether the full training protocol for the judgement bias test affects chicken welfare.

The welfare of laboratory animals during international transport – current situation, considerations, and how can we improve it?

Sunday, 1st August - 18:00: Welfare of Animals used in Research and Teaching posters - Poster

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International transport of laboratory animals is an essential component in nowadays-medical research. Though the transport is a short event in the life of the animal, it is a significant stress factor. The re-grouping of animals, living area, temperature, noise, exposure to other animals' species, and inconsistent lighting conditions - each of these is a stressor on its own but during transport, all of these stressors combine into a huge strain on the transported animals. Therefore, it may cause short and long-term physiological changes that must be taken into account including heart rate, blood pressure, body weight, social interaction, and activity.

The import of laboratory animals to Israel takes place exclusively by air transportation through Ben-Gurion Airport, which allows a uniform audit of the animals. An analysis of the import data between 2017 and 2020 indicates that the number of laboratory animals imported to Israel increased by 54% (from 10,982 to 16,942) in this period while the number of these Imported from the Americas alone increased by 112% (2,916 to 6,181). This indicates that more imported animals have to go through longer transport, up to several days, and longer exposure to strain. Delays and flight cancellations might compose risk to their life and not only their welfare.

The laboratory animals that were imported to Israel in the largest quantity in 2020 were mice, which accounted for 73.9% of transported laboratory animals, followed by fish (9.6%), hamsters (6.5%) rabbits (3.9%), guinea-pigs (2.5%), rats (2.4%), pigs (1.3%), and monkeys (0.1%). Imported laboratory animals constituted 3-4% of the animals used in experiments in Israel during 2018-2019.

Due to these increasing numbers of transported laboratory animals, more attention must be given by inspecting authorities to the conditions in which the animals are transported including to and from the airport. The staying duration in the airport should be reduced to minimum. Reviewing veterinarian documents before boarding, settling customs payments in advance and mandating importers to arrive within two hours from landing can be implemented in order to reduce the staying in the airport. During the waiting period special intention needs to be given to the conditions in the surroundings of the laboratory animals to minimize the stress.

The scientific community must take into consideration the effect of the transport on the animals and the approving authorities of the studies should take into consideration the stress of transportation as part of the consideration when approving these studies.

Possibility to use infrared thermography as a non-invasive method to assess stress-induced hyperthermia in laboratory mice

Sunday, 1st August - 18:00: Welfare of Animals used in Research and Teaching posters - Poster

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Stress-induced hyperthermia (SIH) is a physiological response to acute stressful events in mammals. It is mediated by HPA axis activation, causing redirection of blood flow with consequential temperature variations in different body regions. These temperature changes can therefore objectively identify stress responses. Traditional methods measuring temperature in laboratory rodents, such as thermometers and telemetry devices, may themselves be stressful and invasive, and thus impact results. We tested infrared thermography (IRT) as a non-invasive approach to follow temperature changes during mildly stressful events in laboratory mice. We used pair-housed Balb/c and C57BL/6 mice of both sexes (N=68, divided in four cohorts). Half of the mice were tail-picked (conventional method), the other half was tunnel-handled (reportedly less anxiogenic), daily for 10 days. Animals were tested weekly by voluntary interaction test (VIT) and at the end by elevated plus maze (EPM). Thermal images and subcutaneous temperature (from implanted thermosensitive PIT-tags) were taken concomitantly with daily handling (DH) and anxiety tests. As a positive control (accounting for possible temperature variation from other factors), half of the animals of each handling group were given an anxiolytic drug before EPM. Thermal images were analysed using in-house developed software (ThermoLabAnimal 2.0) which automatically segments mice from the background and assesses mean body surface temperature (T_{body}) and mean tail surface temperature (T_{tail}). Results from IRT were compared with subcutaneous temperature (T_{sc}). The study followed a randomized block design, with strain, sex, handling technique and drug as fixed factors, and cohort as a block. We observed that 30-60s exposure to stress raised T_{sc} ($p<0.001$) and T_{body} ($p<0.001$) significantly, with positive correlation between the two. Contrariwise, T_{tail} decreased ($p<0.01$) and correlated negatively with T_{sc} and T_{body}. Anxiolytic-treated mice showed significantly lower temperature for the whole duration of EPM, in accordance with observed reduced anxiety level in EPM (time spent and entries in open arms). No significant differences in temperature profile were found between tail picked and tunnel handled animals, but testing order had a significant and robust effect, with the second animal from the cage tested consistently showing higher T_{sc} and T_{body} and lower T_{tail}, as compared with the first. This suggest short term social isolation and/or anticipatory stress may elicit a measurable SIH response. In conclusion, thermography offers accurate assessment of SIH in mice, either as a stand-alone parameter or complementary to behavioural tests, without impacting animal welfare and results.

The effects of weaning age on hair loss in a sample of female Rhesus macaques (Macaca mulatta) from a UK breeding colony

Sunday, 1st August - 18:00: Welfare of Animals used in Research and Teaching posters - Poster

Mr. David Massey [1] _, Prof. Melissa Bateson_ [2] _, Dr. Claire Witham_ [3]

1. _Newcastle University,_ **2.** _Biosciences Institute, Newcastle University,_ **3.** _Centre for Macaques, MRC Harwell Institute_

Alopecia occurs in both humans and nonhuman primates (herein, primates). In primates, alopecia is associated with a number of variables including sex, season, pregnancy, hair pulling etc. Furthermore, severe alopecia could be a potential biomarker of psychological stress. Rhesus macaques (_Macaca mulatta_) are a commonly used species in biomedical research laboratories and the age at which purpose bred macaques are permanently separated from their mother (herein, weaned) is a major stressor and a candidate for refinement to improve welfare. To assess the impact of weaning (age) on alopecia, we collected data from colony records of annual health screens (HS) from 2010 – 2019 that include alopecia scores as a measure. We took a sample of females that had observations for two consecutive HS (n = 90). Some females remained with their mother for both HS (n = 47), the remainder were weaned at least 60 days prior to the second HS (n = 43). Age ranges of all females during the first HS were 1.53 – 3.91yrs (mean±SE = 2.11±0.05) and alopecia scores did not significantly differ between groups at the first HS. At the second HS, unweaned female ages ranged from 2.31 – 4.8yrs (mean±SE = 3.1±0.09); weaned female ages ranged from 2.43 – 3.97yrs (mean±SE = 2.98±0.06); and weaning ages ranged from 1.65 – 3.43yrs (mean±SE = 2.3±0.06). We modelled the impact of weaning and weaning age on alopecia scores. We also created an alopecia difference score (first HS – second HS) to model the impact of weaning on the magnitude of hair loss. Season and age at HS were included in all models as control variables. Both groups of females had more alopecia at the second HS (weaned group: estimate±SE = 1.1±0.43, z = 2.52, p = 0.012; unweaned group: estimate±SE = 1.2±0.41, z = 2.87, p = 0.004), and the weaned group had significantly more alopecia than the unweaned group at the second HS (estimate±SE = 0.61±0.22, z = 2.78, p = 0.005); a later weaning age was associated with less alopecia (estimate±SE = -0.37±0.18, z = -2.06, p = 0.04), and a later weaning age was associated with a positive difference score which indicated hair gain between HS, although this effect was not statistically significant (estimate±SE = 0.63±0.31, t = 2.02, p = 0.0503). These results provide evidence that a later weaning age could mitigate the negative effects associated with weaning.

PRACTICAL MEASURES OF DOMINANCE TO REDUCE AGGRESSION AND IMPROVE WELFARE IN MALE LABOROATORY MICE, MUS MUSCULUS

Sunday, 1st August - 18:00: Welfare of Animals used in Research and Teaching posters - Poster

Ms. Amanda Barabas [1]_, Dr. Jeffrey Lucas [1], Dr. Marisa Erasmus [1], Dr. Heng-Wei Cheng [2], Dr. Brianna Gaskill [1]_

1. _Purdue University,_ **2.** _USDA-ARS, Livestock Behavior Research Unit, Purdue University_

Inter-male aggression in mice continues to challenge laboratory husbandry personnel because mitigation strategies are generally applied at the cage level without a good understanding of how it affects the dominance hierarchy. Aggression is typically displayed by the dominant mouse targeting lower ranking subordinates; thus, strategies may be more successful if applied specifically to the dominant mouse. Unfortunately, social rank is often not assessed because of untimely observations or tests. Several correlates of social status have been identified, but none have been directly compared to home cage behavior in standard housing. This study assessed the convergent validity of three dominance correlates (urinary darcin, tube test score, preputial gland: body length ratio) with wound severity and social ranking in the home cage using factor analysis and general linear models. Daily welfare checks for severe wounding occurred after the mice's active period. If any mice exceeded our humane endpoint criteria (wound >1 cm^2), they would be euthanized. Cages were equally split between 8-week old SJL (high aggression) and B6N-_Tyr$^{c\text{-}Brd}$ (moderate aggression)_ strains and group sizes of 3 or 5 (N=24 cages). However, data from five cages were excluded: four met the humane endpoint criteria, one due to dehydration. The study lasted two weeks and began immediately after grouping. Home cage behavior was observed during week one and used to assign individual rankings. Aggression occurrences were recorded per individual for one minute every five minutes across two 24-hour periods. SJL cages displayed more aggression ($F_{1,14}$ = 6.22, P=0.026), but those that met the humane endpoint criteria were, unexpectedly, the B6N-_Tyr$^{c\text{-}Brd}$_ strain. During week two, urine was collected and darcin quantified; mice completed three rounds of tube tests; and preputial gland: body length ratio and postmortem wound severity were recorded. After controlling for strain and group size, darcin and preputial gland ratio had strong loadings on the same factor as home cage ranking (loadings >0.64) and significantly predicted home cage ranking (darcin: $F_{1,34}$ = 6.80, P=0.013; preputial ratio: $F_{1,36}$ = 26.74, P<0.001) showing strong convergent validity. Data from this study show that darcin and preputial gland ratio are representative of home cage social rank and can be applied when accounting for social status with aggression mitigation strategies. Identifying dominant mice will improve mouse welfare by facilitating approaches to inter-male aggression that specifically target aggressors. However, in light of the excluded cages, it is unknown if the same measures are applicable in the most extreme cases.

Companion and Wildlife Management posters

Investigation into owner-reported differences between dogs born versus imported into Canada

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

__Mr. Kai von Rentzell__ [1], Dr. Karen Van Haaften [2], Ms. Amy Morris [3], Dr. Alexandra Protopopova [4]

__1.__ Faculty of Land and Food Systems, University of British Columbia, __2.__ British Columbia Society for the Prevention of Cruelty to Animals, __3.__ Vancouver Humane Society, __4.__ Faculty of Land and Food Systems, University of British Columbia, Vancouver, Canada

It is estimated that over 1 million dogs are imported into the United States and roughly 40,000 dogs to the United Kingdom yearly. However, official statistics on dog importation are currently unavailable in Canada. Nevertheless, local animal rescue leaders estimate that thousands of dogs are imported into Canada each year. Dog importation may be increasing globally while regulation and surveillance is still limited, resulting in concerns for the health and temperament of imported dogs. Currently, few studies have investigated how the source location of dogs influence the owner-dog relationship. An online survey was distributed to a representative sample of dog owners (n = 803) in British Columbia, Canada, containing questions on various aspects of the owner-dog relationship, including questions from the Lexington Attachment to Pets Scale, Canine Behavioral Assessment and Research Questionnaire, Human Animal Bond questionnaire, Monash Dog Owner Relationship Scale, and constructed questions about source, training practices, expectation, and health. Approximately 7% of respondents reported owning a non-Canadian-sourced dog, with majority of these dogs coming from the United States. Multivariate regression models were used to predict whether the source of the dog, while taking into account other investigated variables, had an effect on the owners' responses. We found no evidence of a poorer owner-dog relationship in non-Canadian-sourced dogs. In fact, owners of Canadian-sourced dogs used aversive training methods more frequently (Estimate = .717, SE = .188, t = 3.827, P = <.001) and had higher expectations for their dog (Estimate = .477, SE = .183, t = 2.601, P = .0095). Our findings suggest that imported dogs are not at greater risk for compromised human-dog relationships. Future research may want to investigate the motivations behind prospective owners and rescue organization for the acquisition of imported dogs, in order to understand the growing popularity for imported dogs.

INTRASPECIFIC SOCIALIZATION AND FUNCTIONAL BITING ACTIVITY SESSIONS DECREASE URINARY CORTISOL AND SIGNS OF STRESS AND ANXIETY IN PROBLEMATIC DOGS

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Dr. Daniela Alberghina [1], *Dr. Pierluigi Raffo* [2], *Ms. Marina Tonelli* [2], *Dr. Alessandra Statelli* [1], *Prof. Michele Panzera* [1]

1. *University of Messina,* **2.** *Associazione Arcadia Onlus, Rovereto, Italy*

Intraspecific social exposure sessions could be useful in modulating undesirable behaviours in pet dogs as well as increase the social behaviour and working ability in military dogs. There is a persistent opinion that biting, and chewing are beneficial for dogs to decrease boredom, loneliness, stress, and anxiety. To our knowledge, however, no studies that have evaluated the influence of functional biting activity on stress levels have been conducted in dogs. The increased hypothalamic-pituitary-adrenal (HPA) axis response is one of the most reported physiological responses to animal stress. In dogs, increased cortisol levels can indicate stress from fear-inducing stimuli. The aim of this study was to determine whether cortisol/creatinine ratio (C/Cr) and stress and anxiety behavioural indicators are influenced by six socialization sessions of 30 minutes between behaviourally healthy and problematic dogs followed by a short functional biting activity of 15 minutes with dried products. Five adult shelter dogs with anxiety disorders were filmed during experimental procedure. Spontaneous urine samples were collected for C/Cr before and after socialization and biting activity sessions. ANOVA was used to analyse the effect of time on basal and post-procedure C/Cr values. Frequency and duration of behavioural anxiety and stress indicators before and after the experimental procedure were analysed by Wilcoxon signed-rank test. An influence of treatment was found for basal C/Cr values ($F_{5,4}$=2,77 P=0.04) that decrease during the experimental procedure. Post session C/Cr showed a tendency to decrease through sessions ($F_{5,4}$=2,38 P=0.07). The videos were evaluated for frequency and duration of anxiety and stress signs the subjects showed. A decrease of intensity and duration of stress and anxiety related behaviour after the experimental procedure was found. Non-invasive monitoring of cortisol and evaluation of stress and anxiety signals could be a useful tool in assessing modulation of behaviour in problematic dogs following intraspecific socialization exposure and functional biting activity sessions.

The Effect of Cuteness on Cats Length of Stay within The Shelter Environment

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Sam Jack [1], Dr. Grace Carroll [1]

1. *Queens University, Belfast*

There have been many factors which have been identified as influential on the adoption of cats from shelters. As yet there have been no studies which address the potential influence of cuteness. This study investigates the role that baby schema; facial features which characterise infants and correlate with cuteness, has on adoption of cats within an animal shelter. Retrospective data and images gathered at an Irish animal shelter were used in this study. The measuring protocols used in previous published studies were explored to determine which proportions of cats' faces were measured, along with several dimensions which hadn't been explored before. Subjective cuteness scores for each cat image were created by using online participant surveys. A novel measurement which reflects the shape of the eyes was found to be the only measurement which significantly correlated with the subjective cuteness ratings. It is suggested that the measurements used by previous studies may not be appropriate in the use for images taken in real-world settings. The study found there may be an influence of cuteness on cats' length of stay, while phenotypic characteristics such as coat colour and sex did not influence the cats length of stay despite previously published studies finding these significant.

Identification of behaviours associated with stress in domestic cats (Felis catus) during lockdown in quarantine by their owners using an online survey

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Mrs. Pilar Muñoz [1] , _Prof. Hernan Cañon-Jones_ [2] , _Dr. Cristian Ugaz_ [2]

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The mandatory quarantine for the coronavirus pandemic is affecting and changing our daily lives, increasing the time we spend home and forcing us to stay permanently with our pet while altering their daily routines. The aim of or study was to identify the main behaviours associated with stress in cats recognized by their owners during total lockdown period and to analyse any relationship between the behaviours to different environments and owners profiles. 865 responses were obtained (minimum calculated sample N 383) using an online survey. Most people (92.1%) were women between 18 to 30 years old of the Metropolitan Region, Chile. Most respondents (76.1%) indicated a period of more than 12 weeks of total lockdown due to the mandatory ruling. Cats were mostly young adult cats between 3 to 6 years old (55%). Owners reported having their cat indoors most of the time (70.3%). The main behaviours described by the owners were "increased proximity to the owner while seeking care" (80.6%), "increased vocalization" (55.1%) and "increased appetite" (44.8%). Gambling behaviors increased in 47.7% of the cases, and significantly more in cats living in flats/apartments. Owners attributed these changes to lockdown and perceived that lockdown increased the quality of life of cats (24.6%). Stress associated behaviour were "increased scratching of furniture" (37%), "aggressiveness" (29.6%), "excessive grooming" (19.1%) and "defecation or urination outside the sandbox" (15.9%). Also, 41.6% of owners indicated that cats had no particular furniture for climbing or taking refuge, which may indicate that cats live in a poorly or low stimulating environment and must seek different cognitive stimuli to improve their well-being. The lockdown imposed changes in daily routines of the owners and their cats with more time spending together in close contact, increasing the human-animal bond positively. Many cats seemed to be able to adapt in a positive way to these changes, while others showed behavioural signs of stress. Our results show the importance of early and correctly identification of behaviours to help cats coping with stress, such as maintaining as much as possible their daily routine or creating cat-exclusive environments where they can take refuge and provide entertainment.

Behavior and personality differences between cat breeds in seven personality traits

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Salla Mikkola [1], ***Dr. Milla Salonen*** [1], ***Ms. Emma Hakanen*** [1], ***Ms. Sini Sulkama*** [1], ***Prof. Hannes Lohi*** [1]

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The domestic cat is the most popular companion animal worldwide, but many aspects of their behaviour and personality are unknown. As problematic behaviour is one of the most common reasons for relinquishment and euthanasia, personality studies could offer new solutions to avoid this welfare problem. Personality is heritable and we hypothesize that cat breeds differ in behaviour due to genetic inheritance. For example, some cat breeds are more active than others and may require more environmental enrichment to prevent stress-related behaviour problems.

To study personality differences between cat breeds, we constructed an online behaviour and personality survey, which was available to all cat owners and included 138 behaviour statements (answered with a 5-point Likert scale). Additionally, the survey included background and health questions. The data of 4316 cats were collected during 2019-2020. We also collected data sets to estimate test-retest (N = 127) and inter-rater reliability (N = 41). We asked the same owners to answer the behavior section again for test-retest reliability (TRR) or to ask an adult person living in the same household to answer this section for inter-rater reliability (IRR).

We started statistical analysis with explanatory factor analysis (EFA) and extracted seven factors. Then, we studied TRR (correlation between answers) and IRR (intraclass correlation coefficients) of these factors and statements. Next, we removed statements with poor reliability, re-run EFA and extracted seven factors. Lastly, we re-ran TRR and IRR for final factors. Factors' internal consistency was studied with Cronbach's Alpha. Additionally, we evaluated convergent validity with hypothesis based on previous literature and discriminant validity with examining correlations between factors. We conducted Kruskal-Wallis tests to examine breeds differences.

Factors were named Fearfulness, Activity/playfulness, Human aggression, Human sociability, Cat sociability, Excessive self-grooming and Litterbox issues. The internal consistency of factors were acceptable (0.60-0.90), IRR was good (ICC(1,k):0.75-0.93) and TRR was good (0.69-0.92). The convergent validity and discriminant validity were also good. We discovered breed differences in all factors. Bengal was the most active and playful breed, and Turkish Van the most human aggressive breed. These differences will be inspected with more complex analyses in our next manuscripts.

Results of this study indicate that the survey and founded traits are reliable and valid. This enable further studies about risk factors of problematic behavior. Cat buyers can utilize found breed differences when selecting potential breeds for them and breeders might focus more on unwanted personality traits within their breed.

THE MOST COMMON CANINE AND FELINE BEHAVIORAL PROBLEMS IN BOGOTA COLOMBIA

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

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Introduction:

Behavioral problems are one of the main reasons to abandon and euthanize felines and canines. According to different reports, the most frequent problems in these species are aggression, excessive barking, fear, anxiety, house soiling, and marking. In this this study, it was analyzed 92 cases of behavioral problems registered in Bogota, Colombia, and the results were contrasted with other studies. **Objective:** Compare the most common canine and feline behavioral problems reported in this research with those reported nationally and internationally. **Material and Methods:** Descriptive cross-sectional study of clinical behavioral cases registered (n = 92), from 2017 to 2020, in Bogota, Colombia. The patients were characterized, evaluated and segmented in two groups, by species, canines (n = 62), and felines (n = 30). **Results**: The most common diagnoses was aggression (canine = 51.61% and feline = 40%), followed by anxiety (canine = 29.3% and feline = 33.33%), subsequently by house soiling (canine = 3.23% and feline = 10%). Whereas the main problem in literature reports was aggression (canine = 21.00% and feline = 26.00%), followed by excessive barking (canine = 21%), and house soiling (feline = 22%), subsequently by fear (canine = 17%) and marking (feline = 15%). **Discussion:** The main problem in these species was aggression. The foregoing evinces that aggression in these animals is a recurring behavior problem affecting society in terms of public health and coexistence with different species. This work suggests to carry out further research on prevention, treatment, and control measures of behavioral problems in animals, considering ethology, animal welfare, interactive and socio-cultural human-animal dynamics, according to the countries. **Conclusion**: Characterizing, segmenting, evaluating and comparing the most frequent behavioral diagnoses in canines and felines in each country, helps to enrich knowledge on behavioral dynamics in these species in different societies.

Keywords: Animal behavioral problems; feline ethology; canine ethology

BROWN BEARS AND HUMAN: HOW TO PREVENT CONFLICTS?

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

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The aim of the presented study is to analyze the factors that influence the behavior of solitary bears during encounters with humans and to evaluate the effectiveness of the traditional precautions aimed to reduce human-bear conflicts. We collected 1870 responses to a Russian survey conducted on the Internet between 2018 and 2019. For our study we divided the questionnaires into two groups: solitary bears and females with cubs. According to previous studies, solitary bears account for 53% of overall attacks on humans, compared to 47% corresponding to females with cubs. At the current stage of the study we selected 718 questionnaires that met the following criteria: encountered bears were solitary; encounters were accidental; responses contained detailed descriptions of situations; bears were close enough to see people and potentially able to do them harm. Respondents were tourists, wild harvest gatherers, foresters and others. Most of the encounters took place in the Arkhangelsk Region, Komi Republic, Karelia Republic and others.

Solitary bears demonstrated the following threatening behavior: in 14% of cases bears attacked or approached people, 5% - growled from a distance, 4% - approached people while growling, 1% - stood on hind legs, growled and approached. Upon seeing humans, in 27% of cases bears stayed, and in 49% ran away.

In order to prevent dangerous situations, while being in the habitat of bears it is advisable to travel in groups of at least two people because in the vast majority of cases (67%) people were alone when they encountered bears. It is not recommended to run away when you encounter a bear because it provokes aggressive behavior of a bear more often (64%) than if people stay still or slowly retreat (36%).

It is important to note that according to our data the use of loud frightening sounds increases the risk of bear attacks (people screamed, used firecracker (68% vs 32%).

Characteristics of urban environments and novel problem-solving performance in Eurasian red squirrels

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Dr. Pizza Ka Yee Chow [1]
1. _Hokkaido University; University of Exeter_

Urban environments can be deemed 'harsh' for some wildlife species. However, individuals frequently show behavioural flexibility such as solving novel food-extraction problems to utilise resources when coping with challenges posed by life in the city. As of yet, it remains unclear which urban environmental characteristics may become a stressor, and how they may fine-tune novel problem-solving performance. Here, we examined how four urban environmental characteristics (direct human disturbance, indirect human disturbance, size of green coverage and squirrel population size) may potentially influence novel problem-solving performance of a successful 'urban dweller', the Eurasian red squirrel. We presented a novel food-extraction problem to 71 free-ranging squirrels residing in 11 city sites that each had different environmental characteristics. Only 38 squirrels (53.5%) were problem solvers. We found that increased direct human disturbance ($P<0.001$), indirect human disturbance ($P=0.007$) and a higher squirrel population size ($P<0.001$) decreased the proportion of solving success at the population level. At the individual level, increased direct human disturbance ($P=0.014$), squirrel population size ($P=0.020$) and experience with the novel problem ($p<0.001$) decreased problem-solving time over time. These findings highlight that some urban environmental characteristics such as direct human disturbance exert forces on varying squirrels' ability to solve novel problems. This characteristic alongside other environmental characteristics shape two phenotypic extremes in the behaviour-flexibility spectrum; individuals either demonstrated enhanced learning, or they failed to solve the novel problem.

The Influence of a Novel Object on the Behaviour of Fallow Deer (Dama dama) in an Enclosure

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Urša Jakopin [1], *Dr. Janko Skok* [1]

1. *University of Maribor, Faculty of Agriculture and Life Sciences, Department of Animal Science, Pivola 10, 2311 Hoče*

Like other domesticated deer species, the fallow deer (*Dama dama*) represents a typical example of a species in the early phase of domestication; therefore, there is still a lack of research on deer behaviour under agricultural conditions and their response to changes in an enclosure. The novel object test provides rapid behavioural information to assess animal responsiveness (e.g., fearfulness) which is likely to be higher in species that are not yet fully domesticated. The aim of this study was to closely examine the behavioural pattern of fallow deer after the introduction of novel object (NO) into the enclosure. The herd was observed at the feeding station, the most frequently visited part of the enclosure. We installed the NOs (abstract object/installation, camping chair, colourful boxes, horse shaped toy) in the enclosure for five days with intervening controls (periods without NO) of five days as well. Results showed that frequency of occurrence and time spent at the feeding station decreased in the presence of NO ($p < 0.05$), and this effect was much stronger when NO had an animal form (horse shaped toy). When considering the type of activity (movement, stationary behaviours, feeding), results demonstrate that feeding and stationary behaviours changed after the introduction of an animal-shaped NO, with the rate of animals that were stationary in the presence of the animal-shaped NO decreased (24%, in contrast to 38-39% in control/Non-animal NO), while feeding behaviour increased (57% vs. 42-43%). Remarkably, an animal-shaped NO (horse shaped toy) also caused frequent complete absence of animals at the feeding station; they were mostly sighted only in the early morning and evening, when control frequencies were also highest. The results provide evidence that NO can still cause some activity disruption of a farmed fallow deer, although the diurnal rhythm of the appearance does not change ($p > 0.05$). However, farmers should be particularly attentive when implementing changes/novelties in the fallow deer rearing area (enclosure) to avoid the disturbance a novelty can cause.

Fur chewing in blue fox vixens: is it associated with proactive coping style?

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Eeva Ojala [1], Dr. Jaakko Mononen [2], Dr. Tarja Koistinen [2]
1. University of Helsinki, 2. Natural Resources Institute Finland (Luke)

Chewing one's own fur is a form of self-injurious behaviour that can be regarded as an indicator of impaired welfare in farmed fur animals. We studied the association between fur chewing and coping style in blue fox vixens. The measurements were carried out in February-March on a private Finnish fox farm in 2017 (n = 660), 2018 (n = 156) and 2019 (n = 577). Each fox was included in the data only once, i.e. in the year when it appeared first time on the farm. The age of the foxes was classified to four age categories (AGE): 1 yr (n = 498), 2 yr (n = 247), 3 yr (n = 307) and 4 to 7 (n = 341). The fur chewing status (FCS) of each fox was measured in a binary scale: no (0) or clear (1) signs of fur chewing. The coping style of the foxes was assessed with a 'coping style index' (CSI) based on three temperament tests: The Stick Test measures whether a fox explores (0) or not (1) a stick inserted into its cage by the assessor, the Subjective Evaluation of Human Animal Relationship measures whether a fox approaches the assessor (0) or not (1) as he/she approaches very close to its cage, and Feeding Test measures whether a fox eats (0) or not (1) in the presence of the assessor. The three test results were summed up to CSI that was used dichotomously in the statistical analyses: animals with the CSI 0 and 1 were interpreted to have a 'proactive coping style' (PCS) and animals with the CSI 2 and 3 a 'reactive coping style' (RCS). The results were analysed with a logistic regression model where FCS was the dependent, and CSI and AGE independent variables. There was a higher percentage of fur-chewers among the PCS (33.9%, 171/504) than the RCS (26.5%, 236/889) blue foxes (P = 0.00081, odds ratio = 1.508). Fur chewing was most frequent in the 2 yr animals (35.6%) and least frequent in the 4 yr or older animals (20.8 %), 1 yr (31.3%) and 3 yr (30.0%) being intermediate (P = 0.00018). Our preliminary results show that proactive coping style may be associated with an increased tendency for fur chewing. Further analyses are needed to understand the associations between the three behavioural tests, age and FCS more comprehensively.

Ethology and welfare in geriatric zoo animal: The case of bears in the National Zoo of Chile

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Stephanie Romero [1], Dr. Andrea Caiozzi [2], Prof. Hernan Cañon-Jones [1]

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Geriatric ethology and welfare of animals is increasingly important in zoological gardens, Animals is zoos tend to live longer than in the wild, and many pathologies emerge during the last year of the life of animals. These pathologies include muscle and bones problems such as osteoarthritis, eye problems such as cataract and metabolic diseases. Changes in behaviour may be useful to identify these health problems and allow to implement management measures to ensure the welfare of geriatric animals. We investigated the daily activity rhythms and activity budget of two bears of the National Zoo of Chile in Santiago, Chile. Diurnal activity budgets were recorded and evaluated in one male (20 years old) and one female (22 years old) brown bear from 10:00 to 17:30 in 5 days, using standard ethological methods. Also, diet, daily food consumption and number of visitors were recorded. The results showed that general activity was low, and not all expected behaviours were expressed by the bears. Bears were mostly laying (52% of time, and significantly higher during midday), followed by self-licking (12% of time). Interesentingly, the male was significantly less active (higher laying behaviour) during the morning and more active (higher locomotion behaviour) in the afternoon. In contrast, the female was significantly more active (locomotion) in the morning and less active (laying) in the afternoon. These results showed that geriatric bear become less active as aged. Also, our results unravelled the fact for a correct environmental enrichment specifically for geriatric animals, as they may need a different enrichment. The use of periodic evaluation of ethology in geriatric animals may be useful to ensure correct management and early detection of health and welfare problems.

Welfare assessment of elephants and wild felids in the Skopje Zoo

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Ena Dobrik [1], _Prof. Vlatko Ilieski_ [1], _Prof. Miroslav Kjosevski_ [2]
1. _Animal Welfare Center - Faculty of Veterinary Medicine - Skopje,_ **2.** _Faculty of Veterinary Medicine - Skopje_

Providing good animal welfare standards is very important for wild animals in captivity, especially in zoos. Despite this topic gaining immense popularity in recent years, there is a lack of research of this kind done in zoos. The aim of this study was to perform a welfare assessment of elephants and wild felids in the zoo using species-specific protocols. Data was collected from the Asian and African elephant, African lions, Euroasian lynx, Persian leopard, Siberian tigers and the jaguar in the Skopje Zoo. All species were observed for three consecutive days, during which time QBA was performed and they were observed for their daytime behaviour. Assessment was done on nutrition, environment, health and management, while wild felids were also assessed on reproduction. The data was descriptively analyzed in terms of the domains and behaviours. Results from the welfare assessment of elephants indicated that the most acceptable domain was nutrition with 50% of answers being scored as acceptable. The most questionable domain was physical health having 57% of answers scored as questionable. The lowest assessment score received the management of the institution having 57% of questions scored as unacceptable. Predominantly observed daytime behaviours of the Asian elephant were feeding (34% of the observation period) and stereotypic behaviour (30%). For the African elephant, the most recorded behaviours were feeding (42% of the observation time), and anticipatory (35%). Wild felids had similar results for the domains, particularly for nutrition and health ranging from 50-67% for nutrition and 52-70% for health, while the tigers had the best score for the environment 70% and all of them were lacking in terms of reproduction with 33% being the highest score for the lynx, leopard and tiger. Concerning the behaviour domain, the lynx had the best score (90%), compared to the male lion with the worst score (50%). Results from the QBA indicated that the most dominant descriptor of the elephants was 'uncomfortable' (296), compared to the least dominant 'playful' (83), while for the wild felids it was 'alert' (115), compared to the least dominant 'aggressive' (5). The zoo should focus on improving their management and husbandry practices. Also, it should provide enrichment and better veterinary care for all their species. This was the first study of its kind done in this institution and in the country. There is an urgent necessity for developing protocols for welfare assessment of zoos, especially in the context of species-specific protocols.

Defining human-wildlife relationship : a case discussion from high altitude Himalaya

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Martina Anandam [1] *, Mr. Vishal Ahuja* [2]*, Dr. Tariq Shah* [3]

1. Faculty of Agrobiology, Food and Natural Resources, Czech University of Life Sciences Prague, 2. Wildlife Information Liaison Development, 3. Osmania University, Hyderabad

In 2012, the authors led a study (Anandam et al, 2012) to map the distribution and conservation status of the then little known Himalayan langur (Semnopithecus ajax).The study surveyed 244 sites in the Chamba District, in the Western Himalayan Pir Panjal ranges, Himachal Pradesh, India. Community interviews (n=85) and direct sightings (n=39) confirmed the langur presence in 124 sites across the surveyed region. Questionnaire surveys were intended to ascertain the presence or absence of langurs and human-wildlife conflict, if any.

'Loss' and 'conflict', conventionally defined and characterized by hatred and violence against wildlife, were not the prevailing sentiments. No active violence was reported against the langurs other than distracting them with sounds or scaring away with stones and mirrors. We interviewed local villagers from these sites on their relationship with the langurs- 73% (n=76) reported crop loss to crop-raiding langurs. Despite crop loss, contrary to conventional expectation, only 15% (n=13)sites expressed an antagonistic attitude towards crop raiding langurs. The rest were either largely positive (n=28, 33%) or neutral (n=11; 13%). Apart from the subtle unease and frustration over lost crops and sustenance, there was overwhelming tolerance and acceptance of the status quo- contrary to our expectations. So, does this mean there is no need for conservation?

Using the Chamba survey as case study, we reframe our questions and challenge our previously held ideas of human-wildlife relationships as unidimensional constructs, albeit in the sophistication of hindsight. We ask: 1. What qualifies 'human-wildlife relationship as 'conflict' and who defines it? 2. Is conflict synonymous with crisis ? 3. How do such constructs advice conservation action in the region.

Definitions shape perceptions of human-wildlife relationships, affects a conservationist's reading of crisis or the lack thereof, and ultimately shapes conservation narratives. Beyond the statistics that are unfortunately limited by predetermined lexicons and templates, human-wildlife relationships are chaotically complex. Studies on human-wildlife relationships inadvertently tend to bend and fit their narratives to predefined definitions of 'conflict' (Peterson et al 2008), while looking for a crisis in the situation to justify conservation.

We attempt to revise and define human-wildlife relationship, conflict and crisis and understand how such constructs shape conservation narratives. With conservationists facing the challenge of garnering funds for biodiversity conservation, decisions based on insufficiently informed narratives could prove expensive. A more locale-specific definition and narrative could help in building smart, feasible, cost-effective, issue-specific, conservation model; lay the foundation for better conservation narratives.

Gaddi breed of livestock guard dog: A saviour of human-wildlife conflict in nomadic pastoralism

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Dr. Ankaj Thakur [1], Dr. Anurag Sharma [2], Prof. Pardeep Kumar Dogra [3], Prof. Adarsh Kumar [4], Dr. Ajay Katoch [5], Dr. Varun Sankhyan [6]

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Gaddi dog is the traditionally reared Livestock Guard dog (LGD) by the Gaddi nomads of Himachal Pradesh, India. Gaddis are nomadic pastoralists rearing nearly the 70 % of sheep and goat population of the state. Migration makes gaddis and their flocks vulnerable to conflicts with the wildlife. Twenty one flocks with average flock size of 167 (Goat and Sheep) were interviewed en route using structured questionnaire to assess the performance of Gaddi dogs in preventing livestock depredation. The perceptions of the Gaddi nomads were analyzed using Garrett's ranking score. Nearly one-third of the respondent farmers reported an increase in wildlife attack in the over a period of past 10 years. Wildlife responsible for higher predatory livestock losses were bears (ranked highest) followed by snow Leopard and wolves. The predatory losses accounted for 7.31 % in comparison to non-predatory losses which were 4.74 %. Majority (over 50 %) of the respondents showed strong dislike for wild animals and 100 % were of opinion that wildlife and livestock need mitigation strategies for prevention of predation over killing/removing entire wildlife. The perception of livestock owners was evaluated in terms of their satisfaction in rearing the guarding dogs. Among traditional combating techniques against depredation, corrals were proved to be more advantageous than using fire, loud noises and air guns during migration. Gaddi dog was reported to be more effective in preventing the livestock depredation when compared to other breeds of dogs, with 23.81% of the respondents reported no livestock losses when accompanied with the Gaddi dogs. The respondents reported decline in predation and rustling to be the major benefit of keeping Gaddi dogs while it's cost of rearing and presenility were the major disadvantages. Gaddi dogs scored higher than the other breeds of LGD in the behavioral characteristics viz. attentiveness, trust, protection and care. The predominant vices that Gaddi dogs exhibited were chasing vehicles and wildlife during migratory commute. Therefore, it can be concluded that the Gaddi dogs have proven to be a most effective non-lethal method in not only preventing the livestock losses due to depredation during migration. Promoting Gaddi breed of dog as LDG among Gaddi nomadic pastoralists can reduce the human-wildlife conflict and indirectly help in conservation of wild animals.

Effect of bull biostimulation on ingestive and resting behaviour of buffalo heifers

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Dr. Sunil Dutt [1], Dr. Madan Lal Kamboj [1], Dr. Dharma Sahu [1], Dr. Sanjay Choudhary [1], Dr. Chander Datt [1], Dr. Anjali Aggarwal [1]

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Biostimulation of buffalo heifers by exposing them to intact bull have been recently reported to improve growth and advance onset of puberty. Presence of bull in heifer sheds for direct exposure or in close vicinity for fenceline exposure may impact the ingestive and resting of the heifers which may have consequences on their performance. We studied the effect of bull biostimulation through direct and through fenceline contact on the ingestive and resting behaviour of buffalo heifers. Twenty-four pre-pubertal heifers were allotted to 3 groups of 8 each on the basis of age (16.09±0.17 months) and body weight (210.88±2.68 kg). In no bull exposure (NBE) group, heifers were not exposed to bull; in fenceline bull exposure (FBE) group, heifers were exposed to a bull through a fenceline contact round-the-clock and in DBE (direct bull exposure) group, heifers were exposed to bull through direct contact by bull twice daily for 6 hours (6.00-9.00 am and 4.00-7.00 pm). Heifers were fed similar rations as per Indian Council of Agricultural Research Buffalo Feeding Standards (2013), comprising seasonal green fodders and grain mixture to achieve a daily weight gain of 600 gm. The significance of differences among the variables was tested using one-way ANOVA in SPSS version 22 software. Mean dry matter intake (kg/day) and mean dry matter intake (kg/100 kg body weight) differed significantly ($p < 0.05$) among 3 groups; being highest in DBE (8.52±0.55 & 2.73±0.15 kg) followed by FBE (7.76±0.44 & 2.67±0.14 kg) and NBE (7.14±0.36 & 2.62±0.15 kg). Feeding time, watering time and rumination time (min/day) were lower ($p < 0.05$) in NBE (261.35±3.95, 14.36±0.77 & 344.76±6.75 respectively) than DBE (282.67±4.46, 16.86±0.90 & 368.79±6.30) and FBE (273.10±3.02, 16.32±0.94 & 361.61±5.58 respectively). Feed conversion ratio was higher ($p < 0.01$) in DBE and FBE than NBE. Feeding frequency, water drinking frequency, rumination frequency, idle lying time and idle standing time did not differ among 3 groups. Total standing time (min/day) in DBE (692.42±14.70), FBE (709.87±14.04) and NBE (774.21±9.97) and lying time (min/day) in FBE (724.62±13.51), DBE (744.56±15.37) and in NBE (665.79±9.97) were different ($p < 0.05$) among 3 groups. Final weights and daily weight gain after 8 months differed ($p < 0.01$) among 3 groups; being highest in DBE (310.34±8.02 kg; 0.764±0.02 gm) followed by FBE (289.33±5.19 kg; 0.678±0.02 gm) and NBE (271.07±4.49 kg; 0.545±0.01 gm). We concluded that biostimulation either by direct or by fenceline bull contact appeared to promote feed ingestion and rest in buffalo heifers.

Patterns of salt ingestion by horses

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Marissa Back [1], Prof. Katherine Houpt [2]
1. University of Florida, 2. Cornell University

Salt (NaCl) is a nutritional requirement for horses. Although we know how much salt a horse will ingest in a week, the frequency of salt ingestion has not been investigated. Our objective was to quantify the pattern of salt ingestion by horses.

A passive-infrared motion detecting camera (Moultrie Birmingham AL.) was used to detect a horse at the salt block. The camera was mounted at the level of the salt block (s). When motion was detected, 30 sec of video would be recorded.

The first location (A) was a university research facility. Eight warmblood mares ranging in age from 8-26 (mean age 16.7 ± 2.5;) were kept in groups of 3 and 5 in grassless paddocks. The identity of the horse could be determined in most cases from the number on its collar, although in some cases the number was not visible in which case the visit was recorded as Unknown. The percentage NaCl in the diet and the amount fed to each horse was recorded. The camera was left in each paddock for ten days or until each horse had visited the salt block at least once.

The second location (B) was a private boarding facility. Ten horses (5 mares and 5 geldings) ranging in age from 3 to 20 yr. (mean = 12.4 ± 0.2) were observed for two weeks. They could be identified by coat color and markings. They received no salt in their diet. They were ridden from 0 to 5 h per week.

The horses at location A licked salt 0.76 ± 0.15 times per day. The horses that received no salt in their diet licked the salt significantly more (0.8± 0.1) than those whose diet contained NaCl (0.7 ± 0.2, $P < 0.05$ Mann Whitney U test). The horses at location B licked the salt from 0 to 36 times during the 14 days of observation. They licked the salt 0.8 ± 0.2 times a day. There was no correlation between frequency of licking and time spent licking.Two of the 10 horses were never observed to lick the salt. There was a significant correlation between the hours the horses were ridden and the number of times they licked the salt (r= 0.89, $P < 0.05$).

The most interesting finding was that horses, even horses consuming the same diet, vary widely in the frequency of their licking salt, but average every other day.

Antecipatory behaviour of group housed horses trained to enter a horse chute with positive reinforcement

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Ms. Laize Guedes do Carmo **_[1]_**, **_Ms. Alice Reis [1]_**, **_Ms. Camila Trojanovski das Neves [1]_**, **_Prof. Pedro Michelotto [1]_**, **_Prof. Ruan Daros [1]_**

1. _Graduate Program in Animal Science, School of Life Sciences, Pontifícia Universidade Católica do Paraná, Curitiba, Paraná_

Positive reinforcement can be used to elicit positive emotions in animals. The aim of this study was to assess anticipatory behavior of group housed horses upon entering a handling area before and after training using positive reinforcement. Thirteen female adult horses were brought once daily to an animal handling facility (holding area and restraining chute) for 3 consecutive days in experimental week 1 (baseline period). In weeks 2 and 3 (3 consecutive days each week), half of the animals received positive reinforcement treatment upon entering the chute in one of the weeks following a cross-over design. During training, horses were offered 8 small pieces of food items (apple, carrot and molasses horse treats), during the control phase no positive reinforcement was applied. Horses were brought from the holding area to a restraining chute individually and kept for 2 minutes and then returned to the group in the holding area. Entering order was randomly assigned before experiment and kept constant throughout. Video recordings of the holding area and rear and front view of the chute were taken during the experiment. Data collection started 10 min after herd arrival in the holding area. Duration and number of times entering the area close to the gate that led to the chute was measured before and after restraining. Body posture, neck position, facial expressions and tail swing were recorded. Multilevel linear and logistic models using horse as repeated measure were built to assess behavioral change from baseline to treatment phase. Number of times approaching and time spent in the area close to the gate either before and restraining did not change from baseline to reinforced and control phase (P > 0.1). Horses did not change their body posture and tail swing across different phases (P > 0.1). Horses during the control phase had lower odds of showing lowered neck (OR: 0.09 95%CI: 0.01 – 0.45; P < 0.01) compared to the baseline while during the reinforced phase odds of showing lowered neck (OR: 0.24, 95%CI: 0.04 – 1.03; P = 0.07) were similar to those observed during baseline. We were not able to detect differences in the behaviors studied during the reinforcement phase. All horses ate at least part of the treats. Further analyses are being done to identify changes in facial expressions. Horses may not have showed marked anticipatory behaviors because housing conditions allowed for rich welfare level.

Heart rate responses in dogs vary across steps of a standard physical examination in mock veterinary setting

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

**Ms. Petra Edwards** [1] _**, Dr. Bradley Smith**_ [2] _**, Dr. Michelle McArthur**_ [1] _**, Dr. Susan Hazel**_ [1]

1. _University of Adelaide,_ **2.** _CQUniversity_

Companion dog welfare is contingent on regular veterinary care. However, many dogs are fearful of their veterinary visits, which can impact the safety of staff, dog welfare and accurate diagnoses. This research was approved by The University of Adelaide HREC (approval number: H-2019-014) and AEC (approval number: S-2018-093). This study aimed to identify the heart rate and behavioural responses of dogs to a physical examination in a veterinary setting. 30 healthy, privately owned dogs (70% female; 5.6yr ±3.9yr) of various breeds were recruited via social media and local veterinary clinics to undergo a standardised physical examination in a simulated veterinary clinic. Continuous heart rate (HR; bpm) was recorded using a Polar® HR monitor, and behavioural responses were coded using recorded video. A mixed linear model compared HR across different stages of the examination. The relationship between behaviour (e.g. tail and ear position) and HR was compared using a Pearson's correlation. The standardised physical examination was conducted in the same order, by the same examiner, for all dogs. Average HR in the 'consult room' was significantly higher than in the 'waiting room (123.5bpm ± 21.2bpm and 97.7bpm ±19.6bpm respectively; p <0.001). During the examination, the initial stage involving patting the dog (138.0bpm ±25.2bpm) and the final stage involving a mock vaccination (133.8bpm ±28.7bpm) had the highest HR (p <0.001), while examining the teeth had the lowest (109.6bpm ±28.7bpm). Approximately one third of dogs (11/30) had a HR peak over 180bpm during the physical examination. Some behavioural signs of fear (e.g. tail tucked below stomach, or ears back) were moderately correlated with increasing average HR for the physical examination, although other behaviours (e.g. number of lip licks, head turns, or duration of tail wagging/ ears forward) were not significantly correlated with HR. There was high variation between dogs in their stress responses (HR and behaviour) as they went through the stages of the physical examination. We suggest that heart rate can vary substantially within a standardised physical examination and a single measure during a consult may not be an accurate representation. HR and behavioural signs of fear were correlated, but further work is needed to evaluate the best measures of fear in dogs within a veterinary context.

Physiological response of pet dogs to different situations with their owners

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Dr. Megumi Fukuzawa [1]

1. *Nihon University, College of Bioresource Sciences*

While their owner is absent, a dog may often show separation-related anxiety behaviour. However, because minor anxiety does not appear as a noticeable change in behaviour, the owner may unable to detect it. We used heart rate as an index of mental state, and attached rubber electrodes (ver. 4; NOK Corporation, Kanagawa, Japan) that did not require pretreatment such as shaving, to six healthy dogs to detect biomedical signals. Each dog was held in a supine position with no anaesthesia, and three rubber electrodes (positive, negative, and ground) for recording biomedical signals (connected to a BITalino biomedical recording system; Lisbon, Portugal) were attached to the dog's chest (right and left intercostal and costal-cartilage junction). ECG waveforms were recorded continuously using Bitadroid (version 1.0). After confirmation of stable waveform, each dog was subjected, for two successive days, to two types of trial for each sex of their owner: "Separation" (the owner left the room but the dog remained there for 15 minutes) or "Staying" (remaining in a room for 15 minutes with the dog) after spending 5 minutes in the same room together. The interval between tests with different owners' sexes was set at two weeks. The waveform was continuously recorded during each trial.

Fluctuation of heart rate (bpm) over 20 minutes showed a similar tendency by owner's sex under both conditions, but the timing was different. The heart rate of dogs who experienced "Separation" with a male owner increased immediately after the owner left but decreased three minutes later. However, with female owners, the heart rate increased and remained high after the owner left, but decreased after 6 minutes. The average heart rate in each 15-minute period varied according to the conditions: it was significantly higher under "Separation" conditions (72.01 ± 24.19) than "Staying" conditions (69.93 ± 25.89) (t = 4.39, $p < 0.001$). The effect of the owner's sex was also observed. The dog's heart rate was lower during "Separation" from a male owner (69.74 ± 23.56) than from a female owner (74.75 ± 24.66) (t = 7.42, $p < 0.001$); however, there was no difference between during "Staying" with a male owner and a female owner. It appears that a dog is less anxious about its owner leaving the room if the owner remains with the dog for 5 minutes beforehand. However, dog heart rate variability is also affected by the owner's sex, so continued research is required.

Can horses recognise real-life objects from 2D computer projections?

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

**Ms. Sarah Kappel** [1]_**, Mr. Marco A Ramirez Montes De Oca**_ [2]_**, Dr. Sarah Collins**_ [1]_**, Dr. Katherine Herborn**_ [1]_**,
Prof. Michael Mendl**_ [2]_**, Dr. Carole Fureix**_ [1]

**1.** University of Plymouth, _**2.** University of Bristol_

Visual 2-dimensional representations (e.g. images) of physical objects are often used in studies of animal (including horses) cognition. Some evidence exists that horses can recognise objects from printed photographs, but it is unclear whether this is also true for computer projections. We expected that horses trained to recognise and discriminate between physical objects would show the same learnt response to computer images of the same objects (back-projected onto a 1.6m x 2.5m screen) as an indication of recognition. We first trained 27 riding school horses (4-26 years, mixed breeds) to touch one of two objects (colour and shape differed, counterbalanced) with their nose to instantly receive a food reward. After discrimination learning (three serial trials of 8 correct/10 trials; receiving 1-2 sessions per day up to five sessions in total), horses were immediately tested with on-screen images of the objects to test recognition. There were 10 trials using images with partial reinforcement delivered within 3s after the 1st and 3rd correct response (touching the image on screen with nose) to prevent the horses simply learning the task. Between image trials, discrimination learning was refreshed with real objects trials after image trial 3, 6 and 8. The handler remained blind (back turned to screen) and delivered the reward as directed by the experimenter, who was not visible to the horses' during image trials. Data were analysed using Chi-square and binomial tests (frequencies of correct responses), and linear regression (effect of age on performance). At first on-screen trial, 25 horses spontaneously responded to the images with the learnt behaviour suggesting that they recognised the objects now presented as images, although the number of horses responding correctly (n=14) and incorrectly (n=13) did not differ significantly (X^2_1= 0.03, p=0.8). Over the 10 trials, horses varied in their performance with only two animals performing significantly better than chance (both more than 8 correct/10, binomial test, p≤0.02). Horses were more likely to respond correctly on trials following trials with objects than on trials following trials with images (X^2_1= 8.45, p=0.003), suggesting a link with previous experience/learning. Aging predicted lower percentages of correct responses out of the 10 image trials ($F_{1,268}$= 42.77, p<0.0001). Our findings suggest that the horses overall did not recognise the objects as images, although some individuals did. Implications for further research will be discussed, including methodological refinements (e.g. nature of the learnt response we measured, object characteristics) to be investigated.

Environmental factors affecting problem behaviors in dogs in multi-dog households.

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Dr. Chie Mogi [1] **, Dr. Aya Fritz** [2] **, Ms. Mika Katsumata** [1] **, Mr. Shinichiro Hata** [3]

1. *Yamazaki University of Animal Health Technology, Laboratory of Animal Clinical Behavior,* **2.** *Animal Behavior Consulting Happy Tails,* **3.** *Smart Analytics, Inc.*

The purpose of this study is to evaluate whether problem behaviors in dogs increase in multi-dog households, and how they are modulated by experiential-environmental factors.

There was an online questionnaire identifying four behavioral problems in dogs in multi-dog households ("multi-dogs"), as well as questions about the owners and their dogs. The four behavioral problems, "breaking things and inappropriate behaviors while left home alone", "barking when the owner is leaving", "becoming restless when left alone", and "pulling on the leash when walking", were scored by frequency from never (1) to always (4), with the total score calculated as the problem behavior score ("PB score"). Data were analyzed by multivariable models to evaluate the factors related to problem behaviors in multi-dogs.

The study sample consisted of 723 dogs, of which 433 were multi-dogs. The PB score mean value was 7.99 (SD 2.75) (multi-dog 8.53, SD 2.70; single-dog 7.19, SD 2.65). The PB score for multi-dogs was significantly higher than for single-dogs (t-test $p < 0.01$).

In the multi-dog group, the cause of the significant difference in PB score was determined to be the age of the owners (ANOVA, $F_{(6, 716)} = 3.07$, $p < 0.01$), and multiple testing showed that there was a difference among the generations with the 60s as the axis. There were no significant differences in the effect of dogs' sex status in PB score.

The frequency of occurrence of the problem behavior was found to be higher in the multi-dog group than in the single-dog group in this study. This suggests that multi-dog groups are likely to be eliciting conflict and anxiety in the environment and social interactions. On the other hand, the sex of the dogs in the multi-dog household did not affect the frequency of problem behavior. Although the effects of sex hormones cannot be examined because we have not been able to survey the history of spaying and neutering, the sex factor did not relate to the behavior that occurs when separated from the owner and when walking on a leash. There was a significant decrease in problem behavior in dogs whose owners were in their 60s. Because their daily schedules and family compositions are different from those of other age groups, these owners are more likely to be at home and have more time to interact with their dogs. Increased time for training and interaction and decreased time away from home can help prevent multi-dogs' problems.

Provision of free-roaming outdoor access is not associated with lower reports of behavioural issues in owned domestic cats

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Dr. Anastasia Stellato [1] *, Ms. Sarah Tan* [2] *, Dr. Lee Niel* [2]

1. *Texas Tech University,* **2.** *University of Guelph*

Cat owners in Canada and the USA are generally encouraged to restrict their cat's free-roaming, uncontrolled outdoor access to reduce risks to the health and welfare of the cat, and to prevent predation of birds and other small animals. Confining cats indoors has been suggested to contribute to the development of behavioural issues and some have indicated that indoor enrichment might be protective; however, there is little evidence to support or refute these hypotheses. We used a cross-sectional study with companion cats to examine relationships between outdoor access, enrichment, and common owner-reported cat behavioural issues. An online survey was distributed to cat owners (N=7,793) in Canada and the United States. Six logistic regression models were used to examine associations between cat factors (e.g., age, breed, sex), provision of different types of enrichment (e.g., time spent playing, toys, training), provision of outdoor access (i.e., indoor, restricted access via direct supervision, enclosure, or leash/harness, and unrestricted access without supervision), and the following behavioural issues: aggression towards cats in the household, aggression towards people in the household, high levels of nighttime activity, excessive vocalizations, scratching furniture and belongings, and house-soiling. Overall, the highest prevalence for scratching (48.5%) was reported for indoor cats, nighttime activity (31%) was reported for cats with restricted access, and house-soiling (15.5%) was reported for cats with unrestricted access. Results of the logistic regression models reveal provisioning of outdoor access was associated with higher odds of aggression towards other cats through an interaction with the number of cats in the household (OR= 5.18, p<0.001), high levels of nighttime activity through an interaction with the cat's sex (OR=1.42, p<0.001), excessive vocalizations (OR=1.26, p=0.003), and house-soiling through an interaction with the presence of a medical condition (OR=1.53, p=0.001), in comparison to providing no outdoor access. Specific enrichment items, such as playing with the cat, training, olfactory stimulation, and exploratory items, were associated with lower odds of some behavioural issues (i.e., aggression to cats and people, scratching, and house-soiling). While these findings suggest that outdoor cats might be at higher risk for various behavioural issues, it is also possible that people are more likely to allow cats with behavioural issues outdoor access. Further, longitudinal research is needed to understand how different types of outdoor access and enrichment items influence the development of behavioural issues in cats.

Investigating the Effects of Housing and Social Interaction on the Welfare of Dogs in the Animal Shelter

Sunday, 1st August - 18:00: Companion and Wildlife Management posters - Poster

Dr. Lisa Gunter [1], ***Ms. Emily Blade*** [1], ***Ms. Liv Hagen*** [2], ***Ms. Rachel Gilchrist*** [1], ***Dr. Rebecca Barber*** [1], ***Ms. Larissa Vollin*** [1], ***Dr. Graham Brayshaw*** [2], ***Dr. Clive Wynne*** [1]

1. *Arizona State University,* **2.** *Animal Humane Society*

In animal shelters around the world, dogs' housing and daily husbandry procedures can vary considerably between facilities. Surprisingly, little attention has been paid in the literature to how such differences can affect the welfare of shelter-living dogs.

In this presentation, we'll describe research conducted at Animal Humane Society in Minnesota, USA, in which we investigated how housing as well as daily contact with other dogs affected the stress and immune function of dogs awaiting adoption. During the study, urine and feces were collected in the morning and evening over 12 days for cortisol and Secretory Immunoglobin A (S-IgA) analysis. Housing of a traditional and novel design were tested along with two types of social contact, no contact with other dogs or three, 15-minute sessions a day. Four conditions were tested in all, each lasting three days in duration. In total, 12 dogs participated in the study, and 288 urinary cortisol, 141 fecal cortisol, and 137 S-IgA values were used in our analysis.

We found that dogs' S-IgA values differed significantly when testing the effects of housing and social contact. Specifically, S-IgA values were higher when dogs were living in the novel-designed kennels, $F(1,76.68) = 4.24$, $p = .043$; and lower when receiving daily social contact with other dogs, $F(1,74.41) = 5.71$, $p = .019$. Cortisol values of morning and evening urine samples and daily fecal samples were all significantly correlated ($p < .01$). While the two-way analysis of variance using dogs' fecal cortisol values detected no main effects of housing or social contact, interactions were found. Particularly, dogs' cortisol values were highest when living in novel housing and receiving no social contact, $F(1,51.36) = 12.01$, $p = .001$; and were lowest when living in traditional kennels and receiving no social contact, $F(1,49.11) = 5.10$, $p = .028$.

These findings provide compelling evidence that dogs' housing conditions within the shelter and interactions with others can influence their stress, immune function, and ultimately, welfare. Further explorations are needed to understand how characteristics of kenneling, such as size, or the kind of social contact, be it with dogs or people, can mitigate inherent environmental stress and should be incorporated into daily practices to improve the lives of shelter dogs.

Emotion, Cognition and Behavioural Testing posters

Behavioural responses of two breeds of turkey poults in an open field test

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing posters - Poster

Dr. Samuel Durosaro [1] *, Dr. Oluwaseun Iyasere* [2] *, Dr. Babatunde Ilori* [1] *, Ms. Tejumola Odubola* [1] *, Mr. Adebola Adewunmi* [3] *, Mr. Victor Oyeniran* [2] *, Prof. Michael Ozoje* [3]

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Animal activities during open field test are used to detect behavioural genetic differences among breeds. Heritability estimates of open field behaviours have been reported; hence behaviours in open field are due to gene and environment. This study examined the effect of breed on behavioural responses of turkey poults in an open field test at 12 days of age. 25 each of white Nigerian indigenous and Hybrid Converter turkeys were used for the study. All the birds were raised together in the same home pen. At 12 days of age, birds were placed in the centre of a novel arena measuring 1m × 1m and subdivided into 16 equal boxes. Frequency of defecation and attempted escape was measured. Duration of floor pecking, vocalisation, sitting and preening was measured. Percentage of boxes explored was also calculated. All the behaviours were recorded for 300 seconds. A Wilcoxon Two-Sample test was used to determine the effect of turkey breed on the behavioural responses. The protocol used for the experiment was according to Animal Care and Use Committee of College of Animal Science and Livestock Production, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. All the behavioural responses differed between breeds except frequency of defecation, duration of floor pecking and duration of sitting. Higher vocalisation duration, frequency of attempted escape, preening duration and percentage of boxes explored were observed in Nigerian indigenous turkeys. This study concluded that breed differences existed in behavioural responses of turkey poults in an open field test with Nigerian indigenous turkeys being less fearful, more exploratory and comfortable in a novel arena. Environment enrichment materials could be provided for Hybrid Converter turkeys to reduce their fearfulness and improve their exploratory behaviours.

The importance of behavioural tasks terminology: methodological evidence

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing posters - Poster

Mr. Jorge Ferreira [1]*, Dr. Anna Olsson* [1]*, Dr. Ana Valentim* [1]

1. *Laboratory Animal Science, Universidade do Porto, i3S, Instituto de Investigação e Inovação em Saúde*

Animals' preferences are often used as the basis for experimental paradigms in neuroscience, such as where an environment considered preferred or aversive is used to test anxiety. This requires establishing the innate preference of each species. In zebrafish, some studies using the light/dark box paradigm report preference for the lit side of the apparatus, while others report scototaxis (preference for darkness). We here present a critical review of studies using this behavioural task, to understand the reason for the inconsistency.

The papers to review were selected in Pubmed and Google Scholar, using the keywords: "white + black + zebrafish", "white + dark + zebrafish", "light + dark + zebrafish", "light + preference + zebrafish", "dark + preference + zebrafish" "scototaxis + zebrafish". From 28 articles, we extracted information on the methodology and terminology used and the results obtained regarding side preference.

In this review, we found that apparatus compartments differ according with two dimensions: luminosity or background colour. However, the terms white/black or light/dark box are used interchangeably and without distinguishing between illumination level and background colour, two features to which zebrafish react differently.

To solve this we proposed a standardized terminology: the test would be named depending on the dimension used to create different compartments: white/black for set-ups varying the colour background- white/black and light/dark for set-ups varying the level of illumination.

When applying the proposed terminology to the 47 experimental situations reviewed, the outcomes would be coherent between articles, and the results would show that adult zebrafish present a preference for the brightly illuminated side of the tank with a dark colour and avoidance for a white/light colour background. This is in line with the natural behaviour of this diurnal prey species that need to camouflage in dark backgrounds. From the 28 articles studied, 75% of the studies had a methodology based on different background colour, and showed that adult wild-type zebrafish prefer a black/dark-coloured background. However, with the terminology used in the current literature, only 16% reported this preference with a correct reference to the background colour terminology, the others refer preference to the dark side. As the terminology light/dark is often used, studies relying on different luminosity levels generally (11 of 13 studies) use correct terminology.

The use of a standardized terminology would increase the coherence of reported results and should be enforced by authors, reviewers and publishers to a more reproducible science.

E 124 artificial dye leads dogs to express anxiety behaviors

Sunday, 1st August - 18:00: Emotion, Cognition and Behavioural Testing posters - Poster

Dr. Suellen Scheibel [1] *, Dr. Maria Camila Ceballos* [2] *, Dr. Mateus Paranhos da Costa* [3]

1. *UNESP, Faculdade de Ciências Agrárias e Veterinárias, Programa de Pós-graduação em Ciência Animal, Grupo de Pesquisa em Etologia e Ecologia Animal,* **2.** *University of Calgary, Department of Production Animal Health, Grupo de Pesquisa em Etologia e Ecologia Animal,* **3.** *UNESP, Faculdade de Ciências Agrárias e Veterinárias, Departamento de Zootecnia, Grupo de Pesquisa em Etologia e Ecologia Animal*

Food dyes have the purpose of improving the final product appearance. However, they can cause adverse effects on animals' metabolism and health. The aim of this study was to verify whether the consumption of the artificial dye ponceau red 4R (E124) leads to behavioral changes, indicative of anxiety disorders. The CEUA at UNESP/FCAV approved the experiment under protocol N° 007955/18. Twelve Beagles from 3 different litters (6 castrated females and 6 whole males), 3 years of age, and an average weight of 12.20 kg were enrolled. The study was performed at the Research Laboratory Professor Dr. Flávio Prada (Jaboticabal, SP, Brazil). Three diets were tested, differing only in the dosage of the dye E124: C=zero dye; T1=0.05% and T2=0.2%; or 8.77 and 35.08 mg dye/kg body weigth, respectively for T1 and T2. Dogs ate the control diet for 17 days (for adaptation purpose) and the test diets for 21 days. The study was repeated with the same dogs after one month. During the experiment, dogs behaviors were video recorded from 10 am to 5 pm. The frequencies of two behavioral categories related to anxiety (dog moves in a circular pattern (pacing) and show tap dance in place or hit the front paws on the wall and metal grid twice in a row or more) were recorded together. An elevated plus maze test was performed to check for possible changes in dogs' anxiety behaviors. Linear mixed model was used to evaluate effects of treatment. The random effect of dog was considered as a repeated measure within the evaluation day. We observed a significant effect of treatment on the frequency of the behavioral categories related to anxiety (P=0.002), with dogs from T1 presenting higher mean (2.83±3.0) than those from C (1.04±1.4) and T2 (0.33±0.5), which did not differ from each other. Significant effects were also observed in the frequency of entries (P=0.03) and time spent in the open arms (P=0.017) during the elevated plus maze test, with T2 treatment showing lower means (1.37±2.6 and 12.86±26s respectively) than the others (C=5.62±3.1 and 42.94±25.2s, and T1=4.87±2.7 and 69.74±40.3s), suggesting that they were experiencing a state of anxiety. The dogs from C and T1 groups did not differ from each other (P>0.05). We conclude that dye E124 can leads to behavioral changes that are indicative of anxiety in dogs, but more studies are needed to understand the effect of the dye concentration on the behaviours.

Welfare of Bovids posters

Measuring motivation in feedlot cattle: making trade-offs with an aversive stimulus

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

Ms. Rachael Coon [1], _Dr. Cassandra Tucker_ [1]

1. _Center for Animal Welfare, University of California davis_

Measures of motivation ask animals to pay a "price" to access resources. These often involve feats of strength or endurance (e.g. lifting heavy weights, jumping over barriers), where motivation may be masked by physical limitations. To avoid these ceiling effects, we asked animals if they were willing to tolerate an aversive stimulus, electric current, in order to gain access to additional resources. To evaluate if this novel approach could distinguish among levels of motivation, we tested the electric current feedlot cattle would voluntarily engage with to access additional food-based resources. Based on optimal foraging theory, we predicted that cattle would endure a higher current to access a high-calorie food than an additional offering of their primary diet. We also expected that animals provided with no additional resource would tolerate the lowest current. Twenty-four steers were each assigned exclusive access to 2 automated feed bins. One bin contained their primary diet, fed ad-libitum, and the other bin contained 1 of 3 treatments (n=8 each): 1) 0.6 kg of their primary diet (TMR), 2) 0.6 kg of corn and molasses (CM), or 3) Empty (E). Both the primary diet and the treatments were fed twice per day. To access a treatment, the steer would push his muzzle against an electrified barrier at the opening of the bin and it would rise above his head and out of the way. The barrier would then drop again when he removed his head from the bin. The current increased exponentially every 48h (0, 156, 312, 625, 1250, 2500, 5000 µA) until the animal ceased accessing the bin. Visits to the bin were recorded continuously 24h/d over the course of the experiment. The proportion of steers successfully accessing treatments at each current level was analyzed using a survival analysis (logrank). The steers differed in the maximum current they were willing to endure based on treatment (p=0.005; median maximum currents were 156, 625, and 1250 µA for E, CM, and TMR, respectively). Animals provided an empty bin were unwilling to pay a high price to access it. In contrast, animals chose to engage with a significantly higher current to access corn and molasses and were willing to pay an even higher price to contrafreeload. The steers made trade-offs between engaging with the current and accessing the treatments, suggesting that this system measures motivation effectively without physical limitations.

Do cows grazing marshland mind drinking ditch water of questionable quality?

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

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1. INRAE, DSLP, F-17450, Saint Laurent de la Prée, France, 2. UMR MoSAR, INRAe, AgroParisTech, Université Paris-Saclay, 75005 Paris, France

On grazing marshes, cattle drink water from the ditches surrounding the fields, which can be of variable quality. The objective of this study was to check if cattle prefer clean drinking water, shown by a higher usage, particularly by high-ranking individuals.

13 dry beef cows (Maraîchine) were observed in the marshlands of Rochefort (Charente Maritime, France) from late June to early August in a field ranging from 4 ha (3 ditches) at the start of the study to 8 ha (4 ditches) at the end. Number and location of drinking bouts in the ditches were recorded from 0600h to 2200h during the first four days. Cows were habituated to the presence of a watering trough of 800l during 6 days, until all cows had drunk from it. Afterwards, the cows had the choice between drinking the ditch or tap water from the trough, which was placed in the field at 30m from the nearest ditch (the prefered one). Dominance relationships were assessed during four mornings after the distribution of concentrate (1.5 kg per cow) in a feeder placed near the watering trough. The drinking location was recorded during 10 days, between 0900 and 1800h. The total quantity of water consumed by the herd per day was estimated based on the change of water level in the trough during 16 days, 8 of which coincided with the distribution of concentrate, 8 without concentrate.

The cows had a strong preference for one of the three ditches at the start of the study (70% of all drinking bouts), and for ditch water over tap water (median visits 7 vs 3, Wilcoxon, T=12.00, n=13, p=0.038), and of the four cows who either preferred tap water or showed no preference, only one was high-ranking. Tap water consumption was very high during two days, when the preferred ditch had run dry (31l and 63 l/cow compared to 6.5l/cow during the 6 other days without concentrate feeding). Tap water consumption was higher during concentrate-days (20.5 l vs 6.5 l, Mann-Whitney, W=22, p<0.01), maybe due to the thirst caused by the consumption of concentrate or by the proximity of the feeder to the trough.

Cows preferred ditch-water, and chose tap water mostly when there was no water in their preferred ditch or after consumption of concentrate, with the drinking trough nearby. Fresh drinking water was, therefore, an important resource only when access was easy or alternatives were limited.

Validation of a breath sampling method for its possible role in early warning for ketosis

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

Dr. Liesbeth Dingboom [1], *Dr. Lenny van Erp* [1]

1. HAS University of Applied Science

Introduction

Ketosis is a metabolic disorder associated with high production levels in dairy cows. These cows enter a negative energy state because of a high milk yield combined with a relatively low energy intake. Fat reserves will be spoken for and ketone bodies arise in breath and body fluids, which makes measuring possible. Traditionally, for diagnostic purposes, the occurrence of ketone bodies is measured in urine or milk with commercially available sticks. Breath analysis in dairy cows is relatively new and relevant for the development of automatic sensor systems for early warning. The purpose of this study is to validate the outcomes of breath analyses by comparing them with already accepted methods.

Methods

Six Holstein-Friesian cows were selected based on their estimated parturition date. Samples from breath, urine and milk were taken to determine the concentrations of acetone, acetoacetate and β-hydroxybutyrate (BHB). Breath and urine sampling was done weekly, from three weeks before to three weeks after parturition. Milk sampling was done weekly from parturition until three weeks after parturition. Breath was collected using a nostril sampler and Nalophan bags. The acetone concentration was determined using a Kitagawa® AP-20 pump with the acetone detecting tube 102SD (measuring range 20-5000 ppm per pump stroke of 100 ml). The acetoacetate concentration in urine was determined using commercial Keto test strips. Concentrations were given from <0.5 mmol up to 16 mmol per litre. BHB concentration in the milk was determined using a PortaBHB milk ketone test-strip. Concentrations were given in four categories from 0-99 μmol up to 500+ μmol per litre. All outcomes were converted to ppm. Correlations between the outcomes were tested using Spearman correlation analysis.

Results

The concentration of acetone in breath ranged from 7-88 ppm, acetoacetate in urine from 0-408 and BHB in milk from 0-200 ppm. Several times, no ketone bodies were found in urine (eight cases) or milk (five cases) while acetone was found in breath. No correlations were found between acetone in breath and acetoacetate in urine (correlation 0.251; p=0.166) or BHB in milk (correlation 0.159; p=0.491). The correlation between acetoacetate in urine and BHB in milk was 0.485 (p=0.026).

Conclusion

Outcomes from breath analysis as performed in this study appeared not to be comparable to outcomes of accepted ketone body measurement methods. However, breath analysis is promising for early warning because acetone occurred in breath while none was found (yet) in urine or milk.

Effects of physical enrichment items and social housing in pre-weaning pens on growth, behaviour and cognitive ability of post-weaning calves after regrouping

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

Mr. Chenyu Zhang [1], Dr. Darren Juniper [1], Dr. Rebecca Meagher [2]

1. university of Reading, 2. Dalhousie University

Housing unweaned calves individually in barren environments negatively affects their cognitive ability and adaptability to environmental changes when compared to social housing. Whether physical enrichment improves these abilities has rarely been studied. The study aimed to determine the effects of providing accessories in pre-weaning pens, pair housing calves, and the combination of both forms of enrichment on post-weaning calves' behaviour and cognitive ability. Forty-eight calves were assigned into eight blocks from 2 days to 8 weeks of age. Within block, calves were allocated to either individual (IP) or pair pens (PP). Half of the calves in each treatment were provided with physical enrichment (brushes, chains, teats, hay-nets filled with hay; PE). The remaining calves received no additional enrichment (NPE). Calves within each block were regrouped into one post-weaning pen at nine weeks of age and were video-recorded on days 1, 3 and 11 following regrouping; behavioural data were collected using instantaneous scan sampling at 5-minute intervals. Spontaneous object recognition tests were then conducted with a 15 and 60-minute inter-phase delay interval separately to measure calves' cognitive ability. A general linear model and generalized linear model were used to analyse data. In post-weaning home pens, PE calves expressed more exploratory behaviour and social sniffing than NPE calves ($F_{1,119}$ = 22.848, p < 0.001; $F_{1,119}$ = 16.904, p < 0.001). PP calves showed increased time spent on cross-sucking and "lie social (defined as lying within 30 cm of another calf)" than IP calves ($F_{1,119}$ = 18.466, p < 0.001; $F_{1,119}$ = 11.087, p = 0.007). The cognitive ability test measured how long after exposure calves recognised the object, indicated by different rates of exploratory behaviour. At a 15-minute delay interval, effects of physical enrichment items and pair housing on the discrimination of novel and familiar objects had interactions (χ^2 = 6.792, df = 1, p = 0.009); PE-IP calves spent more time touching the novel object than the familiar object than NPE-IP calves. At a 60-minute delay interval, PE calves spent more time touching the novel object than the familiar object than NPE calves (χ^2 = 3.834, df = 1, p = 0.05). In conclusion, provision of physical enrichment items seems to improve calves' cognitive ability and adaptability to novel environments. While pair housing improved calves' social skills, it resulted in cross-sucking. The combination of both enrichments showed no further improvement in calves' growth, behaviour and cognitive ability.

Expression of Basic Behavioral patterns in Bannur sheep under farm condition

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

Dr. Mahadevappa D Gouri [1], **Dr. Abdul Mateen K W** [2], **Dr. Uday Gajre** [3]

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The experimental sheep (Bannur breed) were observed for their basic behavior patterns for six hundred hours, six hours in a day during the study. The animals were maintained under standard managemental conditions with 4-6 hours of grazing during cooler parts of the day. Standard housing facilities were provided to all the animals. Study was done to construct the ethogram for bannur breed of sheep under semi-intensive farm conditions. Eight main behavioral categories consisting of forty-six different behavioral patterns were grouped under different headings, were used for the study. Behavioral categories included, gaits, animal oriented locomotion, visual patterns, object and self oriented contact patterns, vocal and non-vocal patterns, stretching patterns, stationary body positions and stances and feeding, digestive and elimination patterns. Sheep utilized the maximum time for grazing activity with occasional browsing on plants, trees, etc. Defecation and urination were the common patterns exhibited along with the feeding activities. Most of the activities were expressed during the day time. The rumination was observed during rest while the animals slept during night times. These results of the study indicated that the bannur sheep express maximum natural behavioral activities in free range system. Further the behavior patterns exhibited under confinement are only need based suggesting that the animal prefer an independent free movement space than enclosed systems.

Effect of management enrichment on memory based performance of Murrah buffalo calves

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

Dr. Sudip Adhikary [1], Dr. Pawan Singh [1], Dr. Rajashree Rath [1]

1. *ICAR- National Dairy Research Institute, Karnal, Haryana, India*

The purpose of management enrichment is to see the positive impact of environmental stimuli on memory of Murrah buffalo calves. Intensive husbandry usually offers limited opportunities for animals to perform their species-specific behavior and can lead to stress or impair cognitive development. The aim of the study was to investigate the effect of housing buffalo calves in individual calf boxes with or without social contact with con-specifics and provision of different environment enrichment stimuli on their cognitive development in long term memory based performance.24 Murrah buffalo calves were selected at birth, randomly allotted to four treatment groups of 6 calves each (T0, T1, T2 and T3) for an experimental period of 6 months. The calves in T0 (control) havingvisual, auditory social contact with calves housed in next boxes. The calves in T1 were groomed by using a curry comb brush twice a day for a period of 10 min each as management enrichment. The calves in T2 were isolated from each other and deprived social contact. The T3 calves having a provision of rubber nipple in the pen for dry suckling as management enrichment. The calves were trained in Y maze for 12 sessions of initial learning with milk feeding bottle hidden at white side and 12 sessions of reversal learning with bottle hidden at black side. The calves treated as qualified for learning in case they made more than 80% correct attempts in 3 consecutive training sessions. After successful completion of reversal learning they were kept as of their treatment group for 3 months, after that again reversal learning tested for three consecutive sessions.The calves were tested for average correct attempts in three sessions for analysis. Data were analysed with SPSS Version 17 using one way ANOVA and means were compared with Dunnett's Multiple Comparison test.The average mean of correct attempt in three sessions were 7.77±0.85, 10.84±0.22, 8.11±0.35 and 10.84±0.84 in T0, T1, T2 and T3 respectively. There is significant difference seen between enriched groups with non-enriched groups, i.e. T1 and T3 groups performed significantly ($p < 0.05$) better than T0 and T2 groups. But there is no significant difference between T0 and T2 groups and also not between T1 and T3.It was concluded that provision of artificial nipple as management enrichment inside the calfboxes and grooming with curry comb brush twice a day improved cognitive performance of buffalo calves on long term memory basis.

Assessing the impact of hot iron branding on calves' welfare: Skin temperature

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

Ms. Jaira de Oliveira [1], ***Ms. Mariana Parra Cerezo*** [1], ***Dr. Mateus Paranhos da Costa*** [2]

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Despite of the criticism, the use of hot iron branding for beef cattle identification is still a common method in Brazil, being a requirement of many Brazilian cattle breeders associations. The aim of this study was to assess the impact of hot iron branding on cattle welfare. The study was carried out in a commercial farm located in the state of Mato Grosso, Brazil, during the farm's normal husbandry routine of hot iron branding of 37 Nellore weaned calves (Bos indicus), according to the rules of the Brazilian Zebu Breeders Association, for the definitive register of pedigree cattle. The hot iron branding was performed by a veterinarian, while the calf was restrained in the squeeze chute. The skin temperatures were measured using a thermographic camera (CAT S60 FLIR MSXs Technology) before and just after applying the hot iron branding, and again for four days, on the brand and ~10 cm above it. A descriptive analysis was performed. In the analysis of every day both in the brand and outside the brand, the data showed a statistical difference ($p < 0.05$) in each of the moments when the temperature was measured. The mean of the skin temperature before and after the application of hot iron branding were 34.3±0.98 and 49.0±0.76 °C. In the following four days the average temperatures above the brand (34.3±0.79, 34.7±0.84, 34.6±0.89 and 33.1±0.95 °C, respectively) were slightly lower than the temperatures on the brands (35.1±1.07, 36.3±0.83, 35.4±0.92 and 33.4±0.99 °C, respectively), with a trend to be the same in the last assessment. In addition, at the time of hot branding there was an immediate transition from 36.6 °C to 59.9 °C, thus increasing by 23.3 °C. Considering that skin temperature is one of the signs of an inflammatory process, we concluded that it remains active at least for four days following the hot iron branding application, indicating that the animals are probably suffering with pain during this period. Thus, our results confirmed that, besides the immediate negative impact caused by hot iron branding on calves' welfare, due to skin burn, its adverse effect lasts for at least four days after its application.

Temperature-humidity based ventilation programming in a compost-bedded pack barn system: effect on the behaviour of dairy cows in a subtropical climate

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Compost-bedded pack barn (CB) plays a key role in the thermal comfort and welfare of dairy cows. However, there are few studies regarding ventilation program based on temperature and relative humidity and how controlling this environment would influence the behaviour of cows. We aimed to assess whether the temperature-humidity based ventilation system affected the behaviour of lactating dairy cows in a CB. A trial was conducted in a commercial CB located in Southwestern Paraná state, Brazil, between February and March 2020. Lactating Holstein cows (n = 13) were submitted to four different ventilation programs which were triggered when air temperature and relative humidity was equal or above: 25 ºC and 70% (T1); 25 ºC and 50% (T2); 23 ºC and 70% (T3); 23 ºC and 50% (T4), and each programme lasted seven days. The behaviour was assessed during 24h intervals with video recordings of each treatment. Videos were continuously scanned and the following behaviours were observed: lying and standing rumination, standing rest, water and feeding intake. Duration (minutes) and probability of occurrence (0/1 sampling) were analysed through a mixed-model in repeated measures procedure, using R software. We found an interaction between period and ventilation programs (P<0.001) probability for the occurrence of lying rumination and standing rest, as well as for the time of lying and standing rumination. No difference was found for feeding intake (P<0.08) or water intake (P<0,72). Regarding the probability of occurrence, cows were more prone to lying behaviour during T1 between 23:00 and 02:00 (approximately 0.6). Standing rest was less frequent when cows were exposed to T1 (above 0.3) between 09:00 and 13:00, followed by a reduction in the T3 programme after 16:00 (below 0.2). Cows spent more time in standing rumination (above 30 min.) during the T3 programme after 17:00. However, during the warmest hours (between 11:00 and 15:00), we observed that lying behaviour lasted longer (above 40 min.) for T1, followed by T3 and T4 and less for T2 (below than 30 min.). The behaviour of lactating cows was affected by the different ventilation programs, especially under the ventilation programme of 25 ºC air temperature and 70% relative humidity, cows showed more comfortable-linked behaviours, which indicated that this programming is promising for efficient environment control in compost barns in a subtropical climate.

Individual differences in the reactions of newborn Nellore calves to first handling procedures

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The aim of this study was to verify whether there are individual differences in the way that newborn Nellore breed calves react to the first handling procedures. The study was carried out at two commercial farms located in the state of Mato Grosso, Brazil. The handling procedures were carried out on the third day of calves' life, comprising the following activities: separating calves from their mothers, catching and restraint each calf by hand, umbilical cord dipping, and ID marking (ear tattooing and piercing). During these procedures, a stockperson was performing tactile stimulation of the calf, carrying out massage over the calf's body for one minute (30 s before and 30 s after ID marking), being hypothesized that this action could have a relaxing effect on calves. The qualitative behavior assessment (QBA) method was applied to assess the reactions of 196 Nellore calves (_Bos indicus_, being 71 pure and 125 F1 Aberdeen Angus x Nellore), considering 16 terms: 'afflicted', 'agitated', 'excited', 'apathetic', 'calm', 'comfortable', 'content', 'frustrated', 'happy', 'restless', 'inquisitive', 'irritated', 'fearful', 'relaxed', 'satisfied', 'tense'. A hierarchical cluster analysis, using the Ward's minimum variance criterion, was applied to define similarities and differences among individuals of each genetic group. Based on the classification dendrogram, three clusters were observed. For Nellore, the first cluster was composed of 15 calves (21.1%), which had the higher rates for 'afflicted', 'agitated', 'frustrated', 'restless', 'inquisitive', 'irritated', 'fearful' and 'tense', being classified as 'disturbed animals". The second cluster was composed of 39 (55%), with higher rates for 'excited', 'calm', 'content', 'happy', 'relaxed' and 'satisfied', being assumed as 'pleased animals', the third cluster was composed of 17 (23.9%) with higher rates for 'calm', 'relaxed' and 'satisfied', having a similar profile to the calves classified in the second cluster. Similar results were observed for the Aberdeen calves, the first cluster being composed of 45 calves (35.7%), the second of 53 (42%) and the third of 28 (22%). It is also worth to note that the 77.7% of the calves showed more positive reactions to the handling procedures, even though most of them were assumed as aversive. One possible explanation of such reactions is the potential relaxing effect of tactile stimulation for some individuals, which may have been modulated by the temperament of each calf. Based on these results we conclude that there are individual differences in the way that newborn calves react to the first handling procedures in both genetic groups.

Impact of social dominance and affinity on agonistic interactions in dairy heifers during the food supplement supply

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Disputes over limited food resources can motivate agonistic interactions among cattle, as during corn silage supply; the "winners" gain access to food. On the other hand, the affinity between individuals might reduce the effect of social dominance during the access to resources. A high affinity pair of animals is characterized when there's constant closeness to each other, especially when performing behaviors like grazing and idleness. The objective of this study was to evaluate the impact of social dominance and affinity among dairy heifers on the frequency of agonistic interactions. Nineteen Jersey heifers were raised under Voisin's Rational Grazing System, entering a new paddock every morning and receiving a silage supply daily on paddock. They were observed for seven days in a row. The proximity between animals was recorded every five minutes for seven hours (7:00 am to 11:00 am and 01:00 pm to 04:00 pm). At 04:00 pm corn silage was supplied, and agonistic interactions were then observed for one hour (04:00 pm to 05:00 pm). The collected data was analyzed by Tukey's HSD with Rstudio software. The social rank was determined from all agonistic interactions recorded, based on a sociometric matrix. The animals were then classified as High Rank (HR) or Low Rank (LR). Pairs were formed from all possible combinations between the animals of the herd, as: HH, when both individuals of the pair were HR; LL, when both were LR; and HL, when they were from different ranks (HR and LR). According to the proximity between the animals during the day, affinity was determined, being high, when their proximity was higher than the average of the herd. HH pairs had a higher frequency of agonistic interactions compared to pairs HL and LL (p<0.001), and these differed from each other, with LL showing less frequency of this behavior (p=0.027). These results suggest that LR animals compete less with each other than HR animals. This can be explained by the higher competition between HR animals and the constant "defeats" in disputes by LR animals. Also, because of that, LR animals presented fewer attempts to access the resource, and consequently, less frequency of dispute. Affinity among animals didn't influence (p=0.357) the frequency of agonistic interactions among them. This initial study indicates that affinity could have a minor role in the dispute over food resources, compared to social dominance.

Social dominance and affinity in allogrooming behaviour of dairy heifers

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

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Allogrooming is the tactile contact that an animal establishes with the body of a conspecific. Licking is the most common allogrooming behavior, which depends on the motivation of two animals to occur, one to lick (executor) and another to be licked (receiver). Some authors suggest that this behavior can be "requested" by the receiver. The aim of this work was to relate social dominance and affinity to the frequency of licking among dairy heifers. Nineteen Jersey heifers were raised under Grazing Rational Voisin, entering a new paddock every morning, and the observations happened for seven hours for seven days in a row. The allogrooming and proximity between the animals were recorded in the morning (7:00am to 11:00am) and afternoon (01:00pm to 04:00pm). All data were analyzed using the Kruskal-Wallis test with Dunn's post-hoc - Bonferroni method - using the Rstudio software. According to the frequency of agonistic interactions, the social order within the group was calculated based on a sociometric matrix. The animals were then classified in High-Rank (HR) or Low-Rank (LR). Pairs were formed from all possible combinations between the animals of the herd, as: HH, when the two individuals of the pair are from HR; LL, when both from LR; and HL, when different ranks (HR and LR). The frequency of proximity between animals was used as a measure of affinity. LL pairs had a higher frequency of licking each other compared to HH pairs (p=0.018). Comparing LL and HL there was a tendency (p=0.063) that LL pairs have a higher frequency of licking each other. And between HL and HH there was no statistical difference (p>0.05). As expected, a higher frequency of licking (p<0.001) was found among high affinity animals. Therefore, licking occurred more between LL pairs and high affinity pairs than HH and low affinity pairs. These results indicate heifers suffering more defeats in resource disputes and with high affinity perform more lickings among themselves.

Psychology drives physiology: A system dynamics approach to modeling emotional circuitry and cattle behavior

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**Ms. Xandra Christine Meneses** [1] _**, Mrs. Amanda Hubbard**_ [2]_**, Dr. Temple Grandin**_ [3]_**, Dr. Courtney Daigle**_ [1]

1. _Texas A&M University_, **2.** _Texas A_, **3.** _Colorado State University_

Animal temperament, or the amalgamation of complex emotional systems (FEAR, RAGE, SEEKING, PANIC), is critical to animal welfare due to its influence on the perception of stimuli and modulation of resulting behavioral responses. To evaluate the interrelationships between emotional systems and behavior, steers (n = 32) were subjected to a twice-repeated series of temperament evaluations (e.g. Open Field Test (OFT), Individual Startle Test (IST), Group Startle Test (GST), Bovine Zero Maze (BZM)) in random order across a 25-day period. Steers were weighed at beginning and end of the trial, and a 5-day minimum washout period occurred between tests. Individual exit velocities (EV) and chute scores (CS) at weaning and pen scores (PS) at study commencement were recorded. Cluster analyses (PROC VARCLUS) identified three primary clusters in the data: 1) FEAR and EV, 2) RAGE and CS, and 3) SEEKING/PANIC and PS. A preliminary causal loop diagram for the General Stress Response (GSR) was constructed to illustrate the attainment of the stress threshold, activation of coping mechanisms, and the erosion of the stress response. The GSR figure accounts for inter-individual variability in stress reactivity and is segmented into four loops: 1) initial response, 2) modification, 3) maintenance, and 4) recovery. The GSR figure was further translated into an S-shaped growth curve that illustrates the overshoot, oscillation, and collapse of neuromodulator concentrations throughout the body. Three additional causal loop diagrams were created for each emotional circuit cluster to describe the effect of handling and restraint on various organ systems, the origin and diaspora of neuromodulators throughout the body, and the resultant physiological and psychological consequences that contribute to the overall flight-or-fight response. The synergy between brain activity and cattle behavior is intricate yet effectively communicated through system dynamics modeling.

How does outdoor access affect the gait and hoof health of tie-stall-housed lactating dairy cows?

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Cows housed in stall-based housing, such as tie-stalls, have a higher risk of hoof and leg issues, particularly where no outdoor access is provided. Increasing movement opportunity through outdoor access can improve gait and hoof health in stall-based systems; however, little research on the subject has been carried out in tie-stalls systems – the predominate housing system in Canada. Our objective was to evaluate how regular access to an outdoor exercise yard affects gait and hoof health of lactating Holstein cows housed in tie-stalls.

Thirty cows, blocked by parity and DIM (n=6/block), were evenly assigned to one of two treatments: Exercise (1 h/d, 5d/wk of outdoor access for five weeks) and Non-Exercise (no outdoor access). Six gait attributes and overall gait were assessed via visual gait assessment at three data collection periods: before the study started (Pre-trial), study end (Post-trial), and 8 weeks post-trial (Follow-up). Hoof health was evaluated by claw lesion assessment and hoof surface thermography. Number, location and severity of claw lesions were recorded at Pre-trial and Follow-up. Hoof thermography using the original image analysis and normalized image was analyzed at trial week 1 and 5. Step activity was continuously recorded during the trial using pedometers.

Step activity did not differ between treatments; however, Exercise cows tended to express higher steps activity than Non-Exercise cows (705 ± 71.4 vs 518 ± 67.9 steps/d, respectively, P = 0.07). There was no difference between treatment and periods for changes in scores for overall gait or gait attributes (P > 0.05). Sole hemorrhage was the only claw disorder observed. The prevalence of claw lesions did not change for Exercise (7.50% to 6.67%; p = 0.58) or Non-Exercise cows (10% to 8.04%; P = 0.16) from Pre-trial to Follow-up. Similarly, there was no impact of time or treatment groups on the severity of claw lesions (P > 0.05). Original thermal image analysis showed no alteration in hoof temperature between treatment groups and times (P > 0.05); however, kurtosis obtained from normalized image analysis differed significantly between treatment groups and weeks (P < 0.0001). Although 1h of daily access to outdoor did not increase step activity or improve gait in our study, claw lesions and hoof thermography results suggest that adverse effects on hoof health also did not occur. Further research is needed to determine if providing different types or levels of outdoor access can be used to benefit hoof and leg health.

Calves are socially motivated

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Dr. Thomas Ede [1] *, **Dr. Daniel M. Weary** [2] , **Dr. Marina A. G. von Keyserlingk** [2]*

1. *University of British Columbia,* **2.** *Animal Welfare Program, University of British Columbia*

Most dairy calves are housed individually in the first weeks and sometimes months of their lives. Lack of social interactions can negatively impact feed intake, social skills, coping abilities and cognitive performance, but the motivation of calves to seek companionship has seldom been investigated. In this study (approved by UBC's Animal Care Committee) , 10 Holstein bull calves *Bos taurus* (averaging 5.4 ± 2.6 days old upon entering the study) were housed individually in a central home pen with access to one pen on either side, each connected by a push gate. One side pen housed another calf of similar age, and the second was otherwise identical but without a social companion. Each time the test calf pushed open the gate to access a side pens, he would be left in it until the next feeding at which time he was returned to the central home pen. After each successful pushing event, additional weight was added to the gate (initially a small amount, then incrementally higher). All calves but one pushed for the first time on day 1 of enrollment (within 9.4 ± 14.8 min of experimental start); the remaining calf pushed on the third day of the test. Each calf was tested for 15 days and we recorded the maximum weight pushed for both side pens. Calves pushed a higher maximum weight for access to the pen with a social partner compared to the empty pen (mean = +1.0 kg, SD = 1.3 kg, 95CI = [+0.08, +2.0 kg], t = 2.4, P = 0.04). We conclude that calves are socially motivated, even at a young age. These results suggest that calves can benefit from access to social contact.

Effect of social support on conditioned place aversion following hot-iron disbudding

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Ms. Emeline Nogues [1], *Dr. Thomas Ede* [1], *Ms. Raphaela E. Woodroffe* [2], *Dr. Daniel M. Weary* [1], *Dr. Marina A. G. von Keyserlingk* [1]

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The presence of a partner can mitigate the effects of a stressful or painful challenge in a wide range of social species. Cattle are gregarious and commonly housed in groups, but isolating animals is common practice when performing routine painful procedures such as disbudding. Using a conditioned place aversion (CPA) paradigm, we assessed whether dairy calves (n=25) find hot-iron disbudding more aversive when alone versus when with a familiar calf. All calves had been previously exposed to the CPA apparatus which included three equally sized pens: two "Treatment" pens with distinct visual cues connected by a "Neutral" pen. When calves were 30 d of age, one horn bud was cauterized in one of the treatment pens, and calves were randomly assigned to recover for 6 h either alone or with a pen mate (pairing was based on date of birth). The second horn bud was cauterized in the other treatment pen 2 d later, under the reverse treatment conditions (i.e. those who first recovered alone did so with a partner, and vice-versa). All calves received a sedative and a local anesthetic at the time of disbudding, and an NSAID (Non-Steroidal Anti-Inflammatory Drug) after the 6 h conditioning session. CPA was tested 2 d following the second conditioning session; calves were returned to the test apparatus and given free access to both treatment areas and the neutral pen for 1 h, or until they laid down for a minute. Re-testing was done on the following 2 d. The difference in time spent in each treatment pen was analyzed using a linear mixed-effects model accounting for pre-exposure preference, test session, treatment pen colour, order of the treatment, horn side. There was no effect of treatment on CPA (p>0.05; Satterthwaite's method), but there was considerable individual variability in response. This individual variation was not associated with the strength of the bond with the companion calf, as assessed using time spent in proximity and behavioural synchronization (standing or lying) in the home pen. Those were recorded over a 24-h period prior to any disbudding procedure by instantaneous samplings at 5-min intervals. These results are not consistent with the idea that a social partner mitigates aversion associated with recovery from hot-iron disbudding. More investigation is necessary to understand whether pain would be too strong to be buffered by companionship, or if the CPA paradigm would not be an appropriate method for this research question.

Lying behaviour of dairy cattle managed in muddy conditions in a pasture-based system

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Dr. Heather Neave [1] , Dr. Karin Schutz [1] , Dr. Dawn Dalley [2]
1. *AgResearch,* **2.** *DairyNZ*

Dairy cattle are motivated to access dry lying surfaces and will seek protection from wind and rain, but winter conditions in pasture-based systems may not always provide these opportunities. The aim of this observational study was to determine the effects of weather and soil conditions on lying behaviour of dairy cattle managed outdoors and fed crop, which is common practice in winter for some regions in New Zealand. Four herds (99 non-lactating cows each) were managed on four outdoor areas on the same farm and offered kale or fodder beet with pasture silage. Lying time was recorded using validated Hobo pedometers on thirty cows in each herd over 31 d. Soil conditions (mud depth with a ruler, surface wetness with a visual 'gumboot' score, and presence of surface water pooling) were scored daily at 25 points within each outdoor area. A mixed regression model tested the effects of daily weather and soil conditions on daily lying time, with herd as the observational unit and random intercepts of day, herd, and outdoor area within herd. Over the study period, rainfall averaged 1.6±2.4 mm (max 12.2 mm), and soil sample sites averaged 6.3 cm depth, 34.6% wet or sodden, and 27.3% had surface water pooling. Herd lying time averaged 9.6±3.1 h/d; however 20% of cows were below 8 h/d (4.9 to 7.9 h/d). Lying time was lower on the day of and day after rainfall ($P<0.001$), but two days after rainfall, lying time rebounded to about 1 h greater than before the rainfall ($P=0.03$). On the day after a heavy rainfall event (12 mm, typical of 5 yr local average), herd average lying time was just 2 h/d; one kale and one fodder beet herd had 30% and 38% of cows that did not lie for 24 h, respectively. Lying time decreased with deteriorating soil conditions (increased mud depth, % of sites with surface water pooling, and % of sites scored as wet or sodden); $P<0.02$. When all measures were considered in the multivariable model, percentage of surface water pooling remained significant ($P < 0.01$), suggesting that this may be a useful measure to indicate if lying time is compromised. Together our results demonstrate that dairy cows can experience periods of low lying time during inclement weather and muddy soil conditions; prior rainfall and surface water pooling may be useful measures to determine if lying time, and thus animal welfare, are compromised.

Successful training of latrine use in calves unlocks possibilities to reduce GHGs

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Ms. Neele Dirksen [1], Dr. Jan Langbein [1], Prof. Lars Schrader [2], Prof. Birger Puppe [1], Prof. Douglas Elliffe [3], Ms. Katrin Siebert [1], Mr. Volker Röttgen [1], Dr. Lindsay Matthews [3]

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Due to high ammonia and other greenhouse gas (GHG) emissions from livestock farming, both technical and behavioural solutions for reducing discharges need to be developed. Ammonia is formed when faeces and urine come into contact. A behavioural approach to facilitate separation of excreta would be to train cattle to use a latrine. Reliable latrine use would require cattle, like other species, to learn to control a range of voluntary and reflex responses associated with toileting. So far, this has not yet been reliably demonstrated. In a proof-of-concept approach, we aimed to determine if it is possible to train calves to use a latrine for urination.

A total of 16 female Holstein calves received 15, 45-min sessions of latrine training. The training procedure was approved by the Federal Committee for Animal Use and Care of MV (file reference: 7221.3-1.1-002/18). The calves were injected with a diuretic to increase the urination frequency during training. In phase 1, we enclosed individual calves in the latrine and rewarded them for each urination, thus, creating an association between urination and reward. In phase 2, the calves could choose to remain outside of, or to enter, the latrine to urinate. Any urinations initiated in the alley were immediately followed by an unpleasant stimulus (3 s water spray). We rewarded urinations in the latrine as in phase 1. In phase 3, we increased the available area outside the latrine to test whether the calves continued to use the latrine to urinate as before. We analysed differences between the slopes of the learning curves in different phases using the Wilcoxon test. We used the Fisher's Exact Test to analyze effect of learning performance in prior phases on later learning.

The mean slope for the calves that showed reliable reward orientation in phase 1 was steeper (0.73 ± 0.08) than for the calves that did not (0.27 ± 0.03; $W = 60$, $P = 0.001$). Eleven calves were successfully trained to use a latrine for urination in phase 2. Calves that had shown reward orientation in phase 1 were more successful in phase 2 compared to calves that did not show this behavior ($P = 0.036$). In the final training phase, nearly three-quarters of all urinations were self-initiated in the latrine.

These results provide convincing evidence that cattle can be trained to use a latrine for urination. This innovative behavioural management allows for effective mitigation of GHG emission.

The use of maternal pheromones for the management of stress in cattle production: a systematic review

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

Ms. Elisa Codecasa [1] *, Dr. Míriam Marcet-Rius* [2] *, Dr. Alessandro Cozzi* [2] *, Prof. Patrick Pageat* [2]

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In cattle industry, husbandry practices can cause in animals stress-induced responses impairing both welfare and productivity. The synthetic analogue of bovine appeasing pheromone (BAP) reproduces the original maternal substance secreted from the dam during calving. Since BAP has calming effects, it aids animals to cope with challenging events. Studies carried out between 2001 and 2020 were performed to evaluate the BAP effects during the pre-weaning period, the weaning, the feedlot entry, the transport and the changes in management routines; these moments are considered stressful and they can lead to health and behavioural problems, low growth and losses in yield and quality of meat and milk. It is the aim of the authors to hereby provide a comprehensive review of the existing literature on BAP application. The data suggest the positive effect of BAP on sanitary, zootechnical and economic parameters. On pre-weaning dairy calves the BAP application was associated to greater body weight (BW) and to a reduction of the treatment costs for pharmacological interventions. At weaning, treated beef calves showed faster grew, greater BW and food intake and improvements in temperament; moreover, BAP was associated to greater serum concentrations of antibodies against bovine viral diarrhea virus and lower plasma concentrations of haptoglobin and lower hair cortisol concentrations. The fattening period is known to impair animal immunocompetence and growth and is characterized by an elevated incidence of bovine respiratory diseases (BRD). The BAP application seemed to enhance feed efficiency, increase BW and physiological parameters such as plasma glucose and β-hydroxybutyrate concentration. Regarding the BRD, preliminary results show an association between BAP and a reduction of the number of animals presenting clinical signs as well as the reduction of the expression of the gene encoding interleukin 6. Concerning the transport, data suggest that BAP can decrease the risk in occurrence of dark, firm, and dry cuts and maintain the pH at levels below the threshold considered as critical. About dairy cows, BAP application during turn out from confinement to pastures was associated to greater milk yield and less milk somatic cell count, suggesting reduced stress caused by the change in management system. Besides, recent research on mechanisms underlying the perception of pheromone signals helped to elucidate the role of the vomeronasal type-1 receptor 1 (VN1R1) in pheromone transport activity in the bovine species. To conclude, chemical communication deserves more exploration and pheromone-based treatments could be an effective alternative to improve cattle management.

Monitoring reactions of grazing animals to sudden artillery shooting noise.

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

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The aim of this study was to investigate if shooting noise affects welfare of grazing animals in proximity to a long-range artillery stand. Interviews of 14 neighbouring farmers were performed; two farms with dairy cows and heifers (A: 1 and B: 3.7 km from shooting range) and 1 farm with sheep (C: 6.3 km from shooting range) were selected for data collection. On farm B, nine dairy cows were instrumented with ICE tag activity sensors on their hind leg, and 19 dairy cows had GPS collars reporting positions every 5 minutes. Direct observations of sheep (N=12 (farm C)) and heifer (N=8 (farm A)) behaviour were complemented with video from GoPro cameras and a drone. Data were collected before and during test shooting. Noise and vibration measurements were performed at the same three farms. Observations of animals engaged in pre-defined behaviours (ethogram) was scored using instantaneous sampling in five-minute intervals throughout the video length, and also scored continuously for 10 minutes around each shooting. A total of 20 grenades were launched August 24th-25th 2020. Kruskal-Wallis comparisons were performed on the behavioral data and activity sensor data, using the Minitab 19. Sheep did not alter their behaviour or activity due to shooting noise, even with shooting noise being 90 dB. The eight heifers located close to the artillery range (1 km) reacted with startle responses, standing tense and listening more (50.3 vs. 10.6 % of tot obs), lying less (3.2 vs. 13.5 % of tot obs), grazing less (4.2 vs. 34.3 % of tot obs) and walking less (5.1 vs. 18.4 % of tot obs) while running more (21.5 vs. 1.2 % of tot obs; $P<0.01$) straight after, compared to more than 60 seconds after the last shooting. Shooting noise up to 101 dB was recorded at the heifer pasture. Adult dairy cows located 3.7 km from the shooting range experienced noise up to 66.9 dB, and displayed startle behaviour, but their activity (motion index) and behaviour on shooting days did not differ from control days ($P>0.05$). GPS data and drone surveillance on cows and heifers confirmed that animals gathered closer together and moved away from the noise. In conclusion, long-range artillery shooting noise affects the behaviour of grazing cattle. Whether the noise has negative affect on animal welfare depends on the duration of the test-shooting and the possibilities for habituation.

Relationships between body temperatures and behaviours in lactating dairy cows

Sunday, 1st August - 18:00: Welfare of Bovids posters - Poster

Mr. Jashim Uddin [1], **_Prof. Clive Phillips_** [2], **_Dr. David McNeill_** [3]

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The welfare of dairy cows is sometimes compromised by anxiety that could be indicated by changes in body temperature. We hypothesized that there was an association between external body surface infrared temperature (IRT) of lactating cows and behavioural responses to anxiety, using rectal temperature as a reference point. Approximately 50 cows were examined individually once a month for 3 consecutive months. Cows were excluded from the evaluation if > 300 d in milk, somatic cell counts exceeded 400x1000's cells/mL, or if dried-off, and so numbers declined over time. Monthly IRT thermograms of each cow's head and coronary bands of forelimbs were taken, and we collected data deemed indicative of anxiety (behaviour in a forced lateralisation test, behaviour in the crush, flight speed and rectal temperature) as well as potential confounders: temperature humidity index (THI) in the parlour and crush area and lactation variables. The hypothesized positive association between IRT and behavioural indicators of anxiety was found in the first month only, between IRT of both eyes and cows' sniffing behaviour in the forced lateralisation test. Associations between rectal temperature and behavioural indicators occurred in month 3, when rectal temperature was positively associated with both flight speed and crush score. Cow waiting time prior to being milked was negatively associated with limb IRT in each of the 3 months, and positively associated with the ratio of eyes to limb IRT in 2 of the 3 months, whereas no such associations were detected with rectal temperature. In the analysis across months there were associations between IRT and behavioural indicators, which suggested that limb IRT may relate to cow behaviour: limb IRT was negatively related to slow to medium walking, and the ratio of IRT of eyes to limbs was positively associated with a vertical, rather than horizontal, tail. No associations were detected between laterality and IRT or rectal temperature. The adjusted R^2 of the regressions across months was higher for IRT (eyes 86%; limbs 78%) than rectal temperature (63%). IRT had a high repeatability, particularly for both eyes, across the 3 months, whereas rectal temperature was not repeatable. We conclude that there are potential relationships between IRT and cow emotions, but it is important to account for confounders.

Human Behaviour Change for Animal Welfare posters

A key opportunity for improving horse welfare: the importance of rules in equestrian sport

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare posters - Poster

**Ms. Karen Luke** [1], **Dr. Andrea Rawluk** [2], **Dr. Tina McAdie** [1]

1. _Central Queensland University,_ **2.** _University of Melbourne_

Calls for adopting more humane horse training practices have been made for over two decades, with scholars repeatedly identifying practices that result in poor horse welfare, such as excessive rein tension (RT), overtightened nosebands (NB) and the riding of horses with their noses behind the vertical (BTV), contrary to the rules of dressage, including the practice of neck hyperflexion (rollkur). The foremost international equestrian body, the Fédération Equestre Internationale (FEI), describes dressage as the ultimate expression of horse training, reflecting a close connection between horse and human, yet known poor training practices persist. This review examines to what extent the poor practices of RT, BTV and NB continue to be practiced to gauge the industry response to calls for better training practices. Additionally, a key opportunity was identified that can encourage positive change. Full-text, peer-reviewed, published papers were reviewed between 2009 and 2021. The Science Direct and ProQuest Central databases were searched using the terms "horse", "equine", "dressage", "training" and "performance". These searches yielded 837 papers, of which 81 met the selection criteria. Of the 81 papers, 34.6%, 27.2%, 17.3% investigated BTV, RT and NB respectively. Other topics of investigation were dressage judging (19.8%), conflict/pain behaviour (4.9%), with the remaining papers (23.5%) investigating a variety of topics (percentages exceed 100% because some papers reported on multiple practices). Publication rates across BTV, RT and NB were reasonably consistent across the study period, with as many papers published in 2020 as were published in 2010, indicating that the poor practices flagged 20 years ago remain topical. The literature reveals dressage judging continues to be problematic with judges rewarding riding horses BTV, contrary to FEI rules. Lastly, comparison of two NB studies demonstrated the power of rules to affect change. Incidence of overtightened nosebands in dressage competition was reduced by 67% when overtightening was explicitly prohibited in the competition rules and objectively measured; despite competitors' dissatisfaction with the rule, they changed their practice. These results suggest the rules of equestrian sport represent an underutilised, powerful tool to promote best practice. Rewarding poor practice and/or failing to safeguard against it creates a self-perpetuating system of poor horse welfare, placing the long-term future of dressage at risk. Future work could explore the use of rules for promoting change across other equestrian sports (as well as dressage) so that the horse industry may be transformed into a sustainable industry that protects horse welfare.

Human behaviour change for cat welfare: an educational intervention

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare posters - Poster

Dr. Syamira Syazuana Zaini [1], **Dr. Claire Phillips** [1], **Dr. Jill Mackay** [1], **Dr. Fritha Langford** [2]

1. *Royal (Dick) School of Veterinary Studies. The University of Edinburgh. Easter Bush Campus, Midlothian. EH25 9RG. United Kingdom,* **2.** *Animal and Veterinary Sciences, Scotland's Rural College (SRUC). West Mains Road, Edinburgh. EH9 3J.United Kingdom*

To maximise the efficacy of educational interventions for supporting animal welfare, it is necessary to understand both human behaviour *and* human behaviour change. This paper illustrates the use of the Health Action Process Approach (HAPA) theory to understand both the current behaviour and behaviour changes of Malaysian veterinarians regarding post-operative cat care, namely the provision of appropriate bedding. HAPA was chosen as it focuses on 'self-efficacy' (pre-action, maintenance and recovery) and 'action planning' factors, which were shown in our previous research to be the main barriers to providing good post-operative cat care including bedding, which could, in turn, improve the identification of pain behaviours and provision of analgesics.

Surveys using HAPA items were developed and deployed pre-, post- and at a 2-month retention to evaluate a video-based educational intervention of post-operative cat care (focusing on bedding) sent to 150 Malaysian veterinarians. Each survey was available for eight weeks. The survey was designed to identify those who were already providing bedding (actors), those who do sometimes or would like to provide bedding (intenders) or those who were not providing bedding (non-intenders).

27 participants completed all three surveys. At the pre-survey, 40.7% were actors, 44.4% were intenders, and 14.8% non-intenders. In a series of hierarchal linear regression analyses, recovery self-efficacy was a predictor of action planning in providing bedding to cats (**β**: 0.635, p: 0.012), and accounted for 55% of the variance in planning to provide bedding to post-operative cats. Post- and retention survey, 55.6/59.3% were actors, 44.4%/40.7% were intenders, and 0%/0% non-intenders.

Although the sample size was small, the intervention directional effects were positive. The HAPA theory was helpful in categorizing human behaviour at different stages. However, HAPA theory limits our understanding of the connection between pre-actional (i.e. after the participant's developed an animal welfare-related intention) to action (i.e. participants that who already provide for animal welfare). This suggests that there is a possible gap in the application of HAPA theory in investigating other underlying factors such as non-conscious factors (i.e.: habit, emotion). These factors may have implications for cat welfare in practices. Having a better understanding of how these and other factors influence the human behaviour change for animal welfare is essential.

Enhancing stakeholder perceptions and Traveller/Gypsy horse owners' experiences of Traveller/Gypsy horse ownership

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare posters - Poster

Mrs. Marie Rowland [1] , **Prof. Cathy Dwyer** [2] , **Dr. Melanie Connor** [3] , **Dr. Neil Hudson** [3] , **Dr. Tamsin Coombs** [2]
1. *University of Edinburgh/SRUC,* **2.** *SRUC,* **3.** *University of Edinburgh*

Travellers/Gypsies are recognised ethnic groups in the UK and Ireland and horses are an important aspect of their culture. However, Traveller/Gypsy horse owners are often regarded as being responsible for poor horse welfare. Stakeholders and the general public associate practices such as fly-grazing (unauthorised grazing), tethering, indiscriminate breeding and abandoned horses with Traveller/Gypsy horse ownership. This study investigated equine stakeholders' perception of Traveller/Gypsy horse ownership and horse welfare. Furthermore, Traveller/Gypsy horse owners' attitudes to, and knowledge of horse care, husbandry and management were also investigated. A survey questionnaire was disseminated through an online survey platform to stakeholders (veterinary professionals, equine trades, animal welfare organisations and council officials) in the UK and Ireland, of which 103 completed the survey. In addition, 71 Traveller/Gypsy horse owners were interviewed in the UK and Ireland using semi-structured interviews. Likert- scale type statements were used to assess stakeholders' perceptions and knowledge of Traveller/Gypsy horse ownership. Analyses revealed that the majority of stakeholders (83.5%) believed that Traveller/Gypsy horse owners were unlikely to request the advice of their occupation. Eighty percent of stakeholders stated that their occupation had a negative perception of Traveller/Gypsy horse owners with 75 of the 103 respondents providing reasons for their response. Thematic analysis revealed that the most common view (44%) related to cultural stereotypes and discrimination. Respondents also referred to the horse's poor health and neglect (33%) and horse abandonment/fly-grazing (15%) as further reasons for the negative perception of Traveller/Gypsy horse ownership held by their occupation. Thematic analysis of the semi-structured interviews identified discrimination and cultural stereotypes as a main factor causing horse ownership difficulties for Travellers/Gypsies (82%). In particular, discrimination was cited as an obstacle in their ability to lease land for their horses (75%). This study is valuable in that it identified stakeholders' perceptions and Traveller/Gypsy horse owners' experiences of horse welfare and horse ownership. Consequently, these findings illustrate the need to enhance stakeholder perceptions and Traveller/Gypsy horse owners' experiences of horse ownership. As such, an intergroup intervention activity targeting both stakeholders and Traveller/Gypsy horse owners is outlined. Participants will be given the opportunity to work together with the aim of creating a greater understanding of Traveller/Gypsy culture, horse culture and horse welfare. Collaborative activities will include discussions, case studies and problem-solving activities. Intergroup contact is considered to be a powerful method for enhancing intergroup attitudes and experiences and for reducing intergroup tensions, discrimination and conflict.

An investigation into the perceptions of farmers towards dairy cow-calf rearing

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare posters - Poster

Ms. Olivia Bolton [1], *Dr. Gemma Charlton* [1], *Dr. Emma Bleach* [1]

1. Harper Adams University

Assessing farmers perception towards cow-calf rearing is important, to understand uptake of alternative rearing strategies and the barriers to doing so. Despite gaining increasing public interest, uptake of cow-calf rearing systems is currently minimal and early separation of cow and calf remains common in British dairies. Researchers wanted to understand why farmers may use cow-calf rearing systems and why others do not. Interviews were conducted with 11 British dairy farmers using different calf rearing strategies. Farmers were questioned about what they thought were the main challenges or benefits of cow-calf rearing methods. All interviewees agreed that calves reared by the cow would have increased weight gain and increased naturalness in their lives. However, conventional dairy farmers expressed concern regarding the potential for increased disease transmission and separation stress in cow-calf systems, stating; "Is it nicer for the calf and the cow? I dont know, maybe, maybe not. Whenever anyone can form a bond over time, is it worse to separate them later?". A common theme amongst cow-calf rearers, however was that calf health was increased by keeping calves with cows and that growth and welfare benefits outweighed the challenges of potentially increased separation stress. One stated; "this is a compromise, its not nice and the trade off is you allow the cow to be a mum and for her to hurt when she stops being a mum, or you dont allow her to be a mum at all. None are nice, but in my opinion the former is better". Cow-calf rearers also emphasised the increased value of their calves stating that "the calf reared by its mother is twice the calf reared by even the best calf rearer" and though there may be a loss in saleable milk, there are other financial benefits like improved health, faster growing calves, reduced labour and increased consumer willingness to pay. However, the financial impact of these systems was a challenge for all farmers stating; "If you want this system, how much will you pay for it?...the more money you've got the more likely you are to think about these sort of things". Farmers that reared cow and calf together suggested that the system required a change in attitude and priorities to be successful; that farmers must compromise on milk yield and control, and that they must "take a step back" and "share" to allow cows to rear calves in a more natural way.

Divergence in first-year veterinary students' attitudes about swine after lectures and a farm visit

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare posters - Poster

Dr. Beth Ventura [1], **_Dr. Perle Zhitnitskiy_** [2], **_Dr. Claire Terreaux_** [3]

1. _University of Minnesota, Department of Animal Science,_ **2.** _University of Minnesota, College of Veterinary Medicine,_ **3.** _Zoopole Développement, Centre Technique des Productions Animales_

While there is some evidence that sensitivity to animal welfare (AW) may decline as students progress through their veterinary training, exploration of the impact of specific educational activities on student knowledge and attitudes in this area warrants further investigation. First year veterinary students at the University of Minnesota (n = 103) were surveyed during the Spring 2019 Professional Development II course to document their knowledge, attitudes, and values relative to pigs, AW, and the swine industry before and after classroom and online lectures and a visit to a university farrow-to-wean farm. Quantitative (Kruskal-Wallis, Kendall tau-c and Chi-Square) and qualitative (content analysis) analyses were used to identify shifts in knowledge and attitudes and associations with demographics and use of the AW values of biological functioning, affective state, and natural living. Most students were female (85.4%), from urban/suburban backgrounds (68.9%), and did not wish to work with livestock (66.0%). Average knowledge scores (p < 0.05) and attitudes toward pigs (p = 0.0152) improved after visiting the farm, and encouragingly the visit seemed to break negative stereotypes of pigs as dangerous or intimidating to work with. However, the farm visit also appeared to "undo" knowledge about natural swine behavior among a segment of students. Satisfaction with AW on most commercial farms shifted after the farm visit (p < 0.001), with students valuing biological functioning becoming more satisfied (p = 0.0342) and more rural and swine-experienced students indicating increased satisfaction compared to those from urban backgrounds. In contrast, those referencing natural living (p = 0.0047) rated the toured farm as a poorer steward of welfare. Students' AW concerns relative to the visited farm included behavioral restriction in individual stalls and injury and lameness in group pens. Farm visits are an important tool in veterinary education, but may result in segmentation in student knowledge and attitudes relative to livestock behavior and welfare.

Investigating the Impact of Brief Outings on the Welfare of Dogs Living in US Shelters

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare posters - Poster

Dr. Lisa Gunter [1], Ms. Rachel Gilchrist [1], Ms. Emily Blade [1], Dr. Rebecca Barber [1], Dr. Erica Feuerbacher [2], Ms. JoAnna Platzer [2], Dr. Clive Wynne [1]

1. *Arizona State University,* **2.** *Virginia Polytechnic Institute and State University (Virginia Tech)*

Social isolation likely contributes to reduced welfare for dogs living in animal shelters. Human interaction is one of the most well-studied interventions in the shelter, yet little is known about how short-term outings of a few hours in duration without an overnight stay could impact the welfare of dogs awaiting adoption. Considering that previously tested in-shelter interventions of less than one hour have been shown to reduce cortisol and improve behavior, it is possible that out-of-shelter outings of a slightly longer duration could confer even greater benefits.

In the present study, we explored whether two-and-a-half-hour outings with a person away from the animal shelter would influence dogs' urinary cortisol:creatinine (C/C) ratios in the afternoon of the intervention as compared to ratios collected in the shelter before and after these outings. Additionally, dogs' physical activity via accelerometer devices were monitored to detect potential differences in activity intensity.

In total, 164 dogs participated in the study from four animal shelters across the United States, with 793 cortisol values and 3750 activity measures used in the statistical analyses. We found that dogs' minutes in the activity categories varied across the three days of this study ($F_{(20, 95)} = 41.78$, $p < 0.001$). In post-hoc comparisons, dogs were found to have spent less time in the lower activity categories during the afternoon of the field trip than any other time in the study ($p < 0.001$). Conversely, dogs spent significantly more time in the higher activity categories during the afternoon of the field trip than all other timepoints ($p < 0.001$).

Even after accounting for dogs' activity in our cortisol analysis, we found that their cortisol:creatinine ratios changed across the study ($F_{(4, 560.42)} = 6.29$, $p < 0.001$). In post-hoc comparisons, dogs were found to have significantly higher cortisol values on the afternoon of the field trip as compared to the afternoon of the day before ($p < 0.001$) and the afternoon of the day after ($p = 0.001$).

Although dogs' cortisol and activity returned to baseline the following day, our findings suggest that short-term outings do not confer the same stress reduction benefits as previously shown with temporary fostering. Nevertheless, it is possible that outings of this type benefit shelter dogs' distal welfare by increasing adoption prospects within the community and should be investigated further to understand this effect.

Training people to improve animal welfare: a longitudinal trial of laboratory animal personnel and rat tickling

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare posters - Poster

Dr. Megan LaFollette [1] *, Dr. Sylvie Cloutier* [2] *, Dr. Colleen Brady* [3] *, Dr. Marguerite O'Haire* [3] *, Dr. Brianna Gaskill* [3]

1. *The North American 3Rs Collaborative,* **2.** *Indep,* **3.** *Purdue University*

Although scientific knowledge of animal welfare has grown significantly, findings are not always applied into practice. An example of this is the positive handling technique called rat tickling, which mimics aspects of rat rough-and-tumble play. It improves welfare by increasing positive emotions, decreasing stress, and improving handling. Despite the benefits to rat welfare, 89% of laboratory animal personnel rarely or never use the technique. A previously identified barrier to implementation is a lack of knowledge about the technique and the intricacy of how it is done. Therefore, the objective of this study was to determine the efficacy of training programs to increase important outcomes related to rat tickling implementation. Our hypothesis was that targeted training would increase important outcomes such as implementation, knowledge, self-efficacy, familiarity, and beliefs in rat tickling and that hands-on training would have an additive effect.

Laboratory animal personnel currently working with rats in the USA were recruited via widespread online promotion. After completing a baseline survey, participants were semi-randomized to either an online-only training (n=30), online + hands-on training (n=34), or waitlist control group (n=32). At baseline, treatment groups were not significantly different in demographics or outcome measures (p's > 0.05). Both training groups received an interactive, visual training course in rat tickling. The hands-on training group also received a 30-minute training session specifically reviewing the hands-on components of rat tickling. Participants received a second survey directly after their assigned training and a final survey 2-months later. In each survey, participants reported on their beliefs, self-efficacy, knowledge, and implementation of rat tickling. Data were analyzed using general linear mixed models. Compared to baseline, both training groups reported increased correct implementation, self-efficacy, knowledge, and familiarity of rat tickling at 2-months follow up ($F_{4,176.5}$= 8.6, p < 0.001; $F_{4,177.5}$= 31.8, p < 0.001; $F_{4,155.6}$= 3.01, p = 0.02), while the waitlist group stayed the same. Compared to baseline, online + hands-on training participants also increased in their perceived control beliefs at 2-months (e.g., feeling in control of providing rat tickling) while the waitlist and online groups did not change ($F_{4,179.4}$= 3.5, p = 0.009).

Our findings indicate that both online and hands-on training can improve rat tickling self-efficacy, knowledge, and implementation. Additionally, hands-on training can increase perceived control beliefs. Therefore, there is potential to improve animal welfare through the creation of online, interactive training courses.

Identifying shelter dogs for use in animal-assisted therapy: a one-welfare approach

Sunday, 1st August - 18:00: Human Behaviour Change for Animal Welfare posters - Poster

Ms. Jacqueline Naud [1] *, Dr. Jacquelyn Jacobs* [1] *, Dr. Marie Hopfensperger* [1]

1. Michigan State University

Animal Assisted Therapy (AAT) is a structured therapeutic intervention, which has been purported to have numerous mental health benefits for the person involved. However, relatively little consideration has been focused on the welfare of the animal involved, including the identification of attributes for animals well-suited for AAT. Characteristics of animals that may be beneficial working with one population of individuals may be different from those working with another, yet there has been no developed selection criteria or research to investigate this question. Our goal is to develop a One Welfare program for survivors of sexual trauma, by incorporating shelter dog training into a human therapy program. In consultation with human social workers, the researchers developed a list of candidate attributes for the shelter dogs such as high levels of resilience, impulse control, social plasticity, frustration tolerance, cognitive flexibility, and empathy. A series of behavioral evaluations previously reported and validated in the literature were utilized to infer the list of candidate attributes. Activity in the kennel after behavioral assessments, as well as heart rate variability data, were collected to monitor the physiological stress response of the dogs before, during, and after the assessments. To confirm this list of candidate attributes as being beneficial to a One Welfare therapy program, we recruited individuals sharing similar demographics to the sexual trauma survivor population to participate in a pilot AAT program. Pre- and post-program, these individuals completed a variety of validated psychometric scales which measured the human-animal bond, the students' enjoyment of the experience, and their attachment to the animals involved. To evaluate welfare of the animal during AAT, salivary oxytocin and heart rate variability were collected. Behavioral indicators of a positive experience for the dogs include accepting food, initiating interaction with student participants, and obeying tricks and training. Based on preliminary data, 90.9% of dog participants displayed all three of these behavioral indicators. Preliminary data has also revealed that there is a statistically significant increase in mood (t = -4.5155, p < 0.0001), and decrease in stress (t = -6.0657, p < 0.0001) post-AAT for the human participants. Survey data also indicates that all participants have found the AAT exercise to be either very positive (84.1%) or somewhat positive (15.9%). From this, it can be concluded that regardless of the background of the dog, the students received some benefit out of the program. Data collection for this project is currently ongoing.

Social Behaviour posters

New adventures are easier with a buddy: Post-weaning behavioral differences in individual and pair-housed dairy calves

Sunday, 1st August - 18:00: Social Behaviour posters - Poster

Ms. Elizabeth Patton [1], _Dr. Beth Ventura_ [1], _Dr. Whitney Knauer_ [2]

1. _University of Minnesota, Department of Animal Science,_ **2.** _University of Minnesota, College of Veterinary Medicine_

Pair housing of pre-weaned dairy calves confers a number of benefits to calves, but effects on social behavior upon social grouping at weaning are poorly understood. Our objective was to assess the behavior of previously pair- (PP) or individually- (PI) housed calves after movement into group pens at weaning. We observed video footage of 5 calves up to 78hr following entry into weaned group pens (n=2 PP, n=3 PI; housed with their treatment group). We focused on synchrony of behaviors with other calves. Five min scan sampling was conducted in 6hr increments (0hr, 24hr, and 72hr after pen entry) to capture the following behaviors: lying, standing, or walking by self; and social lying, standing, or walking. Additionally, continuous sampling [frequency (n) or time (s)] was conducted for 6hr directly after pen entry to describe the following behaviors: self-groom, self-explore, self-locomotor play, cross-suck, social explore, kick, mock fight, mount, allogroom, social sniff, and social locomotor play. Data were aggregated for each calf over the observation periods; data were non-normally distributed and so the Kruskal-Wallis Rank Sum Test was used to assess differences in behavior between PP and PI calves. Results are reported as $\mu \pm SD$. In general, scans did not reveal substantive differences in recorded behavior categories, with the following exception: PP calves were more frequently observed to lay near a companion compared to PI calves (65 ± 9 vs. 40 ± 8 scans). Continuous sampling showed that PI calves spent more time engaged in self (383 ± 233 vs. 106 ± 45 s) and social locomotor play (266 ± 69 vs. 96 ± 22 s) and mock fighting (31 ± 16 vs. 7 ± 2 bouts) but less time self grooming (29 ± 17 vs. 79 ± 11 s) and exploring socially (71 ± 3 vs. 118 ± 12 s) compared to PP calves. Only PP calves were observed to allogroom. Though limited on sample size, these results suggest PP calves may be more socially adjusted and able to cope with novel stimuli after movement to weaned calf pens as compared to PI calves, lending further support to social housing for pre-weaned dairy calves.

Associations between personality and social behavior of group-housed dairy calves

Sunday, 1st August - 18:00: Social Behaviour posters - Poster

Ms. Katie Gingerich [1], *Ms. Samantha Kalman* [1], *Ms. Emily Lindner* [1], *Ms. Jailene Rivera* [1], *Dr. Emily Miller-Cushon* [2]

1. *University of Florida,* **2.** *University*

Evidence across species points to changes in social behavior as a potential indicator of individual welfare. Our objective was to explore the relationship between social behavior and individual differences in personality in group-housed dairy calves who were provided a shelter providing visual seclusion from pen-mates. We hypothesized that differences in personality may be correlated with social behavior expression in the home pen. Holstein heifer and bull calves (n = 32) were introduced to group pens at 2 weeks of age (8 calves/pen; 7.4 × 16.0 m). Each pen contained two shelters (3 sided; 1.2 m x 1.2 m) offering visual seclusion from the rest of the pen. Calves were offered 12 L/d of milk replacer via an automatic milk feeder. At 4 weeks of age, calves were tested in a series of standardized behavioral tests, including an open field and a novel object test. Behavior was recorded continuously for 24 h in the week following behavioral testing to characterize use of the shelters, social grooming, social lying, and social play behaviors. Through principal component analysis of responses during behavioral tests, two factors accounting for 73% of the variance were identified and interpreted as 1) "exploratory active," which was described by a shorter latency to contact the novel object and a greater duration of contact; and 2) "inactive avoidant," which was characterized by more time spent inactive and self-grooming and a greater latency to contact the novel object. Association between these factor scores and behavior were analyzed using linear regression. The "inactive avoidant" factor was negatively correlated with both duration of social grooming (P = 0.03) and social play (P = 0.015), suggesting that calves expressing inactivity and avoidance in response to novelty were less social in their home pen. The "exploratory active" factor was positively correlated with both the number of entries into an empty shelter (P = 0.05), and the number of exits from an empty shelter (P = 0.02), which may indicate an increased willingness for independent exploration of the environment. These results suggest that differences in the expression of social behavior in group-housed dairy calves in the home pen are mediated by differences in personality. Furthermore, avoidance of novelty, which is potentially reflective of fearfulness and pessimism, was negatively correlated with social interaction.

Evaluating sampling strategies designed to measure social behavior in drylot housed cattle

Sunday, 1st August - 18:00: Social Behaviour posters - Poster

__Ms. Claudia Lozada__ [1], Ms. Rachel Park [2], Dr. Courtney Daigle [1]

1. TAMU, 2. NCS

Efficient sampling strategies expedite behavioral data collection. While multiple studies have evaluated sampling strategies for core behaviors in cattle, few have focused on social interactions. To identify sampling strategies that accurately captured cattle social behaviors and brush use feedlot steers (n = 3 pens; 9 steers/pen) were observed from 8:00 to 17:00. Average bout duration (sec), total duration per day (sec), and bout frequency were recorded for allogrooming, bar licking, tongue rolling, and brush utilization. Frequency was recorded for headbutting and mounting. Data was extracted from continuous observation datasets using eight different sampling strategies and the results subsequently compared. Differences among sampling strategies were evaluated using a non-parametric One-Way ANOVA Kruskal-Wallis Test. Pearson correlation evaluated the strength of association between a specific sampling strategy and continuous observations. Bout duration for allogrooming ($P > 0.65$), bar licking ($P > 0.60$), tongue rolling ($P > 0.99$), brush use ($P > 0.99$), and mounting frequency ($P > 0.7$) did not differ from continuous observations. Tongue rolling ($r^{22} > 0.95$, $P < 0.0001$) and brush use ($r^2 > 0.70$, $P < 0.0003$) were best captured when cattle were observed from 08:00 to 14:00. When cattle were continuously observed from 08:00 to 14:00 or for 15 minutes every 30 minutes, allogrooming ($P > 0.2$) (frequency, duration), bar licking ($P > 0.95$) (frequency, duration), brush use ($P > 0.1$) (frequency, duration), heat butt ($P > 0.3$) (frequency), or tongue rolling ($P > 0.3$) (frequency, duration) did not differ from continuous observations. Observing cattle for 15 minutes every 30 minutes yielded the highest accuracy for all behavioral metrics and was considered the most effective strategy for comprehensively evaluating cattle social behavior ($r^2 > 75$; $P < 0.05$). These results provide insight into accurate and efficient sampling strategies that expedite social behavior data collection in cattle and will facilitate efficient generation of new knowledge regarding cattle social behaviors.

Farm Animal Housing and Enrichment posters

Environmental enrichment and feather pecking in chickens: a meta-analysis

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

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1. _Animal Biosciences, University of Guelph, Guelph, Ontario_

Feather pecking (FP) remains one of the largest welfare issues in chickens reared for egg production. One management strategy that is often recommended is to provide environmental enrichment – modifications to the environment to stimulate animals' biological functioning and psychological well-being. However, this management strategy has led to inconsistent results in the scientific literature. We conducted a systematic review and meta-analysis to integrate the results of 23 studies and evaluate the effects of environmental enrichment on FP in laying hens. FP outcomes were extracted and standardized together with other variables of interest: the presence of enrichment, production period when the enrichment started, housing type, beak trimming, bird strain, and age of the birds. Linear mixed models were created treating the experiment as a random effect in a two-step approach where 1) variables with $P < 0.30$ in univariable analysis were retained for 2) multivariable analysis. Variables with $P < 0.05$ were kept in the final models during the multivariable analysis with model selection and evaluation based on corrected Akaike information criteria, the root mean square prediction errors, and concordance correlation coefficients. Fifteen studies were conducted in non-cage housing systems and eight were performed in cage housing systems. Beak trimming status (no vs yes), the period in which the enrichment was started (rearing vs. laying period), strain (brown vs. white colored) did not meet the univariable selection criterion and were excluded. FP occurred at a higher rate in flocks without enrichment ($P < 0.001$), older flocks ($P = 0.001$), and flocks kept in caged housing ($P = 0.002$). These results confirm that environmental enrichment can reduce FP; however, combining environmental enrichment with other management strategies might be most effective in successfully managing FP.

Effect of simplified group housing on behavior, and incidence of bovine respiratory disease (BRD) of preweaned dairy calves.

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Dr. Essam Abdelfattah [1], **_Dr. Betsy Karle_** [2], **_Dr. Dana Yount_** [3], **_Dr. Grazia Machado_** [3], **_Ms. Melinda Lowe_** [3], **_Dr. Fernanda Ferreira_** [4], **_Dr. Terry Lehenbauer_** [5], **_Dr. Sharif Aly_** [5]

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Dairy cattle are a social species with a strong tendency to form groups. However, under commercial conditions, calves are separated from their dams 24 hours after birth and placed in individual hutches. A 2016 California survey revealed that 93.3% of dairies housed calves individually for the first 8 weeks of life to minimize disease spread. Furthermore, switching from individual to group housing can result in additional infrastructure costs. Previous research showed that group housing improves the behavior and welfare of calves. The objective of this field trial was to investigate the effect of modifying the current existing plastic hutch systems to allow for the benefits of group housing while minimizing the costs incurred by the producers. A total of 42 Holstein heifer calves on a Northern California dairy were systematically assigned by birth order to either individually housed (IH) (n=21) or group-housed (GH) (n=21). GH calves were kept in groups of 3 starting at 7 d and continued until 70 d of age. Groups were constructed by assembling 3 polyethylene hutches with a 1.5 x 3.6 m outside exercise area of wire panel fencing. Calves were offered grain concentrate ad libitum and fed milk from nipple buckets two times daily. Behavioral observations were conducted daily throughout the experiment during the morning milk feeding from the start of the milk meal to 60 minutes later. Instantaneous scans were performed at intervals of 10 minutes to record concentrate feeding, determined when a calf lowered its head into the feed bucket. Feeding was recorded between zero and 60 minutes for a total of 7 observations and the count of feeding events calculated per hour daily. The incidence of BRD was measured using the California BRD Scoring system, calves were considered BRD score positive if their total score ≥ 5. Mixed-effects negative binomial regression models with calf as random effect and observation day as repeated measures were used for behavior analyses. Our results showed that group housing had a significant effect on frequency of concentrate feeding (P=0.001). GH calves had greater frequency of concentrate feeding (0.15± 0.01 meals/h, 95%CI = 0.12-0.21) than IH calves (0.08 ± 0.01 meals/h; 95% CI = 0.06-0.10) during preweaning feeding period. The cumulative incidence of BRD in GH calves was 76.2% compared to 71.4% in IH calves (P=0.73). Our study findings show evidence that this simplified group housing provides benefits of social facilitation without detrimental effects on calf health.

Temperature-based control of ventilation system in a compost-bedded pack barn: effect on the thermal environment and behaviour of dairy cows in a subtropical climate

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Prof. Frederico Vieira [1], Ms. Karen Frigeri [1], Ms. Fernanda Danelus [1], Dr. Michelle Diehl [2], Prof. Edgar Vismara [1], Ms. Evelyn Ferraz [1]

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The compost-bedded pack barn (CB) has been widespread in tropical and subtropical regions. However, little is known about the ventilation control in this system and the underlying influence on the behavioural responses of dairy cows. We aimed to assess whether different ventilation programs in a compost-bedded pack barn system affect the environment and behaviour of dairy cows. A trial was conducted between December 2018 and January 2019, on a commercial farm in the Western region of the state of Santa Catarina, Brazil. The structure of the CB was composed of a rest area with a shaving bed with 825 m², feeding track and milking parlour attached to the facility. Multiparous Holstein cows (n=19) were used in the present study. The following temperature-based ventilation programs were assessed: when the ventilation system is triggered with air temperature equal to or greater than 19 °C (T1); equal to or greater than 22 °C (T2), and equal to or greater than 25 °C (T3). These temperature-based treatments were randomly applied and replicated eight times each. Each program lasted seven days and all animals were submitted to the respective treatments. The behaviours were recorded through direct visual observation, using 60-min scan sampling, resulting in three daily periods of observations (9:30 – 10:30; 14:00 – 15:00 and 16:30 – 17:30). We assessed the following behaviours: walking, standing and lying rest; standing rumination and ingesting water. Regarding the microclimate, we registered the air temperature, relative humidity. Based on this data, we estimated the temperature-humidity index (THI). We performed mixed modelling, using Bayesian inference. As results, cows subjected to T3 showed the lowest probability of standing rest and walking (probability of 0.5) and water intake (probability of 0.3), mainly during the hottest periods of the day (from 15:00), when compared with all treatments. For all treatments, the probability of standing rest increased with the rise in air temperature values. Otherwise, when THI values reached above 75, we observed a decrease in the lying rest and a rise in walking and standing rumination behaviours. However, during T3 treatment, the lowest THI values (72.5 – 75) were registered, followed by T1 and T2 (highest THI of 77.5). We concluded that the behaviour of cows was influenced by the ventilation programmes, mainly when ventilation was triggered with a temperature equal to or above 25 °C when cows showed behavioural levels of comfort in this livestock system.

Do different scratch mats influence hen behaviour in enriched cages?

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Dr. Victoria Sandilands [1], _Mr. Laurence Baker_ [1], _Ms. Jo Donbavand_ [1], _Dr. Sarah Brocklehurst_ [2]

1. SRUC, 2. BioSS

The EU Directive on laying hens says 'laying hens must have... litter such that pecking and scratching are possible'. In enriched (furnished) cages, litter is typically provided as layer's mash ("scratch feed") on a mat, but there are no requirements for mat size, location or makeup. Commercial furnished cages offer various scratch mat materials and sizes, which may influence behaviour. This study compared hen behaviour on four mat designs.

A commercial shed with 60-bird Big Dutchman (BD) cages was used. Cages were arranged over six banks and nine tiers. Twenty-four cages in banks 2-5, tier 5 (6 cages/bank) were used. Cages contained two scratch mats. Prior to flock arrival, some BD mats were replaced with other mat types in a balanced design, so that mats were equally represented across banks, cage locations, and cage sides. All mat pairs/cage were of two different designs: BD, Kovobel (K), Valli (V), or Zucami (Z), which varied in size, shape, and colour. Mat areas (cm^2) were: 927.5 (BD), 579.5 (K), 806.4 (V), and 2016.0 (Z). Hen behaviour at the mats was recorded at three observation points relative to scratch feed application at 30, 50 and 79 weeks of age. Observations were 1st (1 h 40 min-4 h 45 min since last scratch feed), 2nd (during/immediately after scratch feed), 3rd (40 min-1 h since last scratch feed). At the 2nd observation, only half the cages were observed (balanced for mat designs) to capture behaviour when scratch feed was most likely to be present. Behaviour proportions were analysed using Generalised Linear Mixed models (GLMMs) for binomial data, with logit link, and Linear Mixed models (LMMs) on angular transformed data. Fixed effects were age, observation, mat type and their interactions; random effects were bank, cage, cage.age, cage.age.observation and cage side within cage. Analyses shows results back transformed to proportions. This study was ethically approved by SRUC's AWERB. Proportions of birds on the mats overall were low and declined from 30 and 50 weeks to 79 weeks (0.028, 0.030, and 0.020, respectively; P<0.001). More birds were observed on Z (P<0.001), but relative to mat area, most birds were seen on K (P<0.001). Mat types had little influence on foraging behaviour. Foraging was highest when scratch feed was present (1st 0.000, 2nd 0.015, 3rd 0.000, P<0.001), but the amount of time observed foraging overall was small, and there was no evidence to suggest that mat design influenced foraging behaviour.

Single or mixed: Comparing behaviour of single- and multi-species groups of young cattle and broiler chickens on pasture

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

**Ms. Lisa Schanz** **[1]_, Dr. Sara Hintze_ [2]_, Mr. Severin Hübner_ [3]_, Dr. Kerstin Barth_ [3]_, Prof. Christoph Winckler_ [1]**

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The practice of keeping two or more species together has received little attention in research. Here we present a first explorative study comparing behaviour on pasture in multi-species groups of cattle and broiler chickens to single-species groups. In four 6-week cycles, two single-species groups (ten cattle and approximately 55 broilers, respectively) and one multi-species group (ten cattle with approximately 55 broilers) were observed on pasture. Twice a week, once in the morning and once in the evening, ten animals per species and group were directly observed using focal animal sampling for 6 minutes each. Behaviours including e.g. feeding, locomotion and interactions were recorded as frequencies or durations. Inter-observer-agreement between two independent observers was moderate to high. Due to the small sample size (n = 4 cycles) we present our results descriptively.

Cattle in multi-species groups spent on average 20 % ± 39 (mean, sd) of the time lying, while the percentage of lying time amounted to 30 % ± 42 in single species groups. Broilers in multi-species groups were out of sight (i.e., in hut) for 16 % ± 32 of the time and broilers in single-species groups for 25 % ± 36. Cattle in multi-species groups were feeding 63 % ± 41 (single-specie groups: 60 % ± 42), standing 9 % ± 2 (6 % ± 2) of their time and interacting with conspecifics 7 ± 13 (6 ± 13) times per hour. Broilers in multi-species groups were lying 19 % ± 30 (single species groups: 14 % ± 29) and foraging 50 % ± 36 (48 % ± 36) of their time and performed comfort behaviour 2 ± 5 (1 ± 5) times per hour.

While we cannot draw conclusions based on statistical differences, these first findings indicate that animals in mixed groups may influence the behaviour of the other species. For example, broilers may perceive cattle as structural elements of the pasture and therefore spent more time outside and less time in the hut than broilers in single-species groups. Cattle in multi-species groups may be lying less than cattle in single-species groups, due to the activity of the broilers. However, further research is necessary to confirm these first results and to investigate the reasons for such differences.

Severe and low competition at scarce and abundant feeder spaces result in deviations from the ideal free distribution in laying hens

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Dr. Janja Sirovnik [1], Dr. Bernhard Völkl [2], Prof. Linda Keeling [3], Prof. Hanno Würbel [2], Dr. Michael Toscano [4]

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The ideal free distribution (IFD) of competitors in a heterogeneous environment often predicts habitat matching, where the relative number of individuals using any two locations matches the relative availability of resources in those same two locations. The IFD may depend on the level of competition among animals. We applied the habitat-matching rule to microscale foraging decisions between two feeders. Total feeder space and the ratio of the space at the two feeders were systematically varied in 10 pens while hen density in the pens stayed constant. This was done by covering different proportional sections of each of the two lines of the feeders so that pen-specific feeder space was provided in different ratios (resource ratio) and a single continuous section of each feeding site was accessible for feeding. Aggression and jostling at the feeder were analysed continuously for 3 minutes for each feeder space and resource ratio and the presence and position of each hen at the feeder was identified at each 30-second-time step. To construct confidence intervals for the expected IFD slope we used simulated re-sampling, where for each trial and each time point we randomly re-allocated hens to feeders with probabilities proportional to the resource ratio and fitted a regression line through the origin to the simulated data. While for feeder spaces of 4, 18, and 27 cm/hen we see deviations from the IFD (slope=1), when birds are offered 8 and 10 cm/hen feeder space, the observed slopes fall squarely into the range of expected slopes under IFD. There was a strong decrease in aggression with greater feeder space ($p<2\times10^{-16}$), though an interaction existed between feeder space and resource ratio for aggression (p=0.001). Birds were jostling less with increasing feeder space ($p<2\times10^{-16}$). We show that hens feeding from two non-depleting feeders distribute proportionally to feeder space under intermediate levels of competition. However, when a resource is scarce, access is restricted to individuals with high resource holding potential leading to an increase in competition and deviation from the IFD. The distribution of hens also deviates from the IFD in the case of resource abundance, when social attraction or preference for specific locations rather than competition determines distribution. We demonstrate that IFD is sensitive to competition and highlight IFD's potential as a biological basis for determining minimal resource requirements in animal housing.

Sows housed outdoors have different approaches to thermoregulation in gestation and lactation

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Dr. Sarah Baert [1] _, Dr. Derek Haley_ [2] _, Dr. Renée Bergeron_ [3] _, Dr. Sabine Conte_ [4] _, Dr. Lydiane Aubé_ [4] _, Dr. Nicolas Devillers_ [4]

1. _Sherbrooke Research and Development Centre, Agriculture and Agri-food Canada, Sherbrooke, QC; Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, ON,_ **2.** _Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, ON,_ **3.** _Department of Animal Biosciences, Ontario Agricultural College, University of Guelph, Guelph, ON,_ **4.** _Sherbrooke Research and Development Centre, Agriculture and Agri-food Canada, Sherbrooke, QC_

Pasture-based housing systems for sows have many potential benefits. Compared to a typical indoor facility, outdoor systems require less capital investment, provide a more complex and spacious environment, and allow for a broader range of behaviours. However, outdoor systems expose sows to extreme weather conditions, especially in the summer, which can lead to heat stress and negatively impact their biological functioning and affective state. The objective of this study was to describe the behaviour of gestating and lactating sows living on pasture in eastern Canada during the summer, and to determine which behaviours may be important to thermoregulation. We housed six groups of 4 Yorkshire-Landrace sows, from July to September 2018, in outdoor paddocks equipped with a wallow, shade structure, waterer, feeding stalls, individual farrowing huts and access to a pasture. From week 15 of gestation to week 3 of lactation, we recorded the location of each sow during 5 daily observation periods (between 10:30 and 17:30, Monday-Friday), each consisting of 15 consecutive scan samples at 1-minute intervals. Simultaneously, we monitored environmental conditions with temperature and humidity loggers. We analyzed the impact of day relative to farrowing and the temperature humidity index (THI) on the percent of daily observations in the wallow, shade, and farrowing hut using polynomial regression models, with day and THI as covariates and the sow as the subject of repeated measures. In both gestation and lactation, THI was associated with the percent of observations in the wallow (F=19.65 and 16.61 respectively, P<0.001). Day was also significantly associated with wallowing; gestating sows were more often observed in the wallow as farrowing approached (F=4.85, P=0.0286), while lactating sows were more often observed in the wallow as the time from farrowing increased (F=46.22, P<0.0001). In gestation, THI was a significant predictor of the percent of observations in the farrowing hut (26.09, P<0.0001); however, in lactation, only day influenced the use of the farrowing hut (F=29.63, P<0.01). In gestation, sows used wallowing as their primary means of thermoregulation and their wallow usage depended on THI. However, lactating sows prioritized the farrowing hut and exhibited low wallow usage even when THI was high, especially in the first few days following farrowing. The differences in the sows' use of the wallow and farrowing hut between gestation and lactation may demonstrate a conflict of motivation between thermoregulatory and maternal behaviours when sows are nursing their piglets.

Antibiotic resistance genes from industrial farms in a river near you

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Dr. Kate Blaszak [1], Mr. Chokdee Smithkittipol [2], Mr. Cameron Harsh [3], Dr. Sarah Ison [1]

1. World Animal Protection, International, 2. World Animal Protection, Thailand, 3. World Animal Protection, US

Over 50 billion land animals are industrially farmed annually for food. They suffer poor welfare, high stress, and high risk of infection, leading to high antibiotic use and contributing to the global issue of antibiotic resistance. Antibiotics and antibiotic resistance genes (ARGs) in the waste from industrial farms are often discharged into public waterways or dispersed over crops. The aim of this study was to determine the presence of ARGs from industrial farms in public waterways in four countries and associated community sentiment to advocate for farm animal responsible minimum standards (FARMS) to improve health and welfare globally. Water and sediment from public water courses connected to effluent discharges from 6-10 pig farms in Canada, Spain, Thailand and USA was tested. Groundwater near a high intensity pig farming area in Spain was also tested. Samples were collected up- and downstream of farm discharge and recorded using Epicollect5. Samples were analysed for ARGs by national accredited laboratories using PCR, with quantification of target ARGs in Spain and USA. In Thailand key bacteria were isolated and antibiograms conducted. Semi-structured interviews of nearby residents assessed individual attitudes to nearby farms, effluent discharge and public water contamination, as well as attitudes to pig welfare and industrial farming. An array of ARGs were found conveying resistance to antibiotics including those categorised as highest priority critically important to human health by the World Health Organisation; third generation cephalosporins, ciprofloxacin and macrolides. Other ARGs of importance conveyed resistance to gentamicin, amikacin, sulphonamides, amoxicillin, carbapenems and most widely tetracycline. The levels of surface water ARGs in Spain were sometimes 5 to 200 times the base levels. The mecA gene was isolated nearby to farms in Thailand and Spain, demonstrating selection pressure in the environment for potential Methicillin Resistant *Staphylococcus aureus* (MRSA). This work includes first report of environmental ARGs from pig farms in Central Thailand and Manitoba, Canada. Local communities expressed concern from Thailand; 'everything changed when such pig farms came'. Their fish, vegetables and rice 'didn't grow normally or died' as 'water had drugs and disease', 'soil became muddy and rotten'. The water was 'no longer good to drink'. Our results concur with prior studies and infer that industrial farming is contaminating public waterways including potentially drinking, crop, recreational water and wildlife. This conclusion aligns with 2020 public polling, revealing concern globally regarding water contamination from industrial farms, substandard animal welfare and associated public health risks.

FARM ANIMAL WELFARE THROUGH USE OF COST EFFECTIVE TECHNOLOGIES

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Dr. Mahadevappa D Gouri [1] , **Dr. Shankarappa Bhajantri** [2] , **Dr. PRASANNA BASAVARAJU** [3] , **Dr. Abdul Rahman** [4]

1. *Unit Head, KVAFSU-CVA Animal Welfare Research Centre Veterinary College Bengaluru,* **2.** *Dept. of LFC, KVAFSU, Veterinary College, Bengaluru,* **3.** *Dept. of LPM, KVAFSU, Veterinary College, Bengaluru,* **4.** *KVAFSU-CVA Animal Welfare Centre, Executive Director & Past President, CVA, Bengaluru*

The Welfare issue is major concern in both animals and human society. The Animal welfare especially with respect to the farm animal is of utmost important. The farm animals' used in agriculture or dairy industry has become significantly focused on mainly production efficiency, as evidenced by confinement systems, total mixed ration delivery of concentrated feedstuffs, genetic selection for high producing cows and the use of hormones, antibiotics and other feed supplements to sustain high production levels. These practices have increased the production of milk and milk products dramatically, but often at the expense of animal welfare and at times these animals are over exploited. From an economic perspective, grass-based and organic dairies place more attention on income than on high productivity. It has been mentioned that some dairy farmers with less extensive production systems achieve a higher income by lowering their production costs. From an ecological perspective, grass-based and organic dairy farms measure success in increased animal health and a more appropriate quality of life for the farm family. But this practice may be difficult to practice in countries like India due to the non-availability of sufficient grazing lands. By adapting the new easily manageable technologies which are cost economical and at the same time they are highly effective in improving the productivity in livestock. For the sustainable livestock production the low cost technologies such as effective utilization of crop residues, growing of improved new high yielding varieties of fodder crops, pastoralist livestock production, feeding of animals with corn/maize Stover silage, mixture of corn stover with legume grass silage, effective utilization of unconventional locally available feed and fodder based resources, feeding of azola, cactus, fodder trees, during emergencies introduction of hydroponic fodder production unit, installation of mosquito nets for milking animals. These technologies not only found to increase the milk production to greater extent to the tune from 10 to 30 per cent, but also help in mitigating the fodder shortages to the extent of up to 25 to 40 per cent. Further these methodologies accelerate the productivity of the existing animals, known to increase the health status of the livestock.

Native tree species as the key point for thermal comfort and sustainability improvement in free range systems.

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Mr. Bruno Emanoel Teixeira [1], _Mr. João Victor Mós_ [1], _Dr. Evandro Oliveira_ [2], _Ms. Bárbara Passos_ [1], _Dr. Vinícius dos Santos_ [3], _Dr. Alex Sandro Maia_ [4], _Dr. Luci Murata_ [1], _Dr. Sheila Nascimento_ [1]

1. _University of Brasilia, Faculty of Agronomy and Veterinary medicine,_ **2.** _University of Maringá,_ **3.** _Federal Institute of Brasilia, Campus Planaltina,_ **4.** _São Paulo State University, Campus Jaboticabal_

The global warming effects concern on livestock increases searches for mitigating tools of animals' heat stress to improve animal welfare and increase sustainability. Free range systems with trees are linked to sustainability, by the carbon sink and the potential to provide thermal comfort and welfare to animals. Based on this, we estimated the potential of thermal comfort provided by four different Brazilian savanna native tree species shading: _Vochysia thyrsoidea_, _Caryocar brasiliense_, _Solanum lycocarpum_ and _Pterodon emarginatus_. The evaluations were carried out in 2020 summer for 11 days from 8 a.m to 16 p.m., with microclimate data collection, which, we calculate the Mean Radiant Temperature (TMR, °C) from the shading and unshaded place, to estimate the thermal comfort index, Radiant Heat Load (RHL, W m^{-2}), and carbon stock by biomass to CO_2 sequestration from allometry to Cerrado tree species. The trees shading mitigated high air and black globe temperatures at day warmest hours, with respective means (28.5 and 31.0 °C), to animals' thermal comfort adequate values, with average reduction respectively equal to 1.3°C and 6.4°C in the shading, with significant difference of unshaded place ($P<0.05$). These values improve animals' thermoregulation mechanisms efficiency, as well, the shaded places were able to maintain the relative humidity at recommended levels, between 30 and 70% at warmest hours, which favor animal welfare. The shaded soil temperature by all tree species obtained a mean reduction of 7.7 °C of the unshaded ($P>0.05$), which increases heat flows by conduction mechanism from animal bodies to soil. The species _C. brasiliense_ highlight by the 14°C decreases in soil temperature at midday, which allows a lying down behaviour, and provides an adequate animal option of shaded place, mainly when existing values of 1000 W m^{-2} of solar radiation observed in this study. In shading, the TMR and RHL obtained lower values, respectively 27.4% and 18.7% by reduction provided by each species ($P>0.05$), with an RHL mean of 503.61 ± 2.60 W m^{-2}, compared to unshaded place (595.13 ± 2.56 W m^{-2}). The carbon sequestration estimated by each native tree species, obtained a mean of 8.85 Mg by tree, corroborating with some prior studies to address climate change challenges. These results demonstrate the potential of native tree species from Brazilian savanna to provide adequate levels of thermal comfort and thus favor animal welfare in free-range systems together with an aptitude of CO_2 sink to sustainable objectives.

Don't take flight lessons from chickens: Laying hens are near maximal power output during flapping flight

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Ms. Brianna Leon [1], *Dr. Bret Tobalske* [2], *Dr. Neila Ben Sassi* [1], *Ms. Renee Garant* [1], *Dr. Donald Powers* [3], *Dr. Alexandra Harlander* [1]

1. *Animal Biosciences, University of Guelph, Guelph, Ontario,* **2.** *University of Montana,* **3.** *George Fox University*

Wild birds modulate wing and whole-body kinematics to adjust their flight patterns and trajectories when feather loss or damage increases wing loading and, consequentially, flight power requirements. Domestic egg-laying chickens (Gallus gallus domesticus) exhibit feather loss from pecking and abrasions, naturally high wing loading, and limited flight capabilities. Even so, they often utilize wing flapping to move about their environment. Our research question aims to determine whether wing feather loss impacts flapping performance in laying hens, which in turn may implicate feather loss as a risk factor for keel bone injuries, a severe welfare concern. To test for changes in power output and trajectory during flapping descent, we calculated wing and whole-body kinematic measures in 18 adult laying hens. The hens were randomly placed into one of three treatment groups: unclipped (control, fully feathered), half-clipped (bilateral primary feathers), or full-clipped (bilateral primary + secondary feathers). The hens descended while flapping from a 150 cm tall tower apparatus towards a padded floor. A frontal camera view allowed us to calculate wingbeat amplitude (Θ), frequency (Hz), and angular velocity of the wrist (rad s-1) and the asymmetry of these. We also recorded a lateral view to calculate descent velocity (m s-1), descent angle (g), and vertical and horizontal acceleration (m s-2). We predicted that progressive increases in wing loading due to feather clipping would cause birds to compensate with their wing motions to accomplish similar body trajectories. A linear mixed model was used to identify treatment effects in kinematic measures and differences between treatment groups. Wing clipping did not significantly affect any wing kinematic measures nor vertical acceleration. Half-clipped hens demonstrated a lower descent velocity (p=0.0337) and angle (p=0.0372) than full-clipped hens. Both half- and full-clipped hens exhibited significantly lower horizontal acceleration than unclipped hens (p=0.0031 and p=0.0018, respectively). All birds landed with a velocity 2-3X greater than in bird species that are adept fliers. These results suggest that laying hens, regardless of their wing feather cover, are operating near maximal power output during flapping descent. This then makes changing wing kinematics for increased power output impossible despite a significant reduction in wing area. Their immense landing velocities and large body size increase their chance of colliding with great kinetic energy, which could contribute to keel bone injuries. Our results highlight the need for further investigation into the flapping-flight characteristics of laying hens to determine best housing practices.

THERMOREGULATORY RESPONSES OF SOWS IN FREE-RANGE SYSTEMS UNDER TROPICAL ENVIRONMENT

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Mr. João Victor Mós [1], Mr. Bruno Emanoel Teixeira [1], Dr. Evandro Oliveira [2], Ms. Bárbara Passos [1], Dr. Vinícius dos Santos [3], Dr. Alex Sandro Maia [4], Dr. Luci Murata [1], Dr. Antonio Steidle Neto [5], Dr. Sheila Nascimento [1]

1. University of Brasilia, Faculty of Agronomy and Veterinary medicine, 2. University of Maringá, 3. Federal Institute of Brasilia, Campus Planaltina, 4. São Paulo State University, Campus Jaboticabal, 5. Federal University of São João del-Rei

This work aimed to study the effect of different shading on sows' physiological and behavioral responses in free-range systems under tropical environments, through behavioral observation, shading evaluation, meteorological and physiological variables analysis. Between November and December 2019, six sows from the Danbred lineage were evaluated in the Unidade Demonstrativa de Suínos Criados ao Ar Livre at the University of Brasilia, Federal District, Brazil. The females were housed in six paddocks of 1000m² each, with an artificial and natural shading. In the experiment, five treatments were evaluated formed by the environment (1) exposed to the sun; (2) the natural shading of a native tree species to the Cerrado; the artificial shadings of 80%-blockage (3) black net, (4) heat-reflective net, and (5) the nets association (black and heat-reflective nets), where the dry and wet bulb temperature (ºC), relative humidity (%), wind speed (ms-1) and black globe temperature (ºC) were collected at 1-minute intervals during 18 non-consecutive days, between 8:00 am and 4:00 pm. The Mean Radiant Temperature (ºC) and Radiant Heat Load (Wm-2) were calculated from the black globe temperature. The shortwave radiation (Wm-2) was calculated from the sum of direct, diffuse, and reflected radiation. For the behavioral observation, an ethogram was elaborated considering the place where the females were (in the sun, natural or artificial shade), their posture (standing or lying down), and the activity they performed. Physiological variables such as vaginal temperature (ºC) and body surface temperature (ºC) were measured every minute, and respiratory rate (breaths min^{-1}) every 20 minutes. The data were statistically analyzed using the Statistical Analysis System program. The shading resources affected ($P<0.05$) all meteorological and behavioral variables but did not affect ($P>0.05$) the physiological variables, which shows the importance of the expression of natural behavior for sow's thermoregulation. An increase in the shades use was noticed in hottest hours, especially in the net's association, which increased use by up to 15% ($P<0.05$). The sows were more often lying in heat-reflective net treatment ($P<0.05$), and remained more in the sun in black-net treatment ($P<0.05$). The use of natural shading was similar in all hours ($P>0.05$), but animals with access to the nets association treatment spent more time in the artificial shading ($P<0.05$). In conclusion, the different shading has a direct effect on the behavioral responses of sows in free-range systems under tropical conditions, but they don't indicate a physiological thermoregulatory mechanism activation.

Effects of hatching system on individual and group-level activity of broiler chickens

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1. *Faculty of Veterinary Medicine, Utrecht University,* **2.** *Adaptation Physiology Group, Wageningen University & Research, Wageningen, The Netherlands,* **3.** *Wageningen Livestock Research, Wageningen University & Research*

Broilers usually hatch in hatcheries without access to feed and water, which might affect their welfare negatively. Alternative approaches have been developed, e.g. providing chickens with nutrition in the hatchery or hatching eggs on-farm. Information on the behavior of chickens hatched in these systems is limited. Changes in broiler activity are a promising indicator for various welfare threats, such as sickness and lameness. The aim of this study was to assess effects of hatching system on broiler activity at individual and group-level using sensor technology. Group-level activity was measured in chickens that hatched either conventionally in the hatchery (HH), in a system providing feed and water in the hatcher (HF), or on-farm (OH). Chickens were reared in two batches, in 12 pens/batch (1,155 animals/pen), with a total of 8 replicate pens/treatment. In each pen, a camera of the eYenamic system (Fancom) recorded top-view images. Using automated image analyses, a daily activity index (moved pixels/total pixels x 100) was calculated over 35 days. Individual activity was measured in a proof-of-principle-experiment, because the ultra-wideband (UWB) system could not be installed on a farm. Consequently, chickens from the three hatching systems were reared in three pens (one pen/treatment, 30 animals/pen). At d14, tags of the UWB system were attached to five chickens/pen. The distances moved (DM) by the birds were tracked for 4h/d on 19 days.

Group level activity showed a significant age x hatching system interaction ($F_{8,752}$= 5.83, P<0.001). HH and HF chickens showed higher activity levels than OH chickens in week 1, 4 and 5. In week 2, activity did not differ among treatments. In week 3, higher activity levels were measured in HH compared to HF pens, and in HF compared to OH pens. In contrast, HH chickens in small groups showed lower DM than HF and OH chickens in week 3 ($F_{8,291}$= 4.83, P<0.001). In week 4 and 5, no difference was found among treatments. Within all small groups, DM differed among individual chickens (HH: $F_{4,85}$= 31.98, HF: $F_{4,85}$= 22.64, OH: $F_{4,85}$= 115.10, all P<0.001).

The results indicate that hatching system affected broiler activity at specific ages. Effects found at group level in large groups could not be reproduced at individual level in small groups of broilers. In these small groups, individual differences in activity within one treatment might have overshadowed effects of the hatching system. The relation of these findings with animal health and welfare needs further investigation.

Comparison of two farrowing pens for organic pig production: piglet mortality and sow and piglet behaviour

Sunday, 1st August - 18:00: Farm Animal Housing and Enrichment posters - Poster

Mr. Roger Vidal [1], *Mr. Lluís Vila* [2], *Mr. Pino Delàs* [2], *Ms. Berta Baulida* [1], *Mr. Joaquim Pallisera* [1], *Mr. Pau Batchelli* [1], *Dr. Emma Fàbrega Romans* [1]

1. *Institute of Agrifood Research and Technology,* **2.** *Llavora*

Organic pig production in Spain is slowly increasing, but piglet mortality, is one of the major drawbacks for farmers willing to adopt the system. The aim of this study was to evaluate the effect of two loose farrowing systems ("Naturland" (N) and Llavora (LL), differing in distribution of functional areas, and two piglet protection systems using bars (central (C) or lateral (L)), on piglet mortality. A total of 24 sows were assigned to one of 4 treatments (NC, LLC, and LLL and N) and video recorded for 24h from 24h before to 5 days after parturition, when there is a higher piglet mortality, from April to July. All piglet deaths and its cause (crushing, starvation, stillborn) were recorded from video observation. Behaviour of sow (nesting patterns, position in pen, post farrowing movements, parturition duration) and of piglets (position in pen, activity budget) were recorded by continuous focal sampling elapsing 5 minutes each observation (n=864). Data were analysed with a mixed model considering type of farrowing pen and protection system and its interaction as fixed effects, month of parturition as random effect and sow/litter as experimental unit. Mean piglet mortality was 31.60% with no effect of treatments. Major cause of deaths was crushing in all systems (21.51% mean value, and 21.59±19.83; 28.8±18.45; 21.15±12.01 and 13.32±9.52, in LLC, LLL, N and NC, P=0.19, respectively). The higher percentage of crushing was due to changes in lying position (65.39% vs. 26.92%, P=0.2). A significant effect of protection system was found; if pen had a central bar, sows lay more frequently down against the pen wall, whereas in pens with a lateral bar sows used the bar to lie down (P=0.036). Number of postural changes were linearly correlated to duration of parturition (r=0.56, P<0.001). Sows showed a tendency for a higher number of postural changes when a lateral bar was present (2.5 vs. 1.45 changes/h, respectively, P=0.1). Regardless of treatment, piglets spent significantly more time close to the mother than far during the 5 days after parturition (65.81±12.90 vs. 34.19±17.28%, P<0.001). The results suggest that a NC pen could be useful to reduce piglet mortality, since less postural changes were observed and sows with a central bar use more significantly the wall to lie down. This could partly explain the tendency for a lower number of piglets crushed in this system. These type of studies should help encourage farmers to consider pig organic farming feasible.

Welfare and Welfare Assessment posters

Preliminary investigation on evaluation of welfare of migratory flocks of Gaddi goats in North-Western Himalayan region of India

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Dr. Ankaj Thakur [1], *Dr. Madan Lal Kamboj* [2], *Prof. Pardeep Kumar Dogra* [3]

1. *LPM, NDRI Karnal,* **2.** *NDRI Karnal,* **3.** *CSKHPKV, Palampur*

Gaddi goats have been traditionally reared under nomadic pastoralism by the Gaddi tribe of Himachal Pradesh, India. The welfare of livestock reared under nomadic pastoralism is believed by some researchers to be better as the animals have freedom to express natural behaviours while others question the psychological and physiological well being under this system as it could be compromised by natural factors, environment and malnutrition. The aim of this study was to identify the welfare issues encountered by Gaddi goats reared under nomadic pastoralism and evaluate the level of welfare. For this purpose, a preliminary investigation was done on 12 flocks (612 goats) of Gaddi goats in Himachal Pradesh, India. The flocks were selected randomly (post-kidding) from four different migratory routes during low hill migration at an altitude of 350-650 m asl. Socio-demographic characteristics, job satisfaction and management practices were also studied using structured questionnaires. Welfare assessment was done en route using AWIN protocol and available literature on the welfare assessment of goats. Majority of flocks owners were either illiterate (33.33 %) or had only elementary education (25%). Age and job experience of nomads ranges from 35-76 (49.69) and 17-70 (34.07) years respectively. Job satisfaction level of the nomads was 4.84 (Likert scale 1-10). A total of 86.64% of goats had adequate BCS give (2.5-3.5), good hair coat cleanliness (96.40%), no skin lesion (98.03%), low fecal soiling (98.36%), stereotypies (0.81%) and social withdrawal (0.49%). Overall incidence of lameness (Deeming et al., 2018) was 3.92% of the 612 goats observed .Welfare risks identified in the Gaddi goats were FAMACHA © score >4 (14.4%) and higher ectoparasitic score (19.6%). Annual losses in the flock were mainly due to kid mortality (8.48%), predatory attacks (3.95%), rustling and (3.72%) plant poisoning (5.65%). Four (33.33%) flocks were not practicing dipping and deworming regularly. Management procedures such as identification (eat cuts), castration (using knife) and ethno veterinary practices (cutting part of ear in goats suffering from lantana poisoning) were performed in all flocks without using analgesics. The overall welfare of the Gaddi goats was considered to be good on the basis of higher scores for environmental, nutritional and behavioural domain. Scores for the health domain of welfare can further be improved by increasing awareness of farmers for preventive health management practices. Identification and benchmarking of the iceberg indicators of welfare from this study will further help in enhancement of goat welfare in nomadic pastoralism.

Changes in the proportion of immune cells and feather-pecking activity following probiotic supplementation in laying hens

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

**Mrs. Claire Mindus** [1] **, Dr. Nienke van Staaveren** [1] **, Dr. Dietmar Fuchs** [2] **, Dr. Johanna Gostner** [2] **, Dr. Joergen B. Kjaer** [3] **, Dr. Wolfgang Kunze** [4] **, Dr. Anna Kate Shoveller** [1] **, Dr. Paul Forsythe** [4] **, Dr. Alexandra Harlander** [1]

1. _Animal Biosciences, University of Guelph, Guelph, Ontario,_ **2.** _Innsbruck Medical University, Innsbruck,_ **3.** _Institute of Animal Welfare and Animal Husbandry, Celle,_ **4.** _McMaster Brain-Body Institute, Hamilton_

Severe feather pecking (SFP) is a stress-induced behaviour in laying hens with unclear aetiology. SFP involves plucking and pecking feathers of other birds and represents a worldwide economic and animal welfare issue. Recently, it was proposed that SFP is potentially a behavioural consequence of a dysregulated communication between the gut and the brain. Probiotic bacteria, such as _Lactobacillus_ species, favorably modulate the gut-brain axis's various pathways, including its immune component, and show positive effects on stress-induced anti-social behaviours in rodents. For these reasons, _Lactobacillus_ species may represent a potential new therapeutic to mitigate SFP in domestic chickens. We investigated the impact of a _Lactobacillus_ probiotic supplementation on the proportion of subsets of specific immune T cells and SFP behaviour in laying hens. The experiment was approved by the University of Guelph Animal Care Committee (AUP #4113). Eighty-six White Leghorn hens (19 weeks of age) selected for SFP activity were assigned to a probiotic (Lacto, 6 pens, 7 ± 1 birds / pen) or a control treatment (Placebo, 6 pens, 7 ± 1 birds / pen) for 10 weeks. A $5*10^9$ _Lactobacillus rhamnosus_ JB-1™ dosage dissolved in 1 mL of drinking water was orally given to Lacto birds. In contrast, Placebo birds received 1 mL of water through the same procedure every day. Between 24 and 26 weeks of age, 3 pens of each supplementation treatment were additionally exposed to social (mixing and manual restrain) and environmental (removal of perches and nestboxes, and physical restrain) unpredictable and repeated stressors to induce SFP. Pens were video-recorded, and videos were analyzed by the same blinded observer. Tonsil and spleen samples were collected at the end of the experiment from a subset of 16 hens equally representing all treatment combinations (28 woa). The proportion of T helper cells, cytotoxic T cells and regulatory T cells were obtained via flow cytometry analysis. Generalized linear mixed models were used to assess the effect of the supplementation on SFP and the proportion of T cells. SFP was observed across all pens (Means ± SD, 0.13 ± 0.166 peck/min/bird). When stressed, SFP incidence increased significantly (P=0.032); however, Lacto supplementation prevented this increase (P=0.664). Lacto supplementation increased the regulatory T cell population of the spleen (P=0.014) and the cecal tonsils (P<0.001), thus indicating the immunological solid effect of the supplementation. Overall, our findings suggest that a single-strain probiotic can reduce stress-induced SFP in laying hens selected for FP.

Single Components Are Preferred over Mixed Ration by Dairy Sheep and Goats

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Ms. Roxanne Berthel [1], _Dr. Frigga Dohme-Meier_ [2], _Dr. Nina Keil_ [1]

1. _Swiss Federal Veterinary Office, Centre for Proper Housing of Ruminants and Pigs, Agroscope, 8356 Ettenhausen,_ **2.** _Ruminants Research Unit, Agroscope, 1725 Posieux_

Mixed rations aim to provide ruminants with a balanced ration of roughage, concentrates, vitamins and minerals. However, this type of feed reduces diet diversification and the possibility to select food components, what might be a behavioural need of small ruminants. This study investigated the acceptance of a mixed ration in the presence of its single components in dairy sheep and goats.

We tested 24 dairy sheep and 24 goats in 12 pairs of each species that were offered three different feeds simultaneously. Two feeds consisted of single components, i.e. of hay (H) or grass silage (G) of equal nutritional value (H: 5.1 MJ/kg DM NEL, 73.4 g/k DM APD; G: 5.2 MJ/kg DM NEL, 71.0 g/kg dry matter (DM) APD). The third feed was the mixed ration (M) out of the two on a 50:50 DM ratio. Feeds were offered at libitum, and weighed 6 times a day (at 09, 10, 12, 15, 16, 18h) to calculate intake for five consecutive days. All procedures involving animal handling and treatment were approved by the Swiss Cantonal Veterinary Office Thurgau. The effects of feed type, time of day, experimental day, species, and their interactions on intake were analysed by a generalized mixed effects model.

Sheep and goats had a mean daily DM intake of 2.16kg (+/-0.49) and 1.70kg (+/-0.58) of G, of 0.95kg (+/-0.37) and 1.08kg (+/-0.30) of H and of 0.56kg (+/-0.38) and 0.19kg (+/-0.18) of M, respectively. Feed intake was not inconsistent over experimental days (chisq=6.38; p=0.90). The preference for G was more prominent in sheep than goats, and sheep showed a higher acceptance for M (chisq=200.19; p>0.001). Throughout the day, the proportions of the three feeds consumed differed between species (chisq=785.13; p>0.001). Between 9-10h and 15−16h, sheep ate mostly G (G:H:M 75:20:5) and reduced its intake in favour of H and M at other times (G:H:M 60:30:10). In contrast, goats ate a similar amount of H and G at 9−10h and 15-16h (G:H:M 50:50:0) and preferred G over H at other times (G:H:M 70:30:0). Both sheep and goats ate only low amounts of M.

These results show that dairy sheep and goats prefer to feed on grass silage and hay offered as single components rather than on the same components in a mixed ration. This might be explained by haptic or other sensory stimuli of the single components that could be lost or substantially diminished through mixing.

Development of a social motivation test to assess piglets' affective state following surgical castration

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Ms. Mathilde Coutant [1] *, **Dr. Céline Tallet** [2] *, **Dr. Jens Malmkvist** [1] *, **Dr. Mette Herskin** [1]

1. *Aarhus University, Department of Animal Science,* ***2.*** *PEGASE, INRAE, Institut Agro*

Qualification and quantification of animal emotions are long-standing challenges; one cannot simply ask animals how they *feel*. Rather, sets of indirect indicators must be interpreted. In case of piglet castration, an array of indicators, including (neuro)physiological, autonomic, behavioural, and immunological recordings are available to evaluate the pain induced by the procedure. Surgical castration leads to increased cortisol concentration, modified frequency and structure of vocalizations, and impaired behaviours for days after the procedure, and is thus concluded to be *painful*. Potential for local anesthetics to alleviate the impact of castration is therefore extensively studied, using similar indicators. However, while most of these seem to target sensory response to the procedure, their ability to illustrate the complex emotional aspects of pain has been questioned. Recently, development of behavioural tests aiming to record proxies of piglets´ affective states after castration has been initiated, but no standard test is available. The present study involved development of such a test, focusing on piglets´ social motivation immediately after castration as measured, among others, by the latency to contact littermates. Tested piglets were individually introduced at one end of an arena (2.4 x 0.8m), facing, at the other end, three of their littermates in a heated area. Three obstacles were placed between the piglet and the littermates (height: 7 ± 2 cm). The test was concluded when the piglet reached the grid separating him from the littermates, or after 3 minutes. Video recordings were used to determine the latency to reach the grid, and tracking analysis of video sequences (LoliTrack 5) enabled quantification of the speed and distance moved. The study, performed under approval of the Danish Animal Experimentation Inspectorate and the Danish Medicines Agency, included 149 piglets between 3 and 4 days old tested in a Danish commercial farm immediately after being subjected to 1 of 3 treatments: castration without anesthesia (n=50), castration with prior administration of local anesthetic (Procamidor® Vet. 2x0.5mL) as performed by Danish farmers according the industry's requirements (n=49), and sham handling without tissue damage (n=50). Piglets were given analgesics (Melovem® 0.1 mL) within 24h after the procedure. Eighty-nine percent of the piglets reached their peers within the time limit, with an average latency of 49 ± 38 s. Preliminary analysis of the video tracking sequences performed on 66 animals showed an average speed of 8.2 ± 3.4 cm/s. Further results will be presented.

Meloxicam use for pain mitigation of spayed cows and heifers: differences between administration techniques

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Dr. Emma Dunston-Clarke [1] **_, Dr. Pete Irons_** [1] **_, Mr. Gavin Pensini_** [1] **_, Ms. Shona Hay_** [1] **_, Prof. Teresa Collins_** [1]

1. _Murdoch University_

The provision of pain-mitigation during routine husbandry procedures is increasing in Australia. Currently, there is no regulatory requirement for cows that are web spayed, or heifers that are spayed using Drop ovary Technique (DoT) to be provided with pain mitigation; however, both procedures are known to cause discomfort, morbidity, and in some cases, mortality. As drug efficacy and duration can vary between administration types, delivery of meloxicam via buccal and sub-cutaneous injection on spayed cows and heifers was tested. This study involved _Bos indicus_ cattle, 75 cows and 69 heifers located on a station in northern Western-Australia. Cows were web spayed; 34 administered meloxicam via buccal mucosa (MB), 33 via sub-cutaneous injection (MSc) and 8 were negative controls (rectal palpation). Heifers were DoT spayed, with 32 MB, 29 MSc and 8 control. Upon entry into the crush, cattle were held for 30sec for crush score and weight recordings. A licensed veterinarian then performed a rectal palpation exam, where upon allocation to treatment group occurred. During the rectal palpation and spaying procedure, cattle aversion to the procedure was recorded. Cattle were then spray-marked and ear-tagged for identification and meloxicam administered. Upon release from the crush, exit speed was recorded, and cattle in the yards had posture, behaviour and demeanour monitored for 1-6 and 22hours post procedure. Cattle were then monitored for 10 days for morbidity and weighed at day 10. All cow treatment groups had weight increases, while all heifers had weight losses. Control cows and heifers has significantly lower aversion to the procedure scores, while MSc cattle significantly walked more than MB. For cows, MB cattle ruminated less but were more social, while MB heifers ate significantly less. Overall, it appears that MSc cattle showed a lower pain behaviour than MB cattle. While the full impact of meloxicam was unable to be determined in these cattle, it is evident that Meloxicam reduced the elicitation of pain responses when cows and heifers were or spayed.

Refinement of broiler chicken welfare assessment optimising the efficiency of current protocols

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Dr. Nico Nazar [1], Dr. Xavier Averós [2], Prof. Inma Estevez [3]

1. *NEIKER. N-104, km. 355, E-01192 Arkaute, Spain; IIByT and FCEFyN, CONICET-UNC, Argentina,* ***2.*** *NEIKER. N-104, km. 355, E-01192 Arkaute, Spain,* ***3.*** *NEIKER. N-104, km. 355, E-01192 Arkaute and IKERBASQUE. Plaza Euskadi 5, E-48009 Bilbao*

Assessing animal welfare requires the collection of scientifically validated parameters. Different animal-based protocols for animal welfare assessment are currently available but they remain time-consuming for practical application, increasing associated costs. Thus, further refinement is still necessary, especially to be applied to certification schemes. We designed a combined broiler welfare assessment protocol including indicators from WQ® and AWIN® projects. We aimed at maximizing assessment efficiency by reducing the number of used indicators while maintaining welfare data variability. Reduction was tested in 2 different genetic lines: fast-growing (FG, Ross308 and/or Cobb500, minimum test age 32d, n=10) and medium-growing (MG, HubbardXRoss, minimum test age 45d, n=10). Farms were divided into transects along which data on indicators was collected following the transect protocol. Additionally, WQ® indicators relative to comfort around resting, thermal comfort, absence of injuries and prolonged hunger, and human-animal relationship were collected. Reactivity to a Novel object and positive behaviours were also registered, totalizing 30 indicators. Correlations were used to analyse relationship between variables, together with principal component (PC) analyses and minimum spanning trees, to explore dimensionality reduction. Both % of total variability explained and the cophenetic correlation between original and modelled data were maximized during reductions. Considering each farm an experimental unit, maximum reductions accounting for 100% data variability lead to sets of 8 indicators, with a core-set of 6 indicators shared by both genetic lines: lame and immobile birds (independently from the assessment method; transects AWIN®, bird sampling WQ®), behavioural diversity, mortality, environmental dust, and initial density. Remaining 2 indicators were bedding-quality and small birds for FG lines, and CO_2 and temperature for MG lines. Cophenetic correlations indicate reductions faithfully preserve original data distances (FG: 0.89; MG: 0.83). Synthetic variables (PC1, 2, 3; FG: 76% and MG: 69% of total variability explained) indicate that mobility problems, behavioural diversity and mortality are relevant for broiler welfare variability in both genetic lines. Additionally, FG welfare variability also depends on initial density and bedding-quality, while MG welfare variability also depends on environmental temperature, CO_2 and dust. Results suggest that current welfare assessment protocols can be further refined while still capturing most farm variability otherwise obtained by applying complete protocols. Specific variables identified indicate that reductions still contemplate particularities associated with each genetic line. Optimized welfare data collection to reduce sampling effort, will translate into reducing auditing time for assessors, and associated cost for farmers and would ease animal welfare accountability of broiler farms.

ANIMAL WELFARE DEVELOPMENT: THE MALAYSIAN EXPERIENCE

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Dr. Razlina Raghazli [1], Dr. Marzuna Md Yunus [1]

1. Department of Veterinary Services Malaysia

Malaysia has given full support to the Universal Declaration on Animal Welfare by developing the Animal Welfare Act 2015 (AWA 2015). AWA 2015 was gazetted in December 2015 and came into force in 2017. Although the act has been developed according to international standards, it has been adapted according to Malaysia practices and conditions. The goal of AWA 2015 is to ensure animal welfare by ensuring animal owners meet the five animal needs stated in the act, establish an Animal Welfare Board which functions to administer and monitor all activities related to animal welfare, license 13 activities involving animal use and prevent animal cruelty by imposing heavier punishments on perpetrators. Since the enactment of AWA 2015, various efforts have been made to strengthen the act further and promote animal welfare, especially "Responsible Animal Ownership" to the community. Under AWA 2015, the appointment of Animal Welfare Voluntary Assistants (AWVA) to any public member by the Animal Welfare Board is to assist government animal welfare officers in promoting animal welfare activities. A total of 15 Animal Welfare Codes of Practice (AWCOP) have also been published. Elements of animal welfare are also included in other developed standards, including the Livestock Guidelines under the Malaysian Good Agricultural Practices Scheme (MyGAP). The establishment of an Animal Welfare Consultation Committee composed of non-governmental organizations is responsible for providing views and technical advice related to animal welfare to the Animal Welfare Board. One of the outputs outlined in the National Animal Welfare Strategic Plan is to provide formal or informal animal welfare education to the country's community. Different animal welfare modules have been planned for each schooling level, starting from pre-school level to secondary school level. Starting from 2021, any research that uses animals except for teaching activities at the school level must be licensed under the Animal Welfare Board. The organization of the "Animal Welfare Colloquium according to Islamic Perspective" has gathered experts from related fields to discuss various aspects of animal welfare based on Islamic views. Animal welfare in Malaysia has also received recognition from the World Animal Protection (WAP). Overall, Malaysia has obtained a C ranking in 2020. These achievements indicate Malaysia's efforts to raise its animal welfare standard have received good recognition from the international community. In conclusion, various efforts have been and are being put in place to promote and raise awareness of animal welfare among Malaysian.

Welfare epidemiology: using welfare indicators for the prediction of Piscirickettsia salmonis infection in Atlantic salmon production farms

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Ms. Leda Loume [1], Mr. Jaime Miranda [1], Mr. Flavio Fuentes [1], Ms. Vania Quinteros [1], Mrs. Marcia Bustamante [2], Dr. Fernando Mardones [3], Ms. Carolina Asencio [4], Mrs. Natalia Lam [5], Prof. Hernan Cañon-Jones [1]

1. *Núcleo de Investigación Aplicada en Ciencias Veterinarias y Agronómicas, Universidad de Las Américas, Chile,* **2.** *Escuela de Medicina Veterinaria, Facultad de Medicina Veterinaria y Agronomía, Universidad de Las Américas, Chile,* **3.** *Escuela de Medicina Veterinaria, Pontifica Universidad Católica de Chile, Chile,* **4.** *InnovaCo SpA,* **5.** *Facultad de Ciencia Agronómicas, Universidad de Chile*

The welfare of fish under intensive farming has been the subject of consumer and scientific interest for the last decade. Intensive salmon farming produces high-quality protein and it is a fairly new animal production compared with other animal productions such as poultry, pigs or cattle. Salmon production cycle is long (up to 2 years from fertilized egg to slaughter) and fish are exposed to several welfare risks throughout their lives. Main welfare problems are densities, physicochemical water properties, nutrition and health. In Chile, *Piscirickettsia salmonis* produces high fish mortalities. Many animal-based welfare indicators such as behaviour (lethargy, swimming, eating) or body injuries, change before disease outbreaks and may be proved useful as early detection indicators of illness. The objective of our work was to detect and predict *P. salmonis* outbreaks using welfare indicators. An appropriate welfare index (AWI) consisting of animal and environmental-based welfare indicators was developed. The AWI was applied daily, weekly or monthly, depending on the welfare indicator, to fish production farms in Chile from the moment of sea-transfer until official disease outbreak was declared based on clinical signs, mortality rate and positive laboratory results. Animal welfare time-related curves were obtained for the AWI and each welfare indicator. Negative welfare changes in the AWI and welfare indicators related to disease outbreak were determined using mathematical probabilistic models. Results showed that the AWI could be used as an early detection tool for *P. salmonis* outbreaks predicting 45 days before happening. More interestingly, specific welfare indicators of the AWI such as lethargy, abnormal swimming and fish close to the net predicted disease outbreaks 48, 47 and 38 days before outbreak, respectively. These results show that fish welfare indexes are useful for measuring and controlling the welfare of fish, but also can predict disease outbreak much earlier than those currently adopted today such as mortality rate and detection of the pathogen in the laboratory which predict only a few days before or during outbreaks. These results have an impact at the management level as farmers could take preventive measures to decrease the risk of disease outbreaks while increasing welfare, or even have the time to anticipate and prepare ahead for the outbreak, acquiring medicated feed in time. This is the first report of the use of animal welfare index and indicators in epidemiology in salmon farming and further studies should focus on other production stages in salmon production cycle.

DOES FOOTPAD DERMATITIS INDUCE A CHRONIC NEGATIVE WELFARE STATE IN LAYING HENS?

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Mr. Matthew James Craven [1], *Dr. Elske De Haas* [2], *Mr. Dimitri Van Grembergen* [2], *Dr. Timothy Boswell* [1], *Dr. Jonathan Guy* [1], *Prof. Frank Tuyttens* [2], *Dr. Tom Victor Smulders* [3]

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Footpad dermatitis (FPD) is a common health condition in commercially housed hens. Birds with severe FPD have necrotic lesions on the feet, which are caused by prolonged contact with wet bedding or faeces in the housing environment. FPD is believed to have a negative impact on the welfare of laying hens, and may therefore affect the efficiency and sustainability of egg production. We hypothesise that birds with severe FPD experience chronic stress, and this study aimed to investigate this by comparing neurogenesis between birds which had severe FPD with those in which FPD was absent.

Hens managed under semi-commercial conditions were scored on three occasions (May, July, and September) for FPD severity, on a scale of 0-2 (0 = no FPD, 1 = necrosis only, and 2 = necrosis and swelling that was dorsally visible). Only individuals which had a FPD score of 0 on at least two occasions (including September) were selected as control birds (n=9). Birds with the most severe FPD were those which had a score of 2 on all three occasions, or a score of 1 in May and 2 in July and September (n=12). In each of these groups, some birds were reared with a dark brooder while others were not. Selected individuals were culled at 70 weeks of age, and their brains were collected and dissected. One hemisphere of each brain was fixed and then cut to 50μm coronal sections. The sections were immunohistochemically stained against doublecortin (DCX) in order to quantify the density of DCX$^+$ neurons in the rostral and caudal hippocampus, which has previously been validated as a marker of chronic stress.

FPD birds reared without a dark brooder had a significantly lower density of bipolar (p<0.001) and multipolar (p=0.049) DCX$^+$ cells than controls. However, in those reared with a dark brooder, FPD had no effect on bipolar cell density (p=0.133) and increased multipolar cell density (p=0.042). A cumulative FPD score was calculated for each bird by adding together their scores from May, July, and September. There was a significant interaction of cumulative FPD score and dark brooder on both bipolar (p<0.001) and multipolar (p=0.015) DCX$^+$ cell densities. These results suggest that the chronic stress experienced by laying hens could be reduced by providing housing conditions and adopting management practices which mitigate the risk of birds developing FPD, and rearing birds with a dark brooder could increase resilience to stress from FPD.

Evaluating the utility of a CO2 surgical laser for piglet castration to reduce pain and improve wound healing

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

Ms. Maria Lou [1]_, Dr. Abbie Viscardi_ [1]_, Dr. Johann Coetzee_ [1]_, Dr. Kelly Lechtenberg_ [2]_, Dr. Michael Kleinhenz_ [1]_, Mr. Andrew Curtis_ [1]_, Mr. Charley Cull_ [2]

**1.** Kansas State University, **2.** Midwest Veterinary Services

Commercially-raised piglets in the United States are routinely castrated using a scalpel. CO_2 surgical lasers are a widely accepted technique in human and veterinary medicine, with evidence of reduced inflammation, faster healing time, and less post-procedural pain compared to a standard scalpel. Refinement of surgical castration using a CO_2 surgical laser may improve piglet welfare. The objectives of this study were to evaluate the ability of a CO_2 surgical laser to 1) reduce pain behavior and 2) improve wound healing of piglets undergoing surgical castration. Thirty piglets (3 days old; Yorkshire cross) were randomly allocated to one of three treatments (n=10 piglets/treatment group): surgical castration with a CO_2 surgical laser, surgical castration with a scalpel, or sham (non-castrated control). Piglets were video recorded for 1h pre-procedure and from 0-2, 6-8 and at 24h post-procedure for behavior scoring. Digital images of the surgical site were taken at baseline, 0, 8, 24, 48, 72, 96, 120, 144, and 168h post-procedure for wound healing assessment. Infrared thermography (IRT) images of the surgical site were also taken at baseline, 0, 0.5, 8 and 24h post-procedure to assess inflammation. Behavior was scored for the first 15 min of every hour of data collected using BORIS (Behavioral Observation Research Interactive Software). Surgical site images were scored using a scale published by Sutherland et al. in 2010. Both behavior scoring and wound healing assessment were performed by an individual blinded to treatment and time point. Behavior was analyzed using the GLIMMIX procedure of SAS (Statistical Analysis System) with a beta distribution and time, treatment, and pen as covariates. Wound healing and IRT images were analyzed using a mixed model of JMP (SAS Institute, Cary, NC) with the same variables described above. CO_2 laser-castrated piglets displayed significantly more pain behaviors (tail wagging, trembling, scratching, and stiffness) across the observation period than scalpel-castrated piglets (P=0.049). CO_2 laser-castrated piglets also displayed more agonistic behavior than both scalpel-castrated (P=0.005) and sham (P=0.036) piglets. There were no significant differences in wound scores or inflammation between CO_2 laser-castrated and scalpel-castrated piglets. Burn evidence on the scrotum of CO_2 laser-castrated piglets was likely attributed to a chemical reaction with the alcohol disinfectant. This may have resulted in the unremarkable healing time and increased pain behavior observed in this study. Future work should improve the CO_2 laser technique utilizing a non-flammable disinfectant before conclusions can be made regarding pain and wound healing.

Topical application of Pig Appeasing Pheromone on the withers to improve pig welfare at mixing

Sunday, 1st August - 18:00: Welfare and Welfare Assessment posters - Poster

**Dr. Míriam Marcet-Rius** [1] _**, Dr. Tiago Mendonça**_ [1] _**, Prof. Patrick Pageat**_ [1] _**, Ms. Sana Arroub**_ [1] _**, Dr. Cécile Bienboire-Frosini**_ [1] _**, Ms. Camille Chabaud**_ [1] _**, Ms. Eva TERUEL**_ [1] _**, Ms. Orane François**_ [1] _**, Dr. Alessandro Cozzi**_ [1]

**1.** IRSEA (Research Institute in Semiochemistry and Applied Ethology)

The practice of mixing unfamiliar pigs in farms is still usual and produces fighting, welfare problems, and performance loss. Synthetic Appeasing Pheromones had already shown many positive effects in animal husbandry and companion animals and are regularly used by breeders to improve welfare and performance. This study aimed to investigate the new application effect of Pig Appeasing Pheromone (PAP) (on withers skin) in an experimental model of pig mixing to see whether it reduced aggression and fighting and impacted behavioural and physiological welfare indicators welfare.

The housing, husbandry, and care for the animals involved in this experiment were performed according to French and European legislation (APAFIS approval number 25098-202004091550975).

The study took place over five weeks with two parallel groups of comparable mini-pigs (N=12) in identical conditions. Both groups were housed in two similar rooms by pairs with the same management. From each room, six mini-pigs participated in the study. Either PAP or Control (Placebo) was applied individually on the skin withers of all the mini-pigs from each group. Then, a total of 24 encounters in a neutral pen (5 minutes maximum; stopped if pigs started fighting) between two unfamiliar pigs receiving the same treatment (PAP or Placebo) were performed and recorded for video analysis by two independent observers. Saliva was sampled for one minute and a half, using a Salivette system (Salivette, Sarstedt, Numbrecht, Germany) fixed to a clamp, without stressing the pigs to analyse the cortisol concentration and alpha-amylase activity before and after the encounters (T_0: 30 minutes before the encounter; T_1: 5 minutes after the end of the encounter; T_2: 20 minutes after the end of the encounter; and T_3: 30 minutes after the end of the encounter).

Concerning behavioural parameters, results confirmed that the PAP on withers skin application reduced agonistic behaviours (DF=1; F=4.14; P=0.0577; Mixed Logistic Regression) and fighting between pigs (DF=1; F=13.47; P=0.0013; Mixed Logistic Regression). Concerning the salivary cortisol concentration, no significant difference was found between treatments (DF=1; F=0.10; P= 0.750; GLMM). Finally, no significant difference was found between treatments regarding the alpha-amylase activity (DF=1; F=0.25; P=0.620; GLMM). Further inspection of data showed variability (dispersion) within each group was lower when PAP was applied.

In conclusion, the skin application of PAP helps to improve pigs' welfare, by reducing aggressions and fighting, among other positive effects. Therefore, it is an interesting tool to use in pig production systems to improve their quality of life.

Early Life and Maternal Care posters

Early visual access to an outdoor range improves range use and the cognitive flexibility of meat chickens

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

Dr. Peta Taylor [1], *Dr. Adam Hamlin* [2], *Prof. Jean-Loup Rault* [3]

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Ranging behaviour is heterogenous in meat chicken flocks. It is unknown why only some birds choose to range or why it takes 3-5 days to first access the range. Meat chickens are typically reared in stable conditions with minimal complexity until allowed range access. Individuals that adapt quickly to this abrupt change may be the first to access the range. We aimed to increase range use by providing complex rearing environments. Mixed-sex Cobb500 chickens (n = 174) were housed across 18 pens in one of three treatments; Control (CON) included wood shaving litter, feed and water. Visual access (VA) treatment were housed with the same CON environment with addition of visual access to the range via transparent pop-hole covers. Complexity (COMP) treatment had the same CON environment with the addition of visual barriers, artificial haybales, fans and streamers. Range access was provided from 21 days. Range use of each individual was tracked via RFID until 42 days. Cognitive flexibility was assessed with a reversal learning task (RLT) on two different cohorts either prior to range access (10-19 days of age; n = 62) or after range access (32-41 days of age; n = 50). RLT included three stages; habitation, learning colour discrimination task (CDT) and the RLT. Chickens were habituated to the Y-maze for five minutes (three times pre-range access; twice post-range access). Only chickens that stepped (≥1) during habituation were included in the CDT. For the CDT, chickens were randomly assigned an arm (colour and side) which contained mealworms. If a chicken reached the mealworms, or two minutes elapsed, it was returned to the start box for another attempt. Chickens had five 2-minute attempts to reach the mealworms within each session. The criteria to pass the CDT was four consecutive correct trials across two consecutive sessions. For the RLT the correct arms were reversed. The number of failed attempts to relearn the task was recorded. Treatment effects were analysed with GLMM (ranging behaviour) and Cox regressions (CDT and RLT). VA birds accessed the range faster ($F_{(2,187)}$12.2,p<0.001) and for more days ($F_{(1,187)}$5.1,p=0.025) than CON and COMP birds. Pre-range access, VA chickens learned the RLT (VA 87.5%, CON 75%, COMP 66.7%) with fewer mistakes (VA 7.14 ± 1.8; CON 19.3 ± 2.4; COMP 14.0 ± 4.2,p=0.025; $\chi^2_{(3,14)}$9.4,p=0.025). These results demonstrate that visual access to an outdoor range during rearing improves cognitive flexibility and is an effective method to increase range use.

Compromised developmental outcomes in the offspring of lame sows

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

Ms. Marisol Parada Sarmiento [1], _Mr. Leandro Sabei [2]_, _Dr. Matteo Chincarini [3]_, _Ms. Lydia Lanzoni [3]_, _Prof. Rupert Palme [4]_, _Prof. Adroaldo Zanella [2]_, _Prof. Giorgio Vignola [3]_

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Pregnant sows, housed in some commercial pig farms, may experience painful states, being lameness the most prevalent one. In this study, we aimed to identify developmental outcomes in piglets born from lame sows during neonatal and post-weaning periods. We used a validated score system (0 to 5, being 0 an easy locomotion and 5 a downer sow) to assess locomotion in sows. Studies were performed in the last third of pregnancy in sows from Italian (ITA) and Brazilian (BRA) commercial pig farms. A cohort of sows with at least three assessments carried out before farrowing were selected and labeled as "without" (G1=ITA(13); BRA(15) scores 0 and 1), "moderated" (G2=ITA(16); score 2), and "severe" (G3=ITA(10); BRA(15) scores ≥ 3) lameness. All litters from ITA farm were assessed (n=539 piglets) for hair cortisol, Intrauterine Restriction Growth (IURG), and nociception during the first week of age. A hair pool, grouped by sex, was collected from piglets (ITA) to measure cortisol by EIA. Nociception was assessed using a pressure algometer device (PAM). From BRA farm three piglets from each sow (90 piglets in total) were weaned at 28 days of age and transported to the University Campus, where the following assessments were carried out: nociception with an Electronic von Frey Anesthesiometer; fear and exploratory behavior using open field and novel object tests. After determining data distribution parametric and non-parametric tests were performed. Hair cortisol concentration in male offspring from G1,G2,orG3 sows was not different (ANOVA; p-value=0.164), but approached significance when hair cortisol, from the male offspring of G1 and G3 sows was contrasted (T-test; p-value=0.094), being a higher concentration of hair cortisol in G3 offspring (mean=11.2pg/mg) when compared with G1 offspring (mean=8.1pg/mg). Piglets born from G3 sows had a higher IURG score than piglets from G1 sows (Wilcoxon-test; p-value=0.05). Nociception threshold was higher in newborn piglets from G3 sows, when compared with piglets from G2 and G1 sows (Kruskal-Wallis-test; p-value=0.003) and was higher too in weaned piglets from G3 sows, when compared with piglets from G1 sows (Wilcoxon-test; p-value = 0.004). Latency to approach the novel object was higher in piglets from G1 sows, when compared with piglets from G3 sows (Wilcoxon-test; p-value=0.03). These results indicate a possible impact of lameness during the last third of pregnancy in affecting fear reaction, nociception, IURG, and hair cortisol in the offspring. The protocol was reviewed by the Ethics and Animal Use Committee (protocol number 9870211117).

Life experiences of boars can shape survival, aggression, and nociception responses of their offspring

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

Mr. Leandro Sabei [1] , Mr. Thiago Bernardino [1] , Ms. Marisol Parada Sarmiento [2] , Ms. Sharacely de Souza Farias [1] , Prof. César Gonçalves de Lima [3] , Prof. Rosangela Poletto [4] , Prof. Adroaldo Zanella [1]

1. *University of Sao Paulo, Faculty of Veterinary Medicine and Animal Science, Department of Preventive Veterinary Medicine and Animal Health,* **2.** *University of Teramo, Faculty of Veterinary Medicine and University of Sao Paulo, Faculty of Veterinary Medicine and Animal Science,* **3.** *University of São Paulo, Department of Basic Sciences, School Animal Science and Food Engineering,* **4.** *Federal Institute of Education, Science and Technology of Rio Grande do Sul, Campus Sertão*

Boars in commercial settings are often housed in challenging environments with poor stimuli, movement restriction and social isolation. Stress during prenatal and neonatal periods (i.e. parental environmental challenges) can reprogram offspring phenotype through molecular changes starting from the gametes. The objective was to investigate the effect of three different individual housing environments of boars on the phenotype of their offspring: crates, pens, and enriched pens (N=6boars/treatment; Ethics Committee on Animal Use N° 6555081018). Boars' enriched treatment consisted of offering them hay, brushing and bathing twice daily. Semen pools matched by quality indicators and representing all treatments in each pool were used to inseminate 15 gilts housed outdoors under same environmental and handling conditions. Behavior assessment was carried out at 25 days of age in all piglets (N=131) through open field, novel object, and elevated plus-maze tests. At weaning (29 days of age), piglets were grouped by weight in three pens with hay bedding. Six body photographs were taken from each weaned piglet for five days to count skin lesions. On day 34th, nociception was assessed using an Electronic von Frey Anesthesiometer. At the end of the study, hair DNA samples were tested for paternity, revealing that crated boars fathered 26.7%, boars in pens 30.5%, and boars in enriched pens 42.8% of the offspring. Offspring data were subjected to factor analysis to summarize the information related to the variability and correlations between the variables in four latent factors. Factorial scores were classified as negative, central, and positive based on the first and third quartiles. Chi-square test (alpha=0.05) was used to analyze the distribution homogeneity of factorial scores in the boars' treatments. A correspondence analysis computed associations between the frequencies of piglets within treatments and categories of the factor scores. No effects of boars' treatments in behavioral tests of their offspring were found (p>0.05). Piglets born from boars housed in enriched pens had fewer skin lesions (p=0.008) than the other treatments. Piglets born from boars housed in crates showed higher nociceptive values than those born from boars in pens without enrichment (p=0.029). In conclusion, aggression and nociception outcomes showed an influence of the environmental housing conditions of boars on their offspring. Further research must be performed to understand the underlying mechanism associated with these changes, applying protocols of epigenetics and other molecular markers.

Thermal responses of newborn lambs in an equatorial semi-arid environment: Are they at risk of hyperthermia over the first 24 hours of life?

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

Mr. José Danrley Cavalcante dos Santos [1] *, Prof. Edilson Paes Saraiva* [1] *, Ms. Larissa Kellen da Cunha Morais* [1] *, Mr. Tarsys Noan Silva Verissimo* [1] *, Mr. Humberto da Silva Teti* [1] *, Ms. Geni Caetano Xavier Neta* [2] *, Mrs. Jessyka Laura Galdino Costa* [3] *, Mr. Sergio da Silva Fidelis* [4] *, Prof. Vinicius de França Carvalho Fonsêca* [1]

1. Animal Biometeorology and Ethology Group (BIOET), Federal University of Paraiba., *2. Department of Animal Morphology and Physiology, Sao Paulo State University, UNESP/FCAV,* *3. Maringá State University (UEM), Maringá,* *4. Innovation in Animal Biometeorology (INOBIO-MANERA)*

High rates of neonatal mortality are still a huge problem for sheep farming worldwide, causing several losses, particularly due to the inability of newborns to cope with extreme weather conditions. However, we are unaware of any study that specifically assessed how newborn lambs thermally respond under natural conditions of an equatorial semi-arid environment. Here in this study we therefore evaluated newborn lambs over the first 24 hours of life, from black (Santa Ines) and white (Dorper) haired sheep breeds, to observe how they thermally respond to the natural conditions of an equatorial semi-arid biotope. Data were collected from 55 newborn lambs (Dorper, n=26; Santa Ines, n=29). Lambs had their latencies to the first reaction, standing and sucking recorded. The hair coat surface (T_S, ºC) and rectal (T_R, Cº) temperatures were measured over the first 24 hours of life at each 1 hour. A Glimmix model was used to examine the main effects of breed and classes of ambient air temperature on response variables. Ewes and lambs experienced levels of air temperature, solar irradiance and mean radiant temperature ranging between 20 and 35°C, 220 and 1270 W m^{-2}, and from 18.6 to 78°C. The thermal environment showed no influence (P>0.05) on behavioural performance of lambs. The rectal temperature ranged from 37 to 41°C for Santa Ines lambs, and from 37 to 40.7°C for Dorper. When they were exposed to direct solar radiation, the rectal temperature of Santa Ines lambs tended to be greater than the temperature assessed if they were in the shade, particularly during the time of high radiant heat load. The hair coat surface temperature ranged from 24.1 to 63.1°C for Santa Ines lambs, and from 24.3 to 42.1°C for Dorper lambs. In fact, both for Santa Ines and Dorper lambs, the hair coat surface and rectal temperatures were positively correlated with mean radiant temperatures; i.e., high levels of T_S and T_R coincided with high levels of mean radiant temperature (e.g., from 10:00 to 15:00h). In conclusion, black-haired Santa Ines lambs delivered in an equatorial semi-arid environment appear to be more susceptible to develop hyperthermia over the first 24 hours of life, especially if they are exposed to direct solar radiation.

Maternal investment and growth performance of Dorper and Santa Ines lambs in an equatorial semi-arid biotope

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

**Ms. Geni Caetano Xavier Neta** [1] , **Prof. Edilson Paes Saraiva** [2] , **Mr. José Danrley Cavalcante dos Santos** [2] , **Ms. Larissa Kellen da Cunha Morais** [2] , **Mr. Humberto da Silva Teti** [2] , **Mr. Sergio da Silva Fidelis** [3] , **Mrs. Jessyka Laura Galdino Costa** [4] , **Prof. Vinicius de França Carvalho Fonsêca** [2]

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The amount of maternal investment (i.e, the ewe's body condition) during gestation and lactation influences offspring performance. In order to investigate the relationship between maternal investment and growth performance during lactation, as well as possible cumulative effects on the behavioral and productive performance of lambs during the confinement phase, 38 Dorper and Santa Inês lambs were evaluated at birth. , from 7 to 63 days of age (i.e, lactation period) and thereafter were housed for assessments over a 42-day period. Behavioral observations were directly recorded through behavioral sampling. Principal component analyzes were performed to identify patterns of dissimilarity in animals during the lactation period based on maternal and lamb performance variables. Least squares analyzes were performed to test the effects of weight and race classes during lactation and confinement. Principal component analysis based on the growth performance characteristics of lambs during lactation (e.g, live weight at birth and at 07, 14, 21, 28, 35, 42, 49, 56 and 63 days) evidenced separation of the animals in three weight ranges at weaning: light ($\leq$17 kg), medium (>17 kg e $\leq$25 kg) and heavy (> 25 kg), which indicates differences in the lambs' responses during lactation and performance in confinement. The correlation matrix within the first main component showed that birth weight, body condition score at birth and at weaning were the variables that contributed least to the separation of groups. It is speculated that other factors affected the growth performance of lambs during the lactation period. In fact, when we take into account the differences between body condition scores at parturition and weaning, mothers of heavy lambs had higher positive values ($P < 0.05$), showing an association between the amount of maternal investment (from the reduction in body score at weaning) and the superior performance of heavy lambs during lactation and the confinement period. During the confinement period there was no difference ($P>0.05$) in the time spent on feeding between lambs grouped in different body weight classes, however, the light lambs waited longer to have access to food. In conclusion, the difference between the body condition score at birth and at weaning seems to be a good measure of the amount of maternal investment of mothers during the lactation period. Furthermore, the greater maternal investment during the lactation phase may reflect better behavioral and growth performance of confined lambs.

Comparative study on behaviours of two genetically selected breeds of domestic chick to different playback calls.

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

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It is unknown how playback calls could affect the behavior of FUNAAB Alpha broiler and Isa Brown pullets which have been genetically selected for meat and egg production respectively. For this study, 36 ISA brown pullet and 36 FUNAAB Alpha broiler chicks of the same age (2 weeks old) were subjected to playback calls. The birds were divided into three replicates (12 birds/replicate). The test was carried out for 3 days/week for two weeks. On the 1st, 2nd and 3rd day, each replicate was placed in the test arena and exposed to no sound (control, NCP), feed call (FCP) and alarm call (ACP) for 1 h respectively. The behaviour of all chicks/per replicate was recorded with the use of digital cameras. The behaviours monitored were foraging, feeding, pecking, running, freezing and clustering. Data were extracted from the recorded video using 5 min scan sampling and the percentage of birds performing each behaviour was recorded. Data was analysed using Kruskal-Wallis test (effect of call type) and Mann-Whitney U test (effect of breed) in IBM SPSS package. On average for both breeds, foraging was greater (χ^2 = 17.79, df =2, P<0.001) during ACP and NCP than FCP; feeding was greater (χ^2 = 35.81, df =2, P<0.001) during NCP than ACP which was in turn greater than FCP and running was greater (χ^2 = 15.04, df =2, P=0.001) during ACP and NCP than FCP. Other behaviours were not affected (P>0.05) by call type. Effect of breed (average for the three call types), there was a significant breed effect on pecking (U=5136.50, P = 0.013) and freezing (U=5093.50, P=0.036) only, pecking was greater in broiler while freezing was greater in pullet chicks. Other behaviours were similar for both breeds. During ACP, there was a significant breed effect on foraging (U= 442.00, P= 0.015) and pecking (U=472.00, P = 0.002); foraging was greater in pullet chicks while pecking was greater in the broiler chicks. Other behaviours were similar for both breeds during ACP. During FCP, foraging was greater in broiler (U=452.50, P = 0.010) while freezing was greater in pullets chicks (U=465.50, P= 0.003), other behaviours were similar for both breed. The only behaviour that differed between breed during the NCP was running (U=366.00, P<0.001) which was greater in the pullet than the FUNAAB Alpha chicks. The two domestic breed of chicks showed similar behavioural responses for each playback calls but with few behavioural differences.

Effect of full mother contact and voluntary colostrum suckling followed by fenceline mother contact and restricted milk suckling on growth and welfare of buffalo calves

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

Dr. Madan Lal Kamboj [1]**, Dr. Sanjay Choudhary** [1]**, Dr. Devan Arora** [2]**, Dr. Pawan Singh** [1]**, Dr. Shwetambri Jamwal** [1]

1. *ICAR- National Dairy Research Institute, Karnal, Haryana, India,* **2.** *Haryana Pashu Vigyan Kendra, Lalalajpat University of Veterinary and Animal Sciences, Uchani, Karnal*

Cow-calf separation imposes many physical, psychological and nutritional stresses on calves affecting their growth, health and welfare. Positive effects of limited cow-calf contact at milking time or unrestricted contact through a fenceline have been demonstrated in cattle. This study was aimed at investigating the effect of full mother-calf contact and free choice colostrum suckling from birth to 5 days and thereafter fenceline mother contact and restricted milk suckling on growth, health and welfare of buffalo calves. For this 24 mother-calf, pairs of Murrah buffalo calves were selected at parturition and blocked into 3 groups of 8 each (parity1-3; lactation yields 2460.25±173.76 kg). In no mother contact (NMC) group; calves were separated from mothers at birth and bottle fed colostrum and milk twice daily ($1/10^{th}$ of body weight). In restricted mother contact (RMC) group; calves were separately from mothers at birth and allowed restricted mother contact and suckling twice daily. In full mother contact (FMC) group; calves were in full time mother contact with unrestricted colostrum suckling from birth to 5 days and thereafter in fenceline contact and restricted suckling twice daily. Mean values were analysed using one-way ANOVA in SPSS. Average daily colostrum intake was higher ($p<0.05$) in FMC and RMC than in NMC. Colostrum suckling frequency and duration (min/day) in FMC on d1 were 19.50±0.62 & 49.87±1.69 respectively which declined linearly to 7.87±0.29 & 32.65±2.41 on d5. Blood serum glucose levels (mg/dL) on d3 and d5 were higher ($p<0.05$) in FMC (70.5±4.1 & 80.5±3.5) than RMC (60.2±4.2 & 72.2±3.1) and NMC (48.2±3.2 & 60.1±2.1). Average daily gains (ADG) from 0-d5 were higher ($P<0.05$) in FMC (660.4±19.1 g) than in RMC (455.4 ±13.6 g) and NMC (357.5±13.4 g). ADG from 0-d30 was also higher ($p<0.05$) in FMC (646.8±9.6 g) than in RMC (482.7±8.3 and NMC (445.0±14.1 g). Stress biomarkers viz., heart rate, rectal temperature, eye temperature, neutrophils count, lymphocytes count and cortisol levels were lower ($p<0.05$) on d1, d6, d10, d15 and d30, in FMC than in RMC and NMC. Number of diarrheal incidences was 3, 46 and 33 in FMC, RMC and NMC calves. Serum IgG and total protein concentrations differed ($p<0.05$) in FMC, RMC and NMC. There was almost no incidence of abnormal behaviours in FMC calves. In conclusion, the buffalo calves reared in full mother contact with voluntary colostrum suckling followed by fenceline mother contact with restricted suckling performed better and suffered with lower stress levels.

Fenceline calf-mother-bull contact: A novel approach for improving performance, behavior and welfare of mothers and their calves

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

Dr. Sanjay Choudhary [1]**_, Dr. Madan Lal Kamboj_** [1]**_, Dr. Shwetambri Jamwal_** [1]**_, Dr. Pawan Singh_** [1]**_, Dr. Nishant Kumar_** [1]

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Provision of cow-calf contact has been reported to improve the productive performance, behaviour & welfare of mothers as well as their calves but results in delayed onset of ovarian activity of mothers leading to prolonged days open especially in buffaloes. We hypothesized and that biostimulation through bull contact to calf bonded buffaloes may counteract the negatives consequences on the reproductive performance of mothers while improving the performance, behaviour of mothers and calves. The study was aimed to investigate the effect of calf-mother-bull contact on performance, behaviour and welfare of buffaloes & their calves. We selected 24 mother-calf Murrah buffalo pairs at parturition and blocked them into 3 groups of 8 each (parity1-3; lactation yields 2460.25±173.76 kg). In T_0; calves were separated from mothers at birth and bottle-fed colostrum and milk twice daily ($1/10^{th}$ of body weight) and were not exposed to the bull. In T_1; calves were also separated at birth but allowed restricted contact and suckling twice daily at milking & exposed to the bull by fenceline contact from d35 post-partum. In T_2; had full-time calf-mother contact with unrestricted colostrum suckling from birth to 5 days. Thereafter they had fenceline contact, twice daily suckling at milking, and exposure to the bull by fenceline contact from d35 post-partum. Mean values were analyzed using one-way ANOVA in SPSS. The average daily gain differed ($p<0.05$) among 3 groups of calves. Average weaning body weight at 4 months was higher ($p<0.05$) in T_2 than T_1 & T_0 calves. Neutrophils count, lymphocytes count, serum cortisol levels, and vocalization frequency were lower ($p<0.05$) in T_2 _vs._ T_1 & T_0 calves and mothers on d1, d6, d10, d15 & d30 respectively. Daily milk yield differed ($p<0.05$) among 3 groups in T_2, T_1 & T_0 respectively) with docile milking temperament and higher peak yields in T2 than in the other 2 groups. Days from calving to first oestrous, days from calving to the first service, and service period were similar in T_0, T_1 & T_2 respectively. The time spent on eating, rumination, and resting was higher ($p<0.05$) in T_2 _vs._ T_1 & T_0 mothers, while standing time was higher ($p<0.05$) in T_0 & T_1 _vs_ T_2 mothers. In conclusion, full-time fenceline or restricted calf contact did not adversely affect the reproductive performance of biostimulated buffalo mothers whilst improving their productive performance behavior and welfare. It also improved the growth and reduced the stress levels in calves.

Effect of degree of mother-calf contact on behavioral responses in Murrah buffalo calves

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

Dr. Shwetambri Jamwal [1] _, Dr. Pawan Singh_ [1] _, Dr. Madan Lal Kamboj_ [1] _, Dr. Rajneesh Rajneesh_ [1] _, Dr. Sanjay Choudhary_ [1] _, Dr. Rajashree Rath_ [1]

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Mother-calf contact during early calf-hood stage of rearing is important for behavioral development in an animal's life. Deprivation of this bond with restricted or no maternal contact can affect calf's response and welfare. With this objective the present study was conducted to investigate the effect of maternal contact on behavior of calves. For this response of a calf to novel object was studied. 24 Murrah buffalo calves were taken from Livestock Research Center, ICAR-NDRI, Karnal, India.Three groups of mother-calf contact of 8 calves each were formed, i.e Full Mother Contact (FMC), Restricted Mother Contact (RMC) and No Mother Contact (NMC). Calves of FMC group were kept with their dams for 0-5 days with free choice colostrum intake, after 5 days they were separated through fence line with 24 hrs contact with their dams and were allowed morning and evening suckling. The calves of RMC were provided with restricted maternal contact during morning and evening hours for suckling and were housed separately from their mother. In NMC group, calves were separated immediately after birth and fed colostrum and milk with bottle throughout the experiment with no maternal contact. Each calf was tested individually in test arena for its response to novel object (a ball) at one month of age for three consecutive days for 10min/test through CCTV camera. Behavior of calf was recorded and analyzed using GLM method (SPSS software) and the means were compared among groups. The results showed percentage of calves that made contact with novel object were higher (P<0.05) in FMC (58.33± 12.19) compared to RMC (45.83±8.76) and NMC (20.83±8.76). The number of retreats from novel object were lower (P<0.01) in FMC (18.58±0.60) compared to RMC (26.50±1.13) and NMC (39.80±1.87). Escapes attempts from test arena were higher (P<0.01) in NMC (39.50±3.00) compared to FMC (25.95±1.76) and RMC (30.50±1.59). The calves of FMC (79.25±11.15) spent more (P<0.01) time (sec) in exploring the novel object as compared to RMC (57.83±11.89) and NMC (14.54±5.72) groups. Whereas, time (sec) spent in exploration of test arena was more (P<0.05) in NMC (388.50±19.50) calves compared to FMC (331.90±15.10) and RMC (319.50±11.07). The percentage of calves defecating in arena during trial were higher (P<0.05) in NMC (50.00±8.90) than FMC (25.00±5.40). The findings suggested fence line rearing of calves with their dams as a good initiative that develops better coping ability with improved welfare for calves under unfamiliar situations compared to restricted and no mother contact.

Factors influencing ease of whelping and its relationship with maternal behaviour in commercial breeding dogs

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

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Parturition is one of the most important stages in the reproductive cycle of the dam and a critical moment for the viability of the newborn puppy. Evidence in other mammals suggests that a difficult labour might influence maternal behaviour and the viability of the offspring during the first hours postpartum. To our knowledge, no previous studies have investigated how the difficulty of the whelping process may affect the onset of maternal behaviour in domestic dogs. The aims of this study were: a) to develop a behavioural index to measure ease of whelping (EoW) in dams maintained within a Commercial Breeding Establishment (CBE) environment, b) to investigate which environmental factors might influence the EoW process and c) to determine the relationship between intrinsic and extrinsic factors, EoW and maternal behaviour during the first 24 hours postpartum. Thirty dams (parity 0-4) from different breeds and crossbreeds were included in the study. Behaviour of dogs was observed from video recordings starting 24 hours before delivery of the first pup and throughout the entire parturition process until birth of the last pup. Parturition duration, birth interval, and duration and frequency of variables indicative of distress, restlessness, nesting behaviour and general activity were scored and included in a Principal Component Analysis to construct an Ease of Whelping Index. Following parturition, mother-pup interactions (nursing, licking and grooming pups, lying in contact with pups) were recorded during the first 24 hours postpartum. Generalized linear models showed that EoW was significantly affected by whelping season ($X^2_{(3)}$ =8.194, P=0.042), litter size ($X^2_{(2)}$ =7.701, P=0.021) and dog origin (whether the dams were born within the CBE or brought in; $X^2_{(1)}$ =4.305, P=0.038). Regarding maternal behaviour, the average time spent by the mothers lying in contact with their pups was significantly affected by breed group ($X^2_{(2)}$ =24.086, P < 0.001) and the EoW index. Mothers that experienced more difficult parturitions (higher EoW score) spent more time lying in contact with their pups during the first 24 hours after giving birth ($X^2_{(1)}$ =6.037, P=0.014). Furthermore, there was a significant effect of breed group ($X^2_{(2)}$ =9.905, P=0.007) and origin of the dam ($X^2_{(1)}$ =6.254, P=0.012) on average nursing duration. This study is the first to investigate the relationship between EoW, environmental factors and maternal behaviour. Results are particularly relevant for the welfare of breeding dams maintained in large scale CBEs, where the staff to dog ratio might be insufficient to adequately manage multiple simultaneous parturitions.

Effect of rearing environment on the development of spatial cognition in egg-laying hens

Mx. Claire Jones [1], *Ms. Allison Pullin* [1], *Dr. Richard Blatchford* [1], *Dr. Maja Makagon* [1], *Dr. Kristina Horback* [1]

1. *UC Davis*

Multi-tiered aviary systems provide laying hens with opportunities for species-specific behaviors, including vertical and horizontal movement. However, collisions and failed landings that occur during vertical movement are associated with injuries, such as keel bone fractures. Previous studies have suggested that floor rearing of pullets with minimal access to elevated structures may negatively impact adult laying hens' ability to navigate vertical space. Unfortunately, it is not clear whether this is due to deficits in physical ability or if differences in rearing environment influence the development of adequate spatial cognition. The effect of rearing environment on the development of spatial cognition was investigated in egg-laying hens using a novel Y-maze task and a visual cliff task at 7-8, 15-16, and 29-30 weeks of age. Dekalb White pullets (n = 450) were reared in three different environments until 16 weeks of age: floor, single-tier aviary, and multi-tier aviary. At 16 weeks, all birds received a multi-tier aviary for the laying period. Distance perception was evaluated via a Y-maze task with a ratio of 1:3 or 1:1 difference in escape arm length and exit choice was recorded. To evaluate depth perception, hens were placed on a perch in the center of the visual cliff table, facing the perceptual cliff. Each bird was tested with three trials with random assignment of cliff depth at 15, 30, and 90 cm below the perch. Birds were given the option of escaping by jumping to a platform suspended over the visual cliff. Behaviors recorded included crossing the visual cliff and number of downward head orientations over the cliff edge. It was found that birds, regardless of age and rearing treatment, exited the Y-maze through the shorter (0.70, $P < .001$) arm more than chance. An interaction effect of age and rearing treatment on crossing the visual cliff (Wald x^2 = 12.734, df = 4, p = 0.013) was found, with hens reared on the floor being less likely to cross the visual cliff at 8 and 16 weeks of age than 30 week old floor reared birds or multi and single treatment birds at 8 and 30 weeks old. These results suggest that floor reared birds do not have impaired depth perception, but do respond differently when faced with a vertical structure prior to being transitioned to adult housing. This has implications for pullet rearing and the importance of early access to vertical structures.

Does maternal care contribute to poorer survivability in triplet lambs?

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

Ms. Sivikelwe Nyoni [1], Prof. Cathy Dwyer [2]
1. _The University of Edinburgh Royal Dick School of Veterinary Studies,_ **2.** _SRUC_

Triplet lambs have a higher mortality rate than single and twin lambs, which is related to slower behavioural development and an impaired ability to maintain body temperature. However, the contribution of maternal care to triplet lamb survival has not been well investigated. We hypothesised that ewes may either increase their maternal care when delivering triplets, if each lamb stimulates more maternal behaviour, or reduce maternal care, if a prolonged delivery with triplets inhibited maternal behaviour. The maternal behaviour (licking, bleating, udder acceptance) of 588 single, twin and triplet-bearing ewes and 615 lambs (grooming received) were assessed for the first 2 hours after birth (of the last lamb for maternal behaviours) from video and live records collected over 15 years. Triplet mothers expressed more grooming behaviour compared to twin and singleton mothers in the 2nd hour after lambs were born (grooming proportion: Single=0.36±0.07; Twin=0.35±0.06; Triplet=0.52±0.08, P<0.05). However, this was not sufficient to compensate for caring for three lambs as triplet lambs received less grooming compared to twins and singletons (P<0.001), and third born lambs received less grooming than lambs born earlier in the litter. There was also a negative correlation between length of labour and the amount of grooming given by the ewe over time (P<0.001). Triplet and twin-bearing ewes had a higher frequency of high-pitched bleats than single ewes (Bleat frequency per 10 minutes: single=3.0±0.9; Twin=6.8±1.2; Triplet=7.0±1.0P<0.001), but there was no effect of litter size on low-pitched bleats. Triplets lambs were less likely to attempt to suck (P<0.05) compared to singles and twins, but ewe responses to sucking attempts were not affected by litter size. Overall the data suggest that although triplet-bearing ewes increase maternal care to their litter compared to smaller litters, they are not able to sufficiently compensate for the need to share maternal attention between more lambs, and later born lambs receive less maternal care. Focusing alternative approaches, rather than increased maternal care, is required to improve survival of larger litters.

Effects of three rearing methods on the reactions of goat kids subjected to an open field tes

Sunday, 1st August - 18:00: Early Life and Maternal Care posters - Poster

**Ms. Mayara Andrioli** [1], **_Dr. Monique Carvalhal_** [2], **_Mr. Renan Santos_** [3], **_Mr. Lucas Pifer_** [4], **_Dr. Mateus Paranhos da Costa_** [5]

1. _Pos-graduante student_, **2.** _Researcher of ETCO group_, **3.** _Graduate student_, **4.** _Graduate_, **5.** _Profesor of UNESP-FCAV_

There is no agreement about the best way to rearing dairy goat kids in Brazil. The aim of this study was to evaluate the effects of three rearing strategies on the emotional reactions of kids subjected to an open field test. The study was carried out at Laboratory of Goat Studies at UNESP, campus of Jaboticabal, with 17 Anglo Nubian and 31 Saanen goat kids. Three rearing methods were tested: AN = the goat kids stayed with their mothers all the time, from birth to weaning; ANS = from the second day of life, the goat kids stayed with their mothers from 7 a.m. to 4 p.m.; and AT = the goat kids were separated from their mother's right just after birth, receiving cow colostrum at will in the first day of life and 1,5 kg of cow milk from the second day of life. ANS and AT kids were housed in collective cages with 3 animals.The behaviors of each goat kid were video recorded during open field tests, carried out at 15, 35 and 60 days old. Each test lasts 180 s, being performed in a 3.8m x 2.5m room. During the first 120 s each goat kid stayed alone in the room, then an unfamiliar person entered the room. The following variables were recorded: frequency of vocalization (Voc), time spent at the start position (Tinic), time stationary (Tpar), and time spent in the corners (Tcant) when the goat kid was alone; and latency of voluntarily approach to the unfamiliar person (Aprox) and the frequency of vocalization when the unfamiliar person entered the room (Vocpess). Data were analyzed using mixed linear generalized model considering the fixed effects of rearing method, sex, age and breed. Significant differences between rearing methods were observed for Voc (P=0,002; means 54.28±3.20, 67.94±3.38 and 64.6±3.24), Tinic (P=0,004; 2.17±2.18, 0.25±2.30 and 8.36±2.21 s), Tpar (P=0,01; 16.92±3.37, 10.60±2.57 and 25.23±3.51 s), Aprox (P<0,0001; 45.22±3.12, 21.47±3.29 and 13.44±2.60 s) and Vocpess (P<0,0001; 8.07±0.89, 2.36±0.94 and 1.68±0.90), for AN, ANS and AT, respectively. The highest frequency of Voc in AN can be interpreted as an indicator of negative emotional state, as well as the higher means of Tinic and Tpar due to the goat kids being considered curious and explorative animals. Additionally, the lower Aprox and Vocpess means shown by AT goat kids might indicate that the unfamiliar person offered social support to them, acting a moderator of stress.

Welfare of Working Animals posters

Welfare Assessment of Working & nonworking Horses in Nyala, South Darfur, Sudan.

Sunday, 1st August - 18:00: Welfare of Working Animals posters - Poster

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Abstract:Welfare assessment of working & non-working horses in Nyala, South Darfur, Sudan.
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Abstract: In many developing countries, horses are considered as the main animal of transportation of goods, people, water, agricultural products and contribute directly and indirectly in livelihoods of a poor communities, although their contributing in human food security particularly in Darfur; horses are still suffering from poor management conditions, harsh environmental conditions, malnourished, subjected to different conditions of hardships, unkindness, over-use, limited veterinary services and owners awareness, zoonotic disease and multiple welfare issues. Though; the study of welfare issues of horses and factors that negatively affect their health in Sudan is still neglected if compared with developed countries. A present study aims to evaluate and compare the welfare of working and non-working horses; moreover this study provides preliminary information about owners' relationships with their horses. The animals were divided into two groups (n=50 of each), working and non-working horses. The parameters as physical examinations, emotional status of horses was measured Through alertness, apathy or depression, walking tests were performed and each horse's response to the observer and owner was categorized as indifferent or friendly, and aggressiveness was avoided in the chin touch test as avoidance or acceptance and owner questionnaire were measured in this study. There were significant differences (P<0.05) in hitting tools, biting, age and behavior between two different groups of horses. Yet there were no significant differences (P<0.06) in hydration, respiration rate, pulse rate, body conformation, physiological condition, external parasite, and gait between working and non-working horses. In conclusion, working horses are suffering from multiple health and welfare problems more than non-working horses.
Thus training, awareness, education, and workshops are recommended for horse owners to improve the welfare of horses.

Keywords: Horses; Welfare; Darfur; Questionnaire.

A shelter as possible important facility for a therapeutic rabbit - a pilot study

Sunday, 1st August - 18:00: Welfare of Working Animals posters - Poster

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Research into the impact of animal therapy is important mainly in terms of human benefits, but the focus on the animal welfare is undervalued. Unsuitable manipulation or high frequency of using the animals can cause distress or frustration to the animals, therefore potentially impairing their welfare. Recent studies showed the positive relationship between humans and mainly dogs and horses. During last several years the domestic rabbit is not just a pet, but we can find it at schools, hospitals or at retirement homes. Using rabbit as animal suitable for the animal therapy seems to be appropriate because of quality of his hairs, small size and easier manipulation. In contrast, of normally used dogs, rabbits can be quite shy. That highlights the importance of realizing when the animal's reactions signal its discomfort during the therapy unit, and, based on this knowledge, finding an appropriate use for the rabbit's therapeutic purpose. The aim of the study was to find whether rabbits use shelter as a part of an interactive device during therapy units with a human, compared to control measurements without a human presence. For this pilot study, nine female rabbits were used, all socialized and habituated to handling. The rabbits were group-housed with substrate. The animals' behaviors were twice video-taped for 10 minutes on a special human-rabbit interactive table with a possibility to use a shelter in two situations: in the presence of the unfamiliar person (N=18) and without a person as a control (N=18). We analyzed the durations of staying in the shelter and the frequencies of shelter visiting. We analyzed data in SAS program, using proc. MIXED. First results showed a significant effect of the human presence on the durations of staying in the shelter (p=0.009). The rabbits spent longer time in the shelter in human presence compared to control without a human (364s ± 88.2s vs. 53.8s ± 64.4s; LS means ± S.E.). The frequency of shelter visiting was not significant (p=0.57). This pilot study showed that shelter is important for rabbits as a part of a therapeutic device and future research will focus on the details of the rabbits' behaviors during therapeutic units with and without shelter.

PRESENCE OF STEREOTYPED BEHAVIORS IN CREOLE COLOMBIAN HORSES (CCC) KEPT ON STABLES IN CUNDINAMARCA COLOMBIA

Sunday, 1st August - 18:00: Welfare of Working Animals posters - Poster

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INTRODUCTION

Stereotypies are invariable behaviors, without apparent function, repetitive and caused by attempts to adapt to the environment. Thus, the most frequent stereotypies in carnivores are displacement, while ungulates preferentially develop oral stereotypies (2). Animal welfare is crucial in equines, since if they are properly managed, they will have better production, they will feed much better, they will be healthier animals, with better reproductive performance and they will be marketed much easier (3). It is important to know that not all inappropriate behaviors can be easily observed and can often be overlooked, an example is: if it kicks the wall of the stall and then the manager supplies it with the food, it will relate it as a way of asking for it, which will increase its habit of kicking the walls (3). It is important to identify stereotypies because it has been found that there is a relationship between stress and a greater susceptibility to them contracting diseases related to its immunosuppression, this will trigger a "fight or flight" reaction, caused by the release of stress hormone, cortisol. Frequent release of this hormone can affect the digestive, immune, and cardiovascular systems, and can cause diarrhea, gastric ulcers, and colic (1).

In different stables, specimens with different behavior problems are observed, ignoring known orders, flight attitudes, poor appetite, depression, accelerated heart rate, pathological disorders, weight loss and physical condition, as well as some stereotypes such as: Aerophagia with and without support, Lignophagia, Coprophagia, Stereotyped pendulum, Stereotyped wander, Effective and ineffective aggression (4).

OBJECTIVES

- Evaluate behavioral alterations in Colombian horses (CCC) that are housed in stables.
- Determine the ages at which stereotyped behaviors occur the most.

METHODOLOGY

A total of 113 Colombian creole horses (CCC) from five stud farms located in Cundinamarca, Colombia were studied. The specimens were reviewed determining the presence or absence of these behavioral alterations and registration form was filled out with name, age, color, height, pace and driving events.

RESULTS

The equines were divided by age into 6 groups: 0-24 months (n=8), 24-36 months (n=11), 36-48 months (n=10), 48-60 months (n=16), 60-78 months (n=18) and > 78 months (n=50). 17% presented stereotypes.

CONCLUSION

The most frequent behaviors in the CCC that are housed in stables were aerophagia with and without support, Effective aggression and ineffective, kicking the stable, rocking and stereotyped walking, and 1% presented 3 behaviors at the same time (slap, pitching and Supported aerophagia).

Useful indicators to assess the welfare of ranch horses and mules in commercial beef cattle farms in Brazil

Sunday, 1st August - 18:00: Welfare of Working Animals posters - Poster

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Horses and mules are often used in Brazilian beef cattle farms for monitoring, driving and sorting cattle, among other activities. However, the knowledge about their welfare status is still scarce. The aim of this study was to identify useful indicators to assess the welfare of ranch horses and mules in commercial beef cattle farms in Brazil. Sixteen welfare indicators (scores 0, 1, and 2; from best to worst condition), adapted from the Wageningen UR protocol (2012, edepot.wur.nl/238619) and AWIN (2015, doi:10.13130/AWIN_HORSES_2015) were applied to 135 animals (84 horses and 51 mules) from seven commercial farms located in Mato Grosso state, Brazil. Indicators showing low variability (when more than 84% of animals received the same score) were excluded from data analyses. The selected indicators were subjected to a principal component analysis (PCA). The welfare status of each animal was defined by the sum of the selected indicators (WFsum). The Kruskal-Wallis test was applied to analyze the differences of WFsum between farms. Only five welfare indicators were selected based on the variability criterion: avoidance distance, skin lesions, body condition, lesions at mouth corners and hoof condition. The first dimension of PCA explained 27% of the variation (eigeanvalue = 1.3), showing high loading values for avoidance distance (.66), skin lesions (.62), body condition (-.56), while the second dimension explained 22% of the variation (eigeanvalue = 1.1), showing high loading values for lesions at mouth corners (.73) and hoof condition (-.58). The results from PCA analysis showed animals from farm 1 had more lesions in the mouth and lower body condition scores than the animals from the other farms. This was also confirmed by the results from Kruskall-Wallis test, which showed that farm 1 showed greater median of WFsum than farms 2, 4 and 5. The combined results suggest that the welfare problems are probably associated to the type of management adopted by each farm. Additionally, the distribution of the individuals in the PCA score plot, and the individual values of WFsum within each farm, lead us to assume that there were differences in the way that each individual was managed within each farm. The welfare problems identified in this study can be characterized as long-term and, therefore, they are not likely to be quickly solved, indicating that some animals were in a state of chronic suffering.
Keywords: Equidae, individual differences, management, suffering, body lesions

Associations between stereotypy and behavior in working dogs

Sunday, 1st August - 18:00: Welfare of Working Animals posters - Poster

Dr. Lucia Lazarowski [1], _Ms. Sarah Krichbaum_ [1], _Mrs. Jordan Smith_ [1], _Ms. Lane Montgomery_ [1]

1. _Auburn University_

Stereotypy, or abnormal repetitive behavior, has been considered an indicator of compromised welfare and/or cognitive dysfunction. Stereotypy has been associated with reduced performance in production animals, and with impaired cognitive function in several species including dogs. Stereotypies are common in kenneled dogs, and particularly in kenneled working dogs, but associations between stereotypy and performance in working dogs have not been explored. The current study examined the relationship between stereotypy and several aspects of behavior in a cohort of working dogs (n= 56). S Measures included a cognitive test battery assessing learning, memory, persistence, and flexibility, an emotional reactivity test (ERT), and a judgment bias test. Additionally, frequency and duration of repetitive behavior (e.g., circling, pacing, wall bouncing) while in the kennel during a morning session (prior to going to work) and an evening session (at the end of work day) was recorded from video observations. Percentage of time spent exhibiting stereotypic behavior was significantly higher in the morning prior to work (M = 24.98%, SE = 4.04) compared to the evening (M = 11.56%, SE = 2.8; p< .001), consistent with previous findings that stereotypy differs in response to low and high arousal events. Contrary to previous studies, stereotypy was not associated with increased perseverative responding. However, increased stereotypy was associated with impaired spatial learning and memory where dogs exhibiting higher levels of stereotypy in the morning required more trials to criteria in a visual displacement (r = .39, p = .03) and a spatial working memory task (r = .58, p < .001). Stereotypy was not related to judgment bias suggesting that dogs exhibiting stereotypy did not differ in affective state, but greater stereotypy was associated with greater reactivity towards novel and surprising events in the ERT (r = .27, p= .04). Our results suggest that the relationship between stereotypy and behavioral function in working dogs may differ across cognitive and behavioral domains. Further research is needed to elucidate the mechanisms involved and to determine impacts on working dog welfare and performance.

Cross-Sectional questionnaire of donkey owners and farriers regarding farriery practices in the Faisalabad region of Pakistan

Sunday, 1st August - 18:00: Welfare of Working Animals posters - Poster

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Pakistan is a lower-middle income country and is home to 5.6 million equines and 4.2 million donkeys, most of which are classified as draft animals. As many as 96% of these suffer from lameness, but the knowledge of owners regarding farrier practices in working equids is often poor.

This study aimed to assess the usage of and access to farrier services in the Faisalabad region of Pakistan. A cross-sectional convenience sampled study was conducted with 61 donkey owners, six of whom were also farriers, using a specifically designed Android Survey App. Data were collected during January to June 2020 using a structured interview with closed and open-ended questions regarding use of farriery services and lameness in the owner's donkey(s). The interview was conducted by a native Urdu speaker (RK). Verbal consent was given by participants, participation was voluntary and data were anonymized in a password-protected database. Data were exported to Microsoft Excel and descriptive statistical analysis performed. The project was approved by the City University Human Ethics Sub-Committee, reference number H002176.

Forty owners (73%) sought farriery services every 15-30 days. Fifty-nine percent adjusted this shoeing schedule seasonally. The majority of owners (78%) sought farrier services from same farrier, mostly (51%) because of a good relationship between owner and farrier. Other influences on farrier choice included the farrier's location (26%), cost and skill of farrier (9% each), and time between shoeing (7%). In addition, 33% owners reported lameness annually in their donkeys, 31% reported year-round lameness, 23% linked lameness with an event while 13% reported no lameness at all. The majority of owners who reported that their donkey was always lame described this as slight (n=9), for example '_slight lameness exists almost all the time_'. The average owner-reported cost for shoeing was 65 Pakistani rupees per hoof, the equivalent of approximately US$1.60 per donkey.

Owner reported lameness appears to be lower than lameness observed in a separate study conducted at the same time, which is consistent with findings in equine populations elsewhere. Factors influencing choice of farrier are predominantly relationship based or convenience based. This survey was the first of its kind to target donkey owners of Faisalabad and provides baseline data on which interventions can be based.

Management of Free-Roaming Animals posters

Stray dog control activities in City of Skopje 2010-2020. Do we have proper strategy?

Sunday, 1st August - 18:00: Management of Free-Roaming Animals posters - Poster

Mr. Dimitar Terzievski [1]_, Prof. Miroslav Kjosevski [2], Prof. Vlatko Ilieski [3]_

1. _Food and veterinary agency,_ **2.** _Faculty of Veterinary Medicine - Skopje,_ **3.** _Animal Welfare Center - Faculty of Veterinary Medicine - Skopje_

Abstract

In the City of Skopje standards for the management of stray dogs are defined by legal norms, generating a high variability of approaches around the country. Despite efforts carried out by the competent authorities, stray dogs are still a reality impacting animal health and welfare and public health. Appropriate control of the size and the structure of the population of stray dogs imply efficient interventions. It is necessary to use the characteristics of an urban environment and the opportunities for data collection over a period of 10 years. The aim of this study was to analyze the current situation with the number of stray dogs in the city of Skopje as well its demographic characteristics with comparations with previous counts of stray dogs for redo of 10 years. The methodology, was in accordance with the guidelines by the WSPA. The stray dog survey comprised of two components: direct observations and counting of the number of stray dogs together with public opinion survey. Parameters considered: gender; animal welfare indicators (whether the dog had skin lesions or lameness); whether the dog had an ear tag; reproductive status of the dog and body condition. The dogs were assessed in ethical manner. The methodology for assessment were based on direct visual observation without physical contact with using of check list with body score condition manual.Estimated number of dogs in city of Skopje were 2442 dogs in 2010, 1883 dogs in 2014 and 1996 dogs in 2020.Results showed that in the period of 10 year there is decrease the total number of counted dogs as well as a decrease of female dogs from 30% to 18% and dogs without ear tag (without CNVR treatment) or collar from 66% to 57%. But figures in 2020 showed increasing percentages of female dog (21 %) and stray dog without ear tag 96 (%). Statistical comparative analysis were performed with determination of upper and lower limits of the total number of dogs. According to the indicators of animal welfare, there were not differences over period of 10 years 4% to 6% of stray dogs had lameness, 3 % to 4% have skin lesions The grades of the body condition of the stray dogs were determined, whereby there were 4% of grade 1 (low body weight); 9% of grade 2; 72% of grade three (optimal body condition); 13% of grade 4 and 2% of grade 5 (overweight).

Managing unwanted toileting in free roaming cats using the cat's own chemical cues

Sunday, 1st August - 18:00: Management of Free-Roaming Animals posters - Poster

Dr. Naïma Kasbaoui [1], Dr. Míriam Marcet-Rius [2], Dr. Cécile Bienboire-Frosini [2], Ms. Fanny Menuge [1], Mr. Philippe Monneret [3], Ms. Estelle Descout [3], Dr. Alessandro Cozzi [2], Prof. Patrick Pageat [2]

1. *Research Institute in Semiochemistry and Applied Ethology (IRSEA), Apt.,* **2.** *IRSEA (Research Institute in Semiochemistry and Applied Ethology),* **3.** *Research Institute in Semiochemistry and Applied Ethology (IRSEA), Apt*

In the interaction between free roaming cats and the human community, one of the most undesired behaviours is unwanted toileting in gardens and vegetable patches. This behaviour creates conflicts between cats and the community, which can lead people to use aversive methods to address this issue.

The aim of this study was to confirm the effect of a validated semiochemical composition from cats' anal glands on the elimination behaviour of domestic cats, testing cats individually. In a cattery setting, previous results showed: cats significantly chose to defecate in the litter tray sprayed with the control rather than in the one sprayed with the semiochemical composition . We hypothesised that when tested individually, this effect would be confirmed. This study was approved by the IRSEA ethics committee (CE_2019_07_CEIS) and conducted on 31 cats (10 entire males, 10 entire females, 4 neutered males and 7 neutered females), using a choice test, with a randomised complete block design. The cat stayed in an enriched test room (with shelves, beddings, hiding places, food, water, treats and toys) for 23 hours, during which four socialisation sessions were performed (play and positive interaction with a familiar human). The cat was given the choice between two litter trays, one where the litter substrate was sprayed with the semiochemical composition and the other where the substrate was sprayed with the control. Parameters studied included elimination weight and urine weight, scoring of elimination, litter tray exploration duration and choice of litter tray to toilet. Parameters were analysed using GLMM with SAS 9.4 software.

Cats significantly preferred to toilet in the litter tray sprayed with the control rather than in the litter tray sprayed with the semiochemical composition: urine weight (GLMM; DF=1; F=41.23; **p<0,0001**); elimination type (GLMM; DF=1; F=15.61; **p=0,0005**); first choice elimination (GLMM; DF=1; F=100.33; **p<0,0001**). Cat also explored significantly less the litter tray sprayed with the semiochemical composition: exploration duration (GLMM; DF=1, F=27.86; **p<0,0001**).

These results confirm the effect observed in our previous study: the semiochemical composition tested not only deters cats from defecating at the location where it is sprayed, but also deters urination. Spraying this composition at specific locations where unwanted toileting occurs may help to entice cats to avoid eliminating at these locations.

Managing unwanted toileting in free roaming cats, using feline chemical cues, is a promising approach to help decrease conflicts between free roaming cats and the communities they are living in.

Evaluation of the effectiveness of a canine Catch-Neuter-Return (CNR) programme in Sri Lanka

Sunday, 1st August - 18:00: Management of Free-Roaming Animals posters - Poster

**Ms. Lauren Nash** [1], **Ms. Samantha Green** [2], **Mr. Mark Green** [2], **Prof. Cathy Dwyer** [3]

1. _The University of Edinburgh Royal Dick School of Veterinary Studies,_ **2.** _The Dogstar Foundation,_ **3.** _Royal (Dick) School of Veterinary Studies and the Roslin Institute, University of Edinburgh_

Free-roaming street dogs are common in many countries where resources are readily available on the streets to maintain dog populations. Methods to control or limit dog numbers include culling, capture and movement into shelters and catching, neutering and returning dogs to the areas in which they were found (CNR), sometimes also including vaccination against rabies or other diseases. Of these CNR is considered the most humane and most likely to result in control of the dog population. In this study we evaluated the impact of a CNR programme run in Negombo, Sri Lanka, by comparing the baseline data (before the programme began) in 2015 with data collected in 2018. We evaluated the ownership (owned/free-roaming) and sterilisation (neutered or intact) status of dogs, their age (adult or puppy), their skin condition (scored from 1 to 4 where 1=no hair loss and 4=80-100% hair loss) and body condition (using the International Companion Animal Management Coalition scale, ICAM (2015) from 1 [emaciated] to 4 [overweight]). In total 12,117 dogs were assessed (2015: 8379 dogs, 2018: 3738 dogs). In 2015 only 10.9% of dogs were neutered, 9% were puppies and two-thirds of dogs assessed (69.7%) were owned. Although there were more of male dogs in the population (56.3%), owned dogs were more likely to be male (62.2%), whereas free-roaming dogs were more likely to be female (54.9%). In 2018, 71.9% of dogs were sterilised, and the number of puppies had decreased to 2% (χ^2=191.2, d.f.=1, P<0.001). Median skin condition was good for both populations and did not change from 2015 to 2018 (median scores [Q1-Q3]: 2015 = 1 [1,1], 2018 = 1 [1,2], NS). Median body condition scores were also good (score 3) for both populations but proportionately more dogs were scored in good condition in 2018 compared to 2015 (χ^2=148.67, d.f.=3, P<0.001). The data suggest that CNR programmes can be effective in reducing the number of puppies in a population, and improving some indicators of dog welfare (body condition).

Canine and Feline Control Program: A New Approach in Chile.

Sunday, 1st August - 18:00: Management of Free-Roaming Animals posters - Poster

Mrs. Maria Marin [1]

1. none

Responsible pet ownership was not an issue in Chile, until a new law was dictated in 2017. Since then, owners, and people in general, started to understand and embrace the importance of the prevention of diseases, neutering and welfare of dogs and cats.

Although it is true that some Municipalities have gotten resources to perform neutering plans in the last four years, it is the first time that such a complete program is funded by a Regional Government, which includes prevention of diseases and control of the number of animals, especially on the streets.

The Gobierno Regional de Tarapacá, invested in the performance of the following services, for animals with or without owners: 9,000 pets neutering, 30,000 internal and external deworming, almost 15,000 microchips implantations, 9,000 rabies vaccinations, 6,000 annual vaccinations for dogs and cats and 1,000 sanitary baths.

The service was delivered through a mobile clinic, which visited not only the principal cities but the small and rural localities across region.

Some numbers that we obtained with this program are: 69% of the animals were dogs and 31% were cats, 93% had owners and 7% were pets without owner.

We asked tutors how they got their pets, and the results were that 38% of animals were obtained on the streets (rescued), and only 8% were bought. About neutered animals, 67% were females and 33% were males. This is very common in Latin American countries, were owners do prefer neutering rather than males. About the body condition of the animals, most of them had a score of 3. About the presence of ectoparasites, an incredible 97% of the animals had any kind of parasitosis. This is such an important issue, especially since zoonoses like Ehrlichiosis or Anaplasmosis could affect people. This data is related to the visits to the veterinary, since 44.7% of pets had never been checked by a veterinarian.

Finally, considering a ratio of 5:1 of dogs and 13:1 of cats (according to a few theorical studies made in Chile), we can determine that we neutered 7.5% of canines and 17.5% of the feline population of the region.

Considering that this was a short, but very important initiative, we will continue working now in a project, where we are going to neuter only stray dogs, so hopefully we will get more interesting information about dogs without owner.

Keywords: Animal Welfare, Responsible Pet Ownership, Neutering Program.

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