A noble diet at the Hof van Leugenhaeghe (Steendorp, Belgium): pig skulls as a 14th-15th century delicacy?

Kim L.M. Aluwé [a*], Britt M. Starkovich[a,b,c], Jeroen Van Vaerenbergh[d]

[a] *Institut für Naturwissenschaftliche Archaologie, University of Tübingen, Rümelinstrasse 23, 72070 Tübingen, Germany*

[b] *Senckenberg Center for Human Evolution and Paleoenvironment, Rümelinstrasse. 23, 72070 Tübingen, Germany*

[c] *School of Anthropology, University of Arizona, Tucson, USA*

[d] *Archeologische Dienst Waasland, Regentiestraat 63, 9100 Sint-Niklaas, Belgium*

**corresponding author: kim-lilianna.aluwe@student.uni-tuebingen.de, 0032498200601*

Abstract

The animal remains found at the 14th-15th century Hof van Leugenhaeghe are crucial to reconstruct the life of the noble inhabitants, as all buildings were destroyed with the construction of a later estate on the property called the Blauwhof. The diet confirms the high social status of this nobility with the suspected consumption of pig skulls, a possible sign of wealth in late-medieval Flanders. Other signs of a noble diet are found as well: juvenile cattle, a diverse spectrum of game, partridge and grey heron. The observed pattern of a wealthy diet is consistent with the zooarchaeological assemblages found at other noble sites in late-medieval Flanders.

Keywords

Zooarchaeology, Late-medieval, Flanders, Nobility, Social status

Acknowledgments

We would like to thank the Archeologische Dienst Waasland, for giving the opportunity to study this zooarchaeological assemblage. We would also like to thank Prof. Dr. Nicholas Conard and Prof. Dr. Jörn Staecker for comments on earlier versions of this work and the University of Tübingen for the support and access to the reference collection.

1. The site and historical context

1.1 Situation

Steendorp (part of contemporary Temse, former part of Bazel) is a small village in Flanders, Belgium. It is a rural village next to the river Scheldt approximately 15 km from Antwerp, 30 km from Brussels and 35 km from Ghent (fig.1). Several clay deposits are found nearby and these were exploited in the 20th century for use in the brick industry. In the middle of these deposits is a very rich archaeological site. In the 14th-15th century, the grounds were known as the Hof van Leugenhaeghe (Van Vaerenbergh & Van Roeyen 2007). Unfortunately, this estate was largely destroyed by the construction of the Blauwhof mansion in 1597 by Duarte Ximenez, a rich Portuguese merchant based in Antwerp (Kretschmar 1978; Aluwé et al. 2015).

The modern clay extraction threatened the site and excavations were necessary to preserve what was left from the medieval and post-medieval buildings. In 1998 the ADW (Archeologische Dienst Waasland) started excavations which finished in 2004. The archaeological objects and finds were collected and stored for further analysis. With this article we present the analysis of the zooarchaeological assemblages belonging to the Hof van Leugenhaeghe.

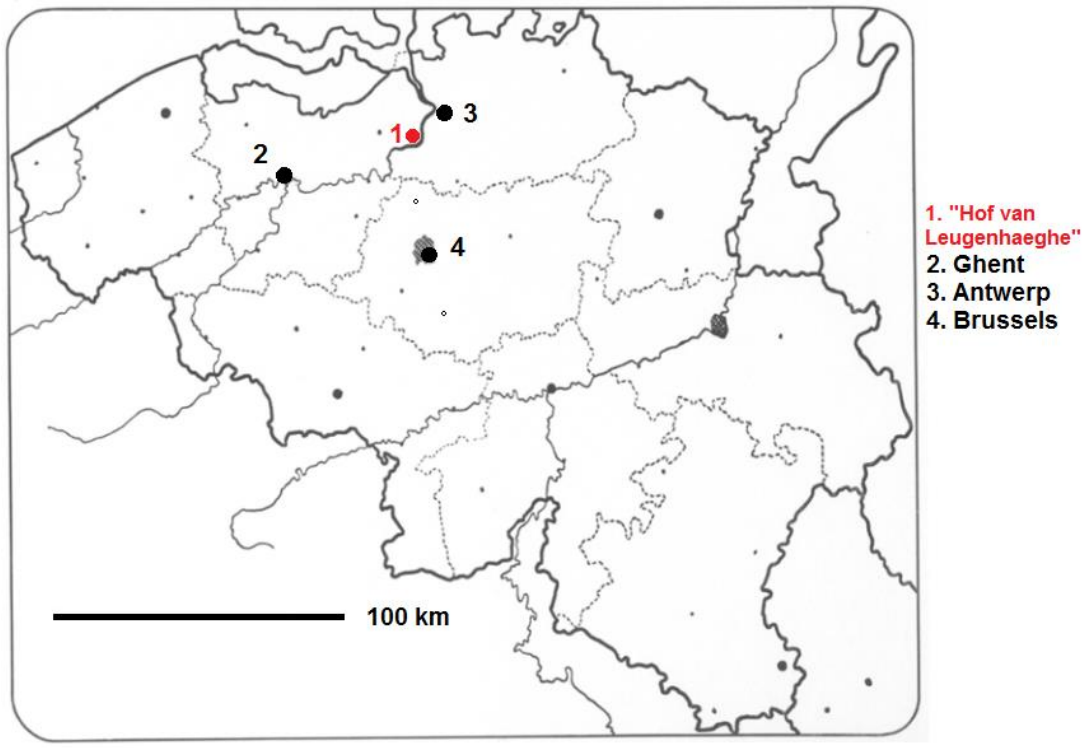


Fig.1: Position of the Hof van Leugenhaeghe and surrounding cities on the map of Belgium.

1.2 The Hof van Leugenhaeghe (14th -15th century)

During the 14th-15th century a noble estate known as the Hof van Leugenhaeghe was present on this site (Pohl 1977; Kretschmar 1978; Dupré 2011). The estate is probably named after one of its first elite inhabitants. How the building might have looked originally is not known; it was totally destroyed for the construction of the Blauwhof by the Ximenez family. With the construction of the Blauwhof, a ditch that had surrounded the Hof van Leugenhaeghe was filled in some section and dug even deeper in others. This allowed only one section of these ditches from the Hof van Leugenhaeghe phase to survive. Excavations discovered that the remaining part of the ditch was filled with animal remains and pottery sherd (Van Vaerenbergh & Van Roeyen 2007). Excavators hand-collected zooarchaeological remains and sediments were not screened. This resulted in a faunal collection of mainly larger animals, while bones of smaller animals (small mammals, fish, birds) and certain small elements (tarsal and carpal complex bones) are likely to be underrepresented.

Little archaeological information is available to learn about the life and habits at the Hof van Leugenhaeghe and historical documents only mention the name and location of this place. The fact that the estate was called "Hof van …" provides evidence that the site belonged to the high society and even to nobility (Buylaert et al. 2011: 396). A preliminary look at the pottery sherds found at the Hof van Leugenhaeghe could confirm this hypothesis with the presence of highly-decorated pottery among others. This material will be analysed in detail in the coming years at Ghent University. Because the site is a noble estate, we expect that the faunal remains from this assemblage will reflect a rich and luxurious diet with desirable taxa such as pigs and wild game, a large number of young animals and possible high-status elements like pig skulls (De Jong 1992; Ervynck et al. 1994; Ervynck et al. 2003; Van der Veen 2003; Ervynck et al. 2006).

1.3 Similar sites

Since the site belonged to the local elite in the 14th-15th century, there are many similar sites available for comparison (Ervynck & Lentacker 2008). Unfortunately, most archaeological studies on medieval elite sites or sites of which the name starts with "Hof…" focus on the building structures, ceramics, glass and metal. An example of such a study can be found for the Hof van Peene at Baasrode (Moens et al. 2011). Zooarchaeological research on medieval sites in Flanders is more popular than for other time periods in the area; urban contexts dominate but multiple castle and residential sites were investigated as well (Ervynck & Lentacker 2008). The animal remains of the 14th-15th century Mote of Drongen provide

evidence for a mixed dominance of mainly older pig and cattle, supposed to be the remains of a rural phase of this castle (Gautier 1981). Another 14th-15th century assemblage was found at the Dobbelslot in Ghent; very low percentages of pig are typical for castle sites in Ghent as these animals were probably banned from the city for hygienic reasons (Lentacker 1984). The remains found in the 14th century basement of the castle of Laarne are mainly freshwater fish and eggshells, other kitchen waste was probably deposited elsewhere (Ervynck & Vandamme 1988). One good example of a comprehensive study from this period is the Burcht of Londerzeel (Ervynck et al. 1994). In the 14th century, this site was inhabited by the local elite and a zooarchaeological analysis of the assemblage was included with the study of the buildings and ceramics. Mammals dominate the collection, though bird bones and seafood were important groups as well. A large number of pig skulls suggests the consumption of pig brains. The Senecaberg fortification in Grimbergen is some centuries older (12th century), but yielded an extensive animal bone collection with a large consumption of pigs similar to the collection of the "Burcht" of Londerzeel (Gautier & Rubberechts 1978; De Wilde et al. 1994). The assemblage of the castle of Assenede is also dated to the 12th century (Ervynck et al. 2006). Again a zooarchaeological assemblage dominated by mammals with the presence of cranial fragments from pigs is found. On this site, large game like red deer is important, which could be linked to the earlier dating of Assenede and could reflect a higher social position compared to the Hof van Leugenhaeghe. The dominance of pig in wealthy diets was also visible in the 13th century remains of the Warande-motte at Veurne (Maenhout van Lemberge 1985; De Wilde et al. 1994: 131; Müldner, Britton & Ervynck 2014: 325).

1.4 The Blauwhof (16th-18th century)

Following the earlier phase of occupation, the estate of the Hof van Leugenhaeghe was bought in 1595 by Duarte Ximenez, a rich Portuguese merchant from Antwerp, who achieved his goal of obtaining a noble status through this purchase. He completely destroyed the older buildings of the Hof van Leugenhaeghe and erected his own impressive country house the Blauwhof. The animal remains from this phase were subject of an earlier study (Aluwé et al. 2015). We concluded that the presence of juvenile cattle and sheep/goat, small game and a variety of birds reflects the family's wealthy status. A large amount of sheep/goat bones compared to other sites in Belgium can be explained by the Portuguese origin of the Ximenez family. They did not seem to take advantage of their trade business as no exotic animals and only small amounts of seafood were discovered. With the presence of non-kosher food items,

we confirmed the Christian status of the family, though their ancestors were previously Jewish (Aluwé et al. 2015).

2. Objectives and research questions

Together with the ceramics, the animal remains are all that is left at this particular site. Historical sources mention the existence of the Hof van Leugenhaeghe in the 14th -15th century as a noble residence and the building structures were all destroyed with the construction of the later Blauwhof. A zooarchaeological study of the animal remains is therefore critical to gather information about the nobles living on the Hof van Leugenhaeghe.

By doing a dietary reconstruction, we evaluate the social status of the site's inhabitants. Based on the designation as a "Hof," we assume that the Hof van Leugenhaeghe was inhabited by nobility, a social class that consumed a rich diet during the 14th-15th century (Buylaert et al. 2011: 395). We analyse multiple lines of evidence to explore features of wealth and luxury in the diet. The ability to acquire a lot of meat is often a sign of wealth as normal households had to rely more on vegetables and grains throughout medieval times (Van der Veen 2003: 412-413). The rich families even had the possibility to select the meatiest parts of the best animals. Killing young animals and consuming this age group in medieval Flanders can also be assigned to wealthy people (Ervynck et al. 2003: 433). Another feature for investigating social status is the diversity of the animals consumed by a particular family (Ervynck et al. 2003: 432; Van der Veen 2003: 408-409). A combination of farm animals, wild mammals, birds and fish is expected for a wealthy diet. Large game hunting was restricted to lords and is only found in noble households (Ervynck et al. 2003: 432). Small game could be hunted by a larger audience but is still restricted to the higher social classes. The final feature reflecting social status is the way animals are cooked, served and consumed. At multiple medieval noble sites in the Lower Countries a large number of skull fragments from pig are found, a fact some researchers interpret as the consumption of pig brains as a delicacy within these wealthy households (De Jong 1992: 216; Ervnck et al. 1994: 130-133; Ervynck et al. 2003: 432-433; Ervynck et al. 2006: 55).

3. Methods

Faunal remains were identified using standard zooarchaeological techniques (Lyman 1994; Reitz and Wing 2008; Groot 2010). Specimens were identified to species level if possible, and to body size categories (e.g., medium mammal) in the case of less identifiable bones. We used

Boessneck (1969) to distinguish between sheep and goat. We assigned ribs, vertebrae, long bone shafts (fragments from limb bones) and flat bone pieces (fragments from mandible, scapula or pelvis) to size classes: large mammals (cattle), medium to large ungulates (small cattle or large pigs), medium mammals (pigs, sheep/goat and large dogs) or small mammals (rabbits, hares and small dogs). Element, portion and side of the body were recorded, as well as butchery marks and evidence of burning. We took measurements of the bones using the guidelines from von den Driesch (1976).

A species list with NISP (number of identified specimens) and %NISP is our basic unit of analysis. To create body part profiles, we calculate the minimum number of elements (MNE) based on the highest number of overlapping portions of each element (Reitz and Wing, 2008). MNE is then divided by the expected number of elements in a complete skeleton to calculate the minimum animal units (MAU) (Binford 1978; Reitz and Wing 2008). MAU is grouped by body part (horn, head, neck, axial, upper front, lower front, upper hind, lower hind and feet) following Stiner (1991) to produce body part distributions. The MAU of the head is based on cranial and mandible fragments instead of teeth as these are often better preserved due to taphonomic processes. Taking into account MNE and the side of each element we calculate minimum number of individuals (MNI) for each animal species (Reitz and Wing 2008).

Three different methods are used to calculate age at death for mammals: long bone fusion, mandible tooth wear, and tooth eruption and wear on specific teeth. The first method uses the data collected on long bone fusion. We present the number of fused, fusing and unfused specimens for early-fusing, middle-fusing and late-fusing elements (Silver 1969; Schmid and Garraux 1972; Moran and O'Connor 1994; Reitz and Wing 2008). A second method uses teeth within mandibles and wear stages developed by Grant (1982). Combined with the age of eruption for certain teeth, this provides additional information from Grant's wear stages (Habermehl 1975; Grant 1982). The last method uses the eruption and wear of specific mandibular and loose teeth (Stiner 2002). To prevent double counting of animals only the deciduous fourth premolar (dp_4) and the fourth premolar (P_4) or third molar (M_3) are used. A dp_4 belongs to a juvenile animal, a P_4 or M_3 with slight to medium wear (Grant wear stages a-f for cattle and a-h for sheep/goat) belongs to a prime-aged adult animal and old animals have P_4 or M_3 with heavy wear (starting from Grant wear stage g for cattle and i for sheep/goat). The numbers of animals in each age cohort are presented in a tripolar graph following Stiner (1991). A 95% confidence interval for the age distribution of each animal species is plotted following a program developed by Weaver et al. (2011).

4. Results

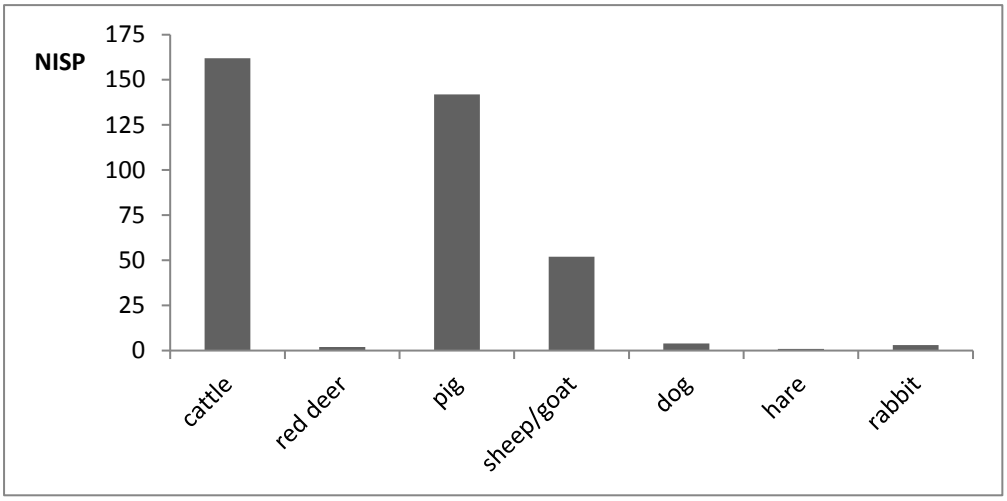
4.1 Animal species representation

The assemblage contains 771 bones and is completely dominated by mammals (table 1). A large amount of these bones were highly fragmented and could only be assigned to size categories. When identified to species-level cattle bones are present in the highest amount, followed by pig (fig.2). Sheep/goat bones only account for a small portion of the remains. We identified the rest of the assemblage as red deer, dog, hare, rabbit and small mammal. Aside from mammals, some birds and mussels were also found in this assemblage.

Table 1: NISP, %NISP (total) and MNI of the animals in the Hof van Leugenhaeghe.

	Species	**NISP**	**%NISP**	**MNI**
Mammal		**759**	**98,4%**	
	Cattle (*Bos taurus*)	162	21,0%	5
	Pig (*Sus scrofa dom.)*	142	18,4%	5
	Sheep/goat (*Ovis/Capra*)	31	4,0%	3
	Sheep (*Ovis aries)*	21	2,7%	
	Red deer (*Cervus elaphus*)	2	0,3%	1
	Dog (*Canis familiaris*)	4	0,5%	1
	Hare (*Lepus europaeus*)	1	0,1%	1
	Rabbit (*Oryctolagus cuniculus*)	3	0,4%	1
	Large ungulate	125	16,2%	
	Medium ungulate	213	27,6%	
	Medium to large ungulate	54	7,0%	
	Small mammal	1	0,1%	
Bird		**7**	**0,9%**	
	Chicken (*Gallus domesticus*)	2	0,3%	1
	Grey partridge (*Perdix perdix*)	2	0,3%	1
	Grey heron (*Ardea cinerea*)	1	0,1%	1
	Unidentified bird	2	0,3%	
Shellfish		**5**	**0,6%**	
	Mussel (*Mytilus edulis*)	5	0,6%	3
Total		**771**		

Fig. 2: Species-specific mammal taxa in order of decreasing body size by NISP.



4.2 Mammals

4.2.1 Taphonomy

Though the assemblage seems to be in a good condition based on visual criteria, we present a simple taphonomic test in order to rule out the possibility of biases related to bone loss in the assemblage. We plot the MNE-based counts of teeth and skulls for each of the main mammalian taxa, following Stiner (2005). Because teeth have a higher mineral component, we expect them to preserve better than bony portions if attrition is a problem in an assemblage. Since teeth are typically introduced to a site within the skull, we expect a 1:1 ratio between the two sets of elements if preservation was not a factor. Figure 3 contains a line indicating a 1:1 ratio; points that fall below this line reflect an overrepresentation of teeth. In this assemblage only cattle bones show a bias toward teeth (fig. 3). Since there is no bias for pigs and sheep/goat, we conclude that taphonomic bias is not a problem for these animals in the assemblage.

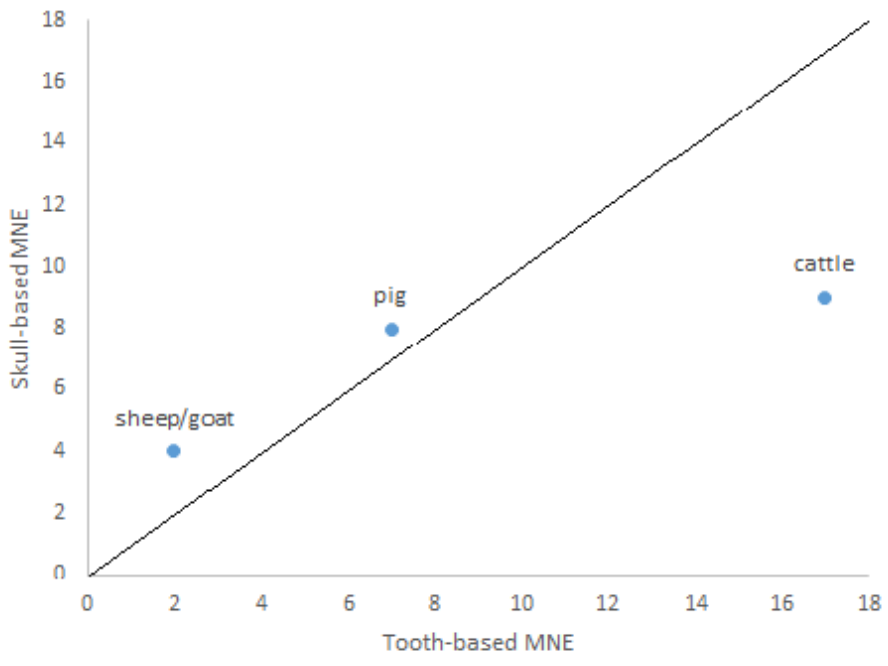


Fig.3: Plot of skull-based to tooth-based MNE of cattle, pig and sheep/goat compared to a 1:1 preservation (following Stiner (2005)).

4.2.2 Cattle + large ungulates

It is likely that undiagnostic large ungulate remains belong to cattle, as we identified no other large ungulates except for two red deer incisors. The large ungulate and cattle bones are therefore treated within one group and account for over one third of the total NISP of the Hof van Leugenhaeghe remains (table 1).

Most elements of the cattle skeleton are found in this assemblage. Hind and front limb elements are present in equal proportions (fig.4). Head parts are slightly overrepresented in this graph. In table 2 NISP, MNE and the ratio of MNE/NISP is represented for crania, mandibles and long bones. Cranial fragments of cattle are more affected by fragmentation than other elements (lower MNE/NISP ratio). As we based our used MNE and body part representations on MNE and MAU, fragmentation does not affect our observed overrepresentation of head parts. Feet, axial and neck elements form only minor groups. Modifications are observed on one third of the bones (table 3). The majority of them are long bone shafts, mandibles and ribs with hack marks.

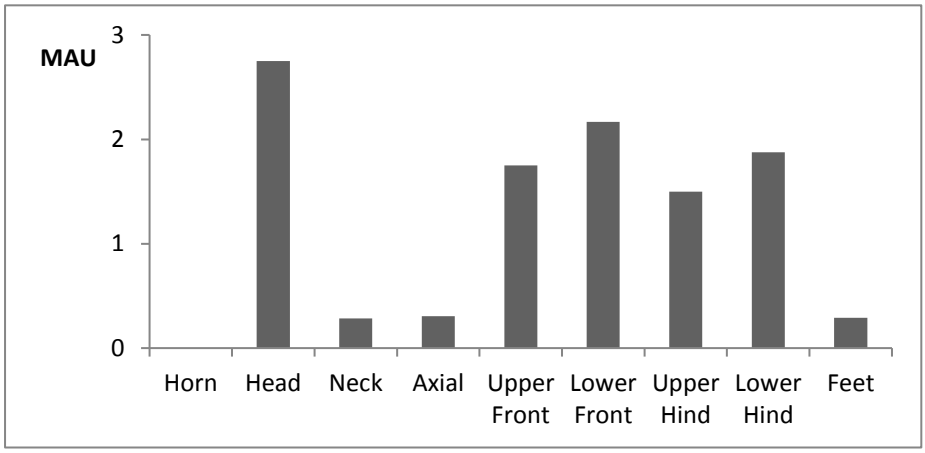


Fig.4: Combined body part representation (MAU) of cattle and large ungulates (following Stiner (1991)).

	Pig + medium ungulate			Cattle + large ungulate			Sheep/Goat		
	NISP	MNE	MNE/NISP	NISP	MNE	MNE/NISP	NISP	MNE	MNE/NISP
1/2 Cranium	126	4	0.03	16	2	0.13	4	2	0.50
Mandible	16	8	0.50	28	9	0.32	9	4	0.44
Scapula	4	3	0.75	5	4	0.80	4	3	0.75
Humerus	10	5	0.50	6	3	0.50	2	1	0.50
Radius	3	3	1.00	8	7	0.88	5	2	0.40
Ulna	8	7	0.88	2	2	1.00	1	1	1.00
Femur	3	1	0.33	18	6	0.33	2	2	1.00
Tibia	4	2	0.50	15	8	0.53	2	2	1.00

Table 2: NISP, MNE and MNE/NISP ratio of head parts and long bones for cattle, pig and sheep/goat. Lower ratio values indicate a higher degree of fragmentation.

The large number of mandibles in this assemblage is useful for determining age at death for the animals. Grant's wear stages are combined with the ages for tooth eruption in table 4 (Habermehl 1975; Grant 1982). Four animals are younger than the age of two and two animals are around the age of two. The other animals are older than 15-18 months, but have comparable wear stages. It is therefore highly likely that these mandibles all belong to animals between 1,5 and 2,5 years. The long bone fusion data follows this same pattern with 70% of the middle-fusing elements being unfused, although some animals reached old age (table 5). The mandibular dp_4 and the loose P_4 (two with slight wear and one heavily worn) are used to create a tripolar graph (fig.5). A juvenile dominated pattern is visible.

Table 3: Modifications on cattle, pig and sheep/goat bones with types of modifications and elements with these modifications.

	Cattle + large ungulates (NISP)				**Pig + medium ungulates (NISP)**				**Sheep/goat (NISP)**	
Element	**cut mark**	**hack mark**	**burned**	**gnaw marks**	**cut mark**	**hack mark**	**burned**	**gnaw marks**	**hack mark**	**gnaw marks**
long bone shaft	1	19		2	2	6	4	2		
flat bone	1	1				1	1			
rib	1	9		1	1					
vertebrae		5				2				
spongy element				1						
cranium	1				2					
mandible	4	8		1	2	6		2		
scapula	1	2			1				1	1
humerus	1					2		3	1	
radius		4				1			1	
ulna		1			1	2		3		
carpal	1	4								
metacarpal	2					1		1		
innominate		1					1		2	
femur		7				2				
tibia		6	1			2		1		
astragalus		2			1					
calcaneum	1	1		1		2		4		
metatarsal	1									
auxillary metapodial					1					
Total modification (NISP)	15	70	1	6	11	27	6	16	5	1
Total modification (%NISP)	5,2%	24,4%	0,3%	2,1%	3,1%	7,6%	1,7%	4,5%	9,6%	1,9%
Total modified (NISP)	92				60				6	
Total assemblage (NISP)	287				355				52	
% modified	32,1%				16,9%				11,5%	

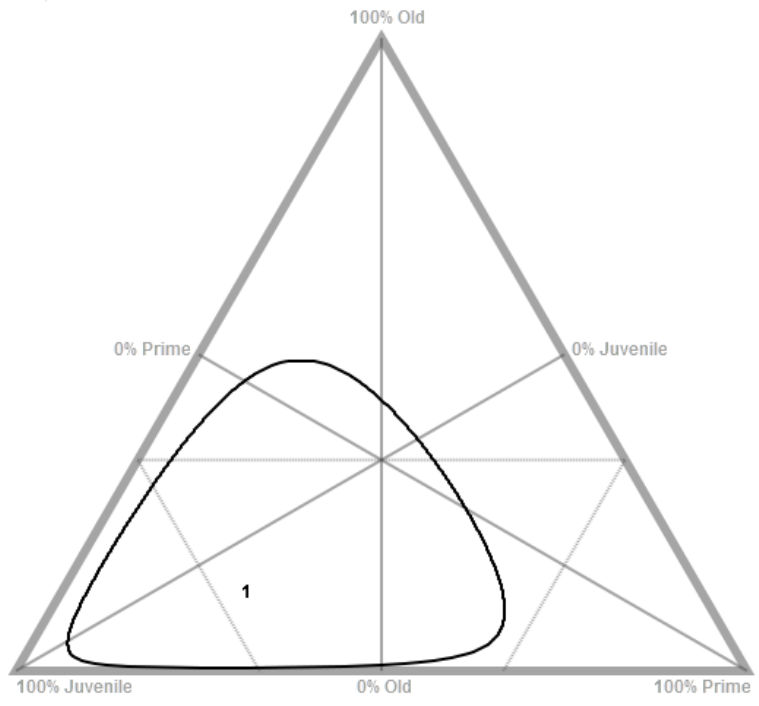
Table 4: Wear stages of cattle following Grant (1982) combined with relative ages of tooth eruption according to Habermehl (1975).

TWS dp_4	TWS P_4	TWS M_1	TWS M_2	TWS M_3	Grant MWS	deciduous teeth	Age Habermehl
g	.	g			.	dp_4	>5-6months + <24-28months
	.	.			.	dp_3+dp_4	<24-28months
j	.	g	e	1/2	26	dp_2, dp_3 +dp_4	24-28 months
	.	j	j		.		>15-18months
h	.	g	d		.	dp_3+dp_4	>15-18months + <24-28months
	.	g	c		.		>15-18months
	.	h	g	U	30		24-28 months
	l	k	g	c	35	dp_4	<24-28months

Table 5: Long bone fusion data (NISP) of cattle.

Moment of fusion	Element	Fused	Fusing	Unfused	%unfused
Early fusing	innominate			2	27%
	humerus dist.	2		1	
	radius prox	4			
	first phalanx prox.	2			
Middle fusing	metacarp dist.			2	70%
	tibia dist.	1		4	
	metatars dist.	2			
	metapodial dist.			1	
Late fusing	calcaneum	1		1	83%
	femur prox.			6	
	humerus prox.			1	
	femur dist.	1		5	
	tibia prox.	1		2	

Fig.5: Tripolar graph of age categories of loose and mandibular teeth of cattle following Stiner (2002) and Weaver et al. (2011). Circle represents a 95% confidence interval. (N=8).

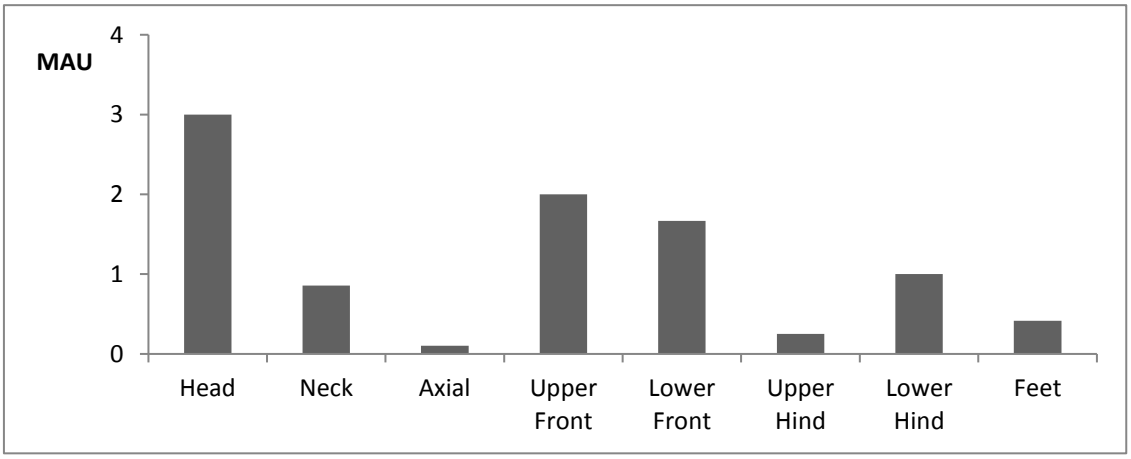


4.2.3 Pig and medium ungulates

Pig bones are three times as common as sheep/goat elements (table 1, fig.2). Medium ungulate bones are probably more likely to belong to pigs rather than to sheep/goat and are therefore treated together with the pigs. Almost half of the assemblage is incorporated in this group.

There is a slight overrepresentation of head parts (cranial and mandible fragments) in the pig body part profile (fig.6). Pig cranial fragments are very heavily fragmented, as reflected in the ratio of MNE/NISP (table 2). However, as with cattle, this high NISP-count of cranial fragments does not account for the slight overrepresentation of head parts in the body part representation as this was based on MNE and MAU, and in fact might indicate the intensive processing of this element. Elements of the front limb are more frequently found than elements of the hind limb. Femurs and axial elements are underrepresented, as are feet. Modifications are found on a minority of the pig bones (table 3). Hack marks and gnaw marks are found on a variety of elements. Only cut marks are found on cranial fragments, no hack marks or gnaw marks. Six bones are burned: four long bone shafts, one flat bone and one innominate fragment.

Fig.6: Combined body part representation (MAU) of pig and medium ungulates (following Stiner (1991)).



Mandibles were present in large numbers and are ideal for determining age. The combination of Grant's (1982) wear stages and ages based on tooth eruption (Habermehl 1975) is presented in table 6. Eighty percent of the animals are between 16 and 20 months because the M_3 is erupting and the wear stages are quite similar. Aging by long bone fusion was possible

as well and confirms the pattern of the tooth wear stages. Late-fusing elements are only found in unfused state and only one of four middle-fusing elements was fused (table 7).

Table 6: Wear stages of pig following Grant (1982) combined with relative ages of tooth eruption according to Habermehl (1975).

TWS P_4	TWS M_1	TWS M_2	TWS M_3	Grant MWS	Age Habermehl
.	c	b	E	18	16-20 months
.	.		1/2	.	16-20 months
a	e	c	1/2	22	16-20 months
.	.		1/2	.	16-20 months
.	e	b		.	>7-13 months
.	.	b	E	.	16-20 months
.	.	a	V	.	16-20 months
.	.	a	C	.	>7-13 months+ <16-20 months
a	c	b	E	18	16-20 months
.	.	b	E	.	16-20 months

Moment of fusion	Element	Fused	Fusing	Unfused	%Unfused
Early fusing	innominate			1	22%
	humerus dist.	2		1	
	radius prox.	2	1		
	phalanx 2 prox.	2			
Middle fusing	tibia dist.		1		50%
	phalanx 1 prox.	1		1	
	metapodial dist.			1	
Late fusing	ulna prox.			2	100%
	femur prox.			1	
	tibia prox.			1	

Table 7: Long bone fusion data (NISP) of pig.

4.2.4 Sheep/goat

Sheep/goat bones make up only a small part of the Hof van Leugenhaeghe assemblage (table 1, fig.2). When species-specific identifications were possible, most bones were identified as sheep. Head parts are more frequently recovered amongst the sheep/goat bones compared to the other body parts (fig.7). Neck elements are completely lacking and feet and axial bones are underrepresented, this was likely caused by adding the medium ungulate remains with the pigs. Front limb elements are found in higher quantities than hind limb bones.

For sheep/goat no age could be determined from mandibles or teeth. Long bone fusion data are available and give some age indications (table 8), although the results can be affected by the small sample size. There is least one juvenile (unfused early-fusing element) and one adult with late-fusing elements in the process of fusing.

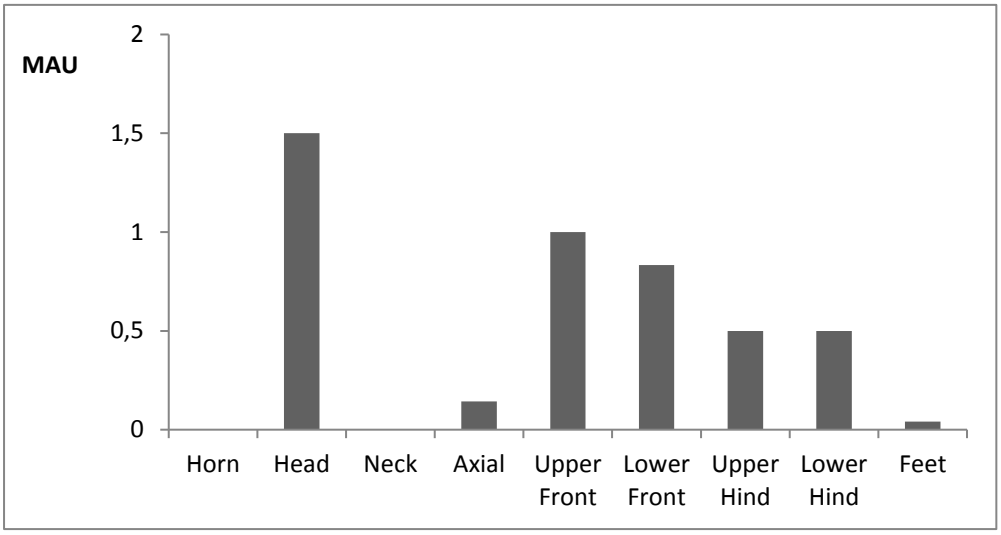


Fig. 7: Body part representation (MAU) of sheep/goat (following Stiner (1991)).

Moment of fusion	Element	Fused	Fusing	Unfused	%Unfused
Early fusing	humerus dist.			1	100%
Middle fusing	metacarp dist.	1			0%
	tibia dist.	2			
Late fusing	radius dist.		2	1	20%
	humerus prox.		1		
	femur dist.		1		

Table 8: Long bone fusion data (NISP) of sheep/goat.

4.2.5 Other mammals

About fifty bones are somewhere between a large and medium ungulate in size. These medium to large ungulates are probably large pigs or small cows (table 1), as cattle in this assemblage is rather small. Half of them are flat bone pieces. Also included within this group are long bones shafts, cranial fragments, vertebrae, ribs, a humerus and an incisor fragment.

Although they are only present in low numbers, some other mammals are represented in this assemblage. Two fused left metatarsals, a left mandible with gnaw marks, and a canine tooth belongs to dog. We recovered two red deer incisors. Three rabbit bones were found as well: a right mandible, a sacral vertebra and a right unfused tibia. One innominate belongs to hare.

4.3 Birds and shellfish

Only seven bird bones are present in the assemblage of the Hof van Leugenhaeghe. Two tibiotarsi could not be identified to species level but are from a chicken-sized bird. One adult humerus and one adult tibiotarsus of chicken were recorded. We recorded two partridge bones: one adult ulna and one adult tibiotarsus. Finally, we documented one grey heron radius.

Five half mussel shells, representing three separate individuals, are the only marine resource we found in this assemblage.

5. Discussion and conclusion

The Hof van Leugenhaeghe, an estate of the local nobility in the 14th -15th century, was completely destroyed in 1595 due to the construction of the Blauwhof. Texts only mention the name and function of the estate and some rough dates of its occupation. The exact nature of this building must be interpreted from the finds in the preserved part of the surrounding ditch. This small section of the ditch most likely contains only a minority of the waste that was once deposited by the occupants of the estate, and also accounts for the small sample size of the assemblage. Nevertheless, the preserved animal remains are crucial for determining the social status of the people that owned the Hof van Leugenhaeghe. We expected a noble diet with the consumption of young animals, wild animals, birds, fish and a high percentage of pig and especially pig skulls.

The assemblage is almost entirely comprised of mammals. The lack of other animal classes can be partially linked to the fact that only a small section of the ditch was preserved; this led to a small sample size in which rare taxa are likely to be absent as species richness increases with sample size (Lyman 1994). Another issue is that, because that sediments were not screened, large animals are overrepresented and small mammals, birds, fish, and small elements such as carpal and tarsal complex bones are probably missing (Klein & Cruz-Uribe 1984). However, the same methods were used to collect animal remains from the ditch associated with the Blauwhof (similar depth and position, similar sediments and similar preservation of the bone assemblage) where mammals account for only 80% of the remains by NISP count, and we observed a more diverse assemblage that includes birds and small game (Aluwé et al. 2015). Therefore, the absence of other animal classes probably reflects the real situation so it seems that the inhabitants of the Hof van Leugenhaeghe did not use this particular kind of high-status resource.

Of course there are other aspects pointing to a wealthy diet, which can be found at the Hof van Leugenhaeghe. The cattle bones belong mainly to young individuals and meaty limb elements were more frequently recovered, two observations that are linked to a rich medieval diet (Ashby 2002: 43-45; Ervynck et al. 2003: 432-433). Pig is found in fairly large quantities as well. Pig was an important animal for the elite of Flanders and England in the late middle ages (Ashby 2002: 41; Ervynck et al. 2006: 55). These semi-feral animals lived around the

forests owned by nobility (Ervynck et al. 1994: 131). Only the highest part of society was able to consume a large amount of pigs and pig-dominated diets are found at several castle sites in Western Europe (Albarella and Davis 1994: 15; Ervynck et al. 1994: 131; Ervynck et al. 2006: 55). At all of these sites archaeologists recovered large numbers of pig head parts, and we also observe a mild version of this trend for the Hof van Leugenhaeghe. The overrepresentation of pig heads is probably the result of selection for skulls and brains as a source of animal fats (Ervynck et al. 2006: 55; Van der Veen 2003: 411; DeFrance 2009). Pig brains were prized by nobility as a delicacy during this period (De Jong 1992: 216). The absence of hack marks on skulls can be explained by the fragmentation of the material due to taphonomic processes. Cut marks on skull and mandible fragments suggest the consumption of other meaty parts of the skull, like the cheeks. Sheep and goat seem to have been of minor importance at the Hof van Leugenhaeghe. Due to small sample sizes it is difficult to interpret the remains from these animals.

Although present in low numbers, other mammals provide more information about the social status of the inhabitants of the Hof van Leugenhaeghe. Hare is part of the hunted game category and consumption of wild animals can again be placed with the higher social classes (Ashby 2002: 40-41; Ervynck et al. 2003: 432). The presence of rabbit shortly after its introduction in Flanders indicates a rich diet on this site (Ervynck 2003; Ervynck et al. 2003: 433). Rabbits were generally kept in warrens like it was the case in Londerzeel (Ervynck et al. 1994), but if a warren was present at the Hof van Leugenhaeghe we would expect to find more than just two rabbit bones. We documented red deer, but only the teeth. The lack of modification on the teeth indicates that they were probably from a hunted animal, as opposed to being collected for use as ornaments or beads. Hunting of red deer was restricted to the nobility and these teeth fit within the expected diet at the Hof van Leugenhaeghe (Ashby 2002: 40-42; Ervynck et al. 2003: 432).

Even in this small collection excavators recovered seashells and bird bones, including chicken, partridge, and grey heron. Partridge is a small game bird generally found on sites with a higher social status and grey heron was only consumed as part of a very rich diet (Albarella and Thomas 2002: 26-27; Ashby 2002: 41; Goddeeris et al. 2002: 1436). A few mussel shells are also found, although the amount of seafood items is surprisingly low for a noble site. It is unclear if this is caused by the small sample and excavation methods or if it reflects the actual diet.

The patterns we observe in the diet of the Hof van Leugenhaeghe are comparable to some others found at medieval nobility sites in Flanders and Belgium (fig.8). In this graph the proportions of cattle, pig and sheep/goat are compared between the different sites.

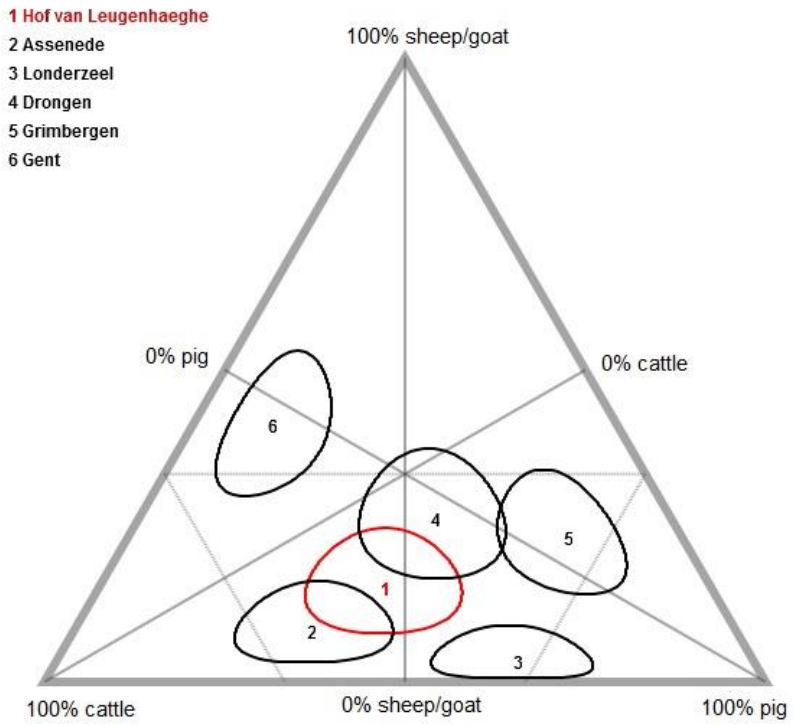


Fig.8: Comparison of percentages of cattle, pig and sheep/goat at the Hof van Leugenhaeghe and contemporary sites. Circles represent 95% confidence intervals

The plot from the assemblage of the Hof van Leugenhaeghe overlaps with that from Assenede and Drongen. The castle of Assenede can be traced back to the 12th century, but was still inhabited by nobility in the 16th century (Ervynck et al. 2006). Assenede is a village near the Dutch border north of Ghent, 45km from the Hof van Leugenhaeghe. A zooarchaeological assemblage of 921 bones is dated to the 12th century, slightly older but in the same social environment as the Hof van Leugenhaeghe. Mammal bones dominate with mainly cattle, a large number of pig remains (mainly cranial fragments) and low percentages of sheep/goat. Mussels and birds are found in small numbers. Large game and horse are rather important in the faunal assemblage of Assenede, but they are almost absent in the Hof van Leugenhaeghe. The animal remains of the 14th-15th century Mote of Drongen are supposed to be evidence of a more rural phase of this castle, however they do overlap with the Hof van Leugenhaeghe assemblage.

The assemblages from Londerzeel and the Seneca-fortification in Grimbergen show a slightly greater importance of pig, than the assemblage of the Hof van Leugenhaeghe. The fortress of Londerzeel was built in the 14th century and was occupied by local lords until the 16th century (Ervynck et al. 1994). It is located in the countryside near Antwerp, 15km from the Hof van Leugenhaeghe. One context dated to the beginning of the 14th century yielded a collection of nearly 8500 animal remains. Mammal bones dominate the assemblage; small amounts of seashells, fish and bird are found as well. Chicken, partridge and grey heron are included in this assemblage, as are mussels. A large number of pig bones, specifically cranial parts, were identified in the fortress of Londerzeel. A relatively small contribution of sheep/goat is also recorded there. Large game is scarce, though some bones of red deer were identified (De Wilde et al. 1994). Although more pig was found on this site, these other observations fit well with the patterns found at the Hof van Leugenhaeghe.

The collection of the Dobbelslot in Ghent completely differs from the pattern in the Hof van Leugenhaeghe. Pigs are not important in the diet of these wealthy inhabitants as these animals were banned from the city of Ghent because of hygienic reasons (Lentacker 1985).

The diet of the Hof van Leugenhaeghe fits within the framework of wealthy late-medieval households such as the owners of the sites of Assende, Drongen, Londerzeel, and Grimbergen. During this period, high-status people generally preferred animals that produce a lot of meat over a diverse diet with seafood and birds which became popular in the 16th century (Van der Veen 2003: 412). Cattle, pigs and sheep/goat were consumed in large amounts. Nobility chose the best cuts of meat of young animals along with fat-rich pig brains. Hunting of large game seemed to have been of minor importance, but some small game and wild birds like partridge were hunted on these noble sites of the 14th-15th century. The diet of this late-medieval nobility in Flanders provides an excellent example of how the consumption of meat and fat can reflect a high social status.

List of references cited

Aluwé KLM, Starkovich B, Van Vaerenbergh J (2015) The diet of the Portuguese merchant family Ximenez at the "Blauwhof" (Belgium): Between tradition and display in the 16th–17th centuries. Journal of Archaeological Science: Reports 3: 581-590

Albarella U, Davis SJ (1994) Medieval and Post-medieval Mammal and Bird Bones from Launceston Castle, Cornwall: 1961-1982. Excavations. English Heritage.

Albarella U, Thomas R (2002) They dined on crane: bird consumption, wild fowling and status in medieval England. Acta zoologica cracoviensia 45:23-38

Ashby SP (2002) The role of zooarchaeology in the interpretation of socioeconomic status: a discussion with reference to medieval Europe Archaeological. Review from Cambridge 18:37-59

Binford LR (1978) Dimensional analysis of behavior and site structure: learning from an Eskimo hunting stand. American Antiquity 43:330-361

Boessneck J (1969) Osteological differences between sheep (Ovis aries Linné) and goat (Capra hircus Linné). In: Brothwell D, Higg E (eds) Science in Archaeology, London:331-58

Buylaert F, De Clercq W, Dumolyn J (2011) Sumptuary legislation, material culture and the semiotics of 'vivre noblement'in the county of Flanders (14th–16th centuries). Social History 36: 393-417

De Jong T (1992) Huisdieren, jachtwild, vissen en weekdieren: een weerspiegeling van gevarieerde maaltijden. In: Arts N (ed) Het Kasteel van Eindhoven. Archeologie, ecologie en geschiedenis van een heerlijke woning:1420-1676, Eindhoven:214-236

DeFrance SD (2009) Zooarchaeology in complex societies: Political economy, status, and ideology. Journal of archaeological research 17:105-168

Dupré S (2011) Trading luxury glass, picturing collections and consuming objects of knowledge in early senventeenth-century Antwerp. In: Dupré S, Lüthy C. (eds) Silent messengers : the circulation of material objects of knowledge in the Early Modern Low Countries. LIT Verlag, Berlin [u.a.]: 261 – 291

Ervynck A, Van Neer W, Van der Plaetsen P (1994) Dierlijke resten. In: De Wilde M, Ervynck A, Van Neer W, De Meulemeester J, Van Der Plaetsen P De 'Burcht' te Londerzeel, Archeologie in Vlaanderen vol.1, Monografie, Zellik:99-170

Ervynck A (2003) De introductie van het konijn in de Lage Landen: een verkeerde datering voor vondsten uit een latrine bij de abtswoning van de Sint-Salvatorsabdij te Ename (stad Oudenaarde, prov. Oost-Vlaanderen). Archeologie in Vlaanderen 7:111-114

Ervynck A, Lentacker A, Van Neer W (2006) Mens en dier in de 12de eeuw. In: De Decker S (ed) Het kasteel van Assenede. Van opgraving tot historisch landschap. Mens & Cultuur uitgevers, Gent: 45-56

Ervynck A, Lentacker A (2008) 9.3 Archeozoölogisch onderzoek. Onroerend erfgoed. https://onderzoeksbalans.onroerenderfgoed.be/node/21292. Accessed 5 March 2016

Ervynck A, Van Damme D (1988) Archeozoölogisch onderzoek op het Kasteel van Laarne; hoezo? Castellum 5:10-17

Ervynck A, Van Neer W, Hüster-Plogmann H, Schibler J (2003) Beyond affluence: the zooarchaeology of luxury. World Archaeology 34:428-441

Gautier A (1981) Vertebratenresten van de mote te Drongen (einde 14de-begin 15de eeuw). Stadsarcheologie Bodem en monument in Gent 5:2-4

Gautier A, Rubberechts V (1978) Animal remains of the Senecaberg fortification. Bulletin Musées royaux d'Art et d'Histoire 48:51-84

Goddeeris B, De Smet G, Roggeman W (2002) Some gastronomic aspects of bird species in still life paintings of Frans Snyders (Antwerp, 1579-1657). Revue belge de philologie et d'histoire 80:1431-1448
Grant A (1982) The use of tooth wear as a guide to the age of domestic ungulates. In: Wilson B Ageing and sexing animal bones from archaeological sites. SBAR 109:91-108
Groot M (2010) Handboek zoöarcheologie. Archeologisch Centrum van de Vrije Universiteit, Hendrik Brunsting Stichting (ACVU-HBS)
Habermehl K-H (1975) Altersbestimmung bei Haus-und Labortieren. Paul Parey, Berlin, Hamburg.
Klein RG, Cruz-Uribe K (1984) The analysis of animal bones from archeological sites. University of Chicago Press
Kretschmar FGLOv (1978) Towards the Identification of a Drawing of a Flemish Château. Master Drawings 16:45-106
Lentacker A (1984) Beenderresten uit Mestput I in het Dobbelslot te Gent (eind 14de-15de eeuw). Stadsarcheologie Bodem en monument in Gent 8:10-12
Lyman RL (1994) Vertebrate taphonomy. Cambridge University Press
Maenhaut Van Lemberge V (1985) De Warandemotte te Veurne: site catchment en voornaamste grote huisdieren (varken, rund). Universiteit Gent, student thesis
Moens J, Ameels V, De Groote K (2011) Archeologisch noodonderzoek naar het voormalige Hof van Peene in Baasrode (prov. Oost-Vl.). Relicta, Archeologie, Monumenten-en Landschapsonderzoek in Vlaanderen 8:47-82
Moran N, O'Connor T (1994) Age attribution in domestic sheep by skeletal and dental maturation: a pilot study of available sources. International journal of Osteoarchaeology 4:267-285
Müldner G, Britton K, Ervynck A (2014) Inferring animal husbandry strategies in coastal zones through stable isotope analysis: new evidence from the Flemish coastal plain (Belgium, 1st–15th century AD). Journal of Archaeological Science 41:322-332
Pohl H (1977) Die Portugiesen in Antwerpen (1567 - 1648). Hochschulschrift, Steiner
Reitz EJ, Wing ES (2008) Zooarchaeology. Cambridge University Press, Cambridge, UK
Schmid E, Garraux O (1972) Atlas of animal bones. Elsevier Amsterdam
Silver IA (1969) The ageing of domestic animals. In: Brothwell D, Higg E (eds) Science in Archaeology, London: 283:302
Stiner MC (1991) Food procurement and transport by human and non-human predators. Journal of Archaeological Science 18:455-482
Stiner MC (2002) On in situ Attrition and Vertebrate Body Part Profiles. Journal of Archaeological Science 29:979-991
Stiner MC (2005) The faunas of Hayonim Cave, Israel: A 200,000-year record of Paleolithic diet, demography, and society. American School of Prehistoric Research Bulletins vol 48. Harvard University Press
Van der Veen M (2003) When is food a luxury? World Archaeology 34:405-427
Van Vaerenbergh J, Van Roeyen J-P (2007) Steendorp-Blauwhof. Annalen van de Koninklijke Oudheidkundige Kring van het Land van Waas 110:430-446
von den Driesch A (1976) A guide to the measurement of animal bones from archaeological sites: as developed by the Institut für Palaeoanatomie, Domestikationsforschung und Geschichte der Tiermedizin of the University of Munich. vol 1. Peabody Museum Press
Weaver TD, Boyko RH, Steele TE (2011) Cross-platform program for likelihood-based statistical comparisons of mortality profiles on a triangular graph. Journal of Archaeological Science 38:2420-2423

Woolgar CM (2006) Food in medieval England : diet and nutrition. Medieval history and archaeology. Oxford Univ. Press, Oxford [u.a.]