

## How to deal with Cardiac Arrhythmia as an Issue in the High Performance Horse?

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Both physiological and pathological cardiac dysrhythmias are commonly found in horses and can occur at rest and/or during exercise. Careful auscultation, which means sufficiently long at both sides of the thorax, will often allow to make a presumptive diagnosis or at least have a strong suspicion about the origin of certain arrhythmias, esp. whether they are physiological or pathological. Attention should also be paid to presence of murmurs as these might be associated with arrhythmias (e.g mitral regurgitation and atrial fibrillation or aortic regurgitation and ventricular ectopy). The definitive diagnosis of the type of dysrhythmia can only be made by electrocardiography (ECG). Nowadays, ECG equipment is easy to use and affordable to private practice which allows on site recording at rest, during exercise or during 24 hours. If one is not familiar with interpretation of the data, digital files can be easily sent to more experienced colleagues or online services.

When assessing performance horses, it is important for the practitioner to be able to distinguish between innocent, physiological dysrhythmias that do not require further examination, and pathological dysrhythmias that require additional examinations. The additional exam obviously includes an ECG at rest and exercise but often also requires cardiac ultrasound and blood examination (electrolytes, troponins, general profile). The exercise ECG test is essential in horses with poor performance and horses with aortic regurgitation, which show an increased prevalence of ventricular arrhythmias. When determining the clinical importance of arrhythmias, one should attempt to identify the possible effect on performance but also the potential risk to horse and rider. Naturally, all decisions and interpretations must always be done in the light of type of sport, level of sport, owner expectations, insurance, future re-sale,...

In normal horses, sinus arrhythmia appears as a waxing and waning of heart rate ('accordion' effect) during recovery from exercise, typically when heart rate drops

from 110 toward 50 bpm. Although the arrhythmia is easily identifiable on an ECG recording, it might be more difficult on auscultation to differentiate it from atrial or ventricular ectopy or from (paroxysmal) atrial fibrillation.

The two most important physiological and pathological arrhythmias to differentiate are second degree atrioventricular bloc (2°AVB) and atrial fibrillation (AF).

2°Atrioventricular Bloc is the most common physiological dysrhythmia in horses appearing at rest when vagal tone is high. It is completely innocent as long as it disappears (often temporarily) with slight excitation of the horse or with exercise. In 2°AVB the underlying rhythm is regular but at regular intervals one beat (or sometimes 2) is blocked producing a pause that is exactly double (or sometimes triple) the normal RR interval. Careful auscultation will often reveal an atrial sound (fourth heart sound) during the pause. 2°AVB should be clearly differentiated from the most important pathological dysrhythmia in horses, atrial fibrillation (AF). Although AF can occasionally present as paroxysmal AF, e.g. during and immediately after racing, in general, it will be permanent AF which means it sustains for ever, unless treated. On auscultation AF typically appears as an irregularly irregular rhythm with a loud first heart sound, but be careful: in some horses the rhythm may mimic 2°AVB (although the atrial sound is absent during a pause). Therefore one needs to listen long enough because during AF a too early beat will always be found. The combination of loud first heart sounds, pauses without fourth heart sound, AND too early beats is by far most likely to be atrial fibrillation. Differential diagnosis could be an ectopic atrial and/or ventricular rhythm. The only way to get certainty is to obtain an ECG. When auscultating an AF horse after exercise, increased heart rates are found and due to the high rate, the irregularity of the rhythm becomes slightly more difficult to appreciate. Horses with AF (in the absence of other cardiac disease) usually will be treated as they show decreased performance, and they can return to full athletic capacity. However, one should be aware that, even when AF is an incidental finding in a normally performing horse, the arrhythmia often results in exercise-related disproportionate tachycardia, abnormal QRS complexes and R-on-T, leading to an increased risk for collapse or even sudden death during exercise. Horses showing any of these ECG abnormalities should be converted. Recurrence risk after successful cardioversion is about 30-35%.

Atrial premature beats are usually found at rest or slow exercise and tend to disappear (or become invisible on the ECG) during exercise. They rarely seem to have an effect on performance. However, atrial premature beats are a trigger for induction of atrial fibrillation. Horses with a high burden of atrial premature beats should regularly be checked by ECG to show the absence of atrial fibrillation.

Ventricular premature beats can be found at rest and/or during exercise and suggest myocardial or other underlying disease. Especially when ventricular premature beats increase with exercise, they are considered a risk for deterioration into ventricular tachyarrhythmias which can result in collapse or sudden death. Exercise ECG recording is mandatory to rule out exercise-related ventricular arrhythmias in poor performing horses. In case of maximal exercise (racing), an occasional, isolated ventricular ectopic beat in the immediate post-exercise period is regarded as normal. Also in horses with aortic regurgitation (degree 3/6 or more) an appropriate exercise ECG is mandatory as these horses are known to show an increased prevalence of ventricular ectopy during exercise. When no underlying cause is found horses should be rested, might be treated with anti-inflammatory drugs, and should be followed-up carefully before they are allowed to continue work.

Bradydysrhythmias, such as 2°AVB, sinus arrest, sinus block or sinus bradycardia are usually vagally driven and should disappear immediately with exercise or excitation. If not one should consider advanced 2°AVB, or rarely, 3°AVB, and an ECG is required.

### Conclusion

Dysrhythmias are commonly found. Some can be readily identified and differentiated on auscultation but the ECG is need to prove the exact type of the dysrhythmia. As ventricular arrhythmias often only appear during intense exercise ECG recording during exercise is an essential part in the evaluation of a poor performer. Also horses with aortic regurgitation require an appropriate exercise ECG assessment. Besides the effect of an arrhythmia on performance, the clinician should inform the owner of possible risks for horse and rider associated with exercise. A full cardiac work-up, including blood examination and cardiac ultrasound, might be necessary to get a full picture of the disease.