

Cardiac electrophysiology of the horse. A characterization of the cardiac repolarization in the equine heart – in healthy horses and in horses suffering from atrial fibrillation.

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Background:

Not much is known about the electrical properties in the equine heart, and a characterization of the ionic currents underlying the equine cardiac action potential has not previously been described.

Disturbances in the cardiac rhythm occur in horses and atrial fibrillation (AF) is the most common clinically important arrhythmia in this species. AF occurs spontaneously and is primarily diagnosed in large breed horses. Symptoms reveal themselves during higher levels of exercise and the most common cause of veterinary consultation is exercise intolerance. Normal atrial pump function is crucial for late diastolic ventricular filling and for maintaining adequate cardiac output during intense training. Given that horses develop spontaneous AF, and might be more comparable to humans than e.g. rodents who are being extensively used in cardiovascular research, the project aims at analysing the possible usability of horses as a model reflecting human AF.

Objectives:

1. Describe a clinical and surgical approach to measure basic electrophysiological parameters and complete a cardioplegia in horses
2. Make a characterization of the ionic currents underlying the cardiac repolarization in horses
3. Understand the molecular and electrophysiological mechanism leading to the appearance of AF in horses
4. Study the possible usability of horses as a model reflecting human AF

Research plan and methods:

Horses included in the study undergo a clinical examination including auscultation of the heart, ECG and echocardiography. The included horses are divided in two groups 1) horses are anaesthetised and undergoes an open chest operation. Administration of a novel anti-arrhythmic compound will be conducted in AF-horses to investigate the ability of this drug to convert the arrhythmia to sinus rhythm. The horses are then euthanized by infusion of icecold high potassium solution retrograde through the aorta and the heart is transported to the laboratory where analysis of action potential morphology is conducted. The method used in this study is sharp electrode electrophysiological measurements done on atrial and ventricular tissue-strips 2) Electrophysiological parameters are measured in the standing horse using transvenous catheter electrodes. The aim of this PhD project is to provide knowledge about the function of cardiac ion channels and to characterize the action potential morphology of the horse which is important to understand the true function of the equine heart.

