Patch-clamping on isolated equine atrial cardiomyocytes to study atrial electrophysiological properties.

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Background: Atrial fibrillation (AF) is the most clinically relevant atrial arrhythmia in horses. Atrial fibrillation in equine athletes can have an impact on performance and horse and rider safety. Transvenous electrical cardioversion becomes the treatment of choice but requires special equipment and expertise. The most commonly used drug for treatment is quinidine sulfate but side effect can be considerable and the product becomes more difficult to obtain. Recurrence rates of AF are relatively high and little is known about drugs that might reduce recurrence. Therefore, it is crucial to gain a better understanding of atrial electrophysiological properties. In vitro studies would allow electrophysiological testing and to investigate different types of drugs that might have potential to treat AF or prevent its recurrence in horses. **Objectives:** The aim of this study was to perform patch-clamp techniques elucidate the equine atrial electrophysiological properties at cellular electrophysiological level to better understand the pathophysiology of AF. **Study Design:** Cross-sectional study. **Methods:** Cardiomyocytes were isolated from atrial tissue harvested from 3 horses in sinus rhythm. Evoked action potentials (APs) were measured from isolated cardiomyocytes using the patch-clamp technique. **Results:** The AP amplitudes and upstroke velocities in equine cardiomyocytes were 126.6 ±14.11 mV and 71.77 ±11.98 mV/ms. The AP duration at 90% repolarization (APD_{90}) in horses was 200.5 ±86.78 ms. This AP duration in horses was significantly longer compared to that in mice, rats, pigs and humans with mean differences of 149, 139, 55 and 116ms. **Main limitations:** Only horses in sinus rhythm, not in horses in AF, were studied. **Conclusion:** Equine cardiomyocytes could be successfully isolated and action potentials, reproduced using the patch-clamp technique, showed important differences compared to other species. This technique creates new opportunities to investigate new therapeutic strategies for atrial rhythm disorders in horses.

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