

Contents

Editorial	i-ii
Original Articles:	
Reference values of Holter electrocardiography in normal horses Zoltan Bakos and Louise Lohne	3-7
Cytoarchitecture of the nucleus of the trapezoid body of bats: A comparative histological study I-sanna Gibbons et al	8-16
Prevalence of endoparasites in wild rats in Grenada. C Coomansingh et al	17-21
Prevalence of intestinal parasites in pigs in Grenada, West Indies Keshaw Tiwari et al	22-27
Short Communications	
Application of immunomagnetic separation (IMS) for the detection of <i>Escherichia coli</i> O157 on dairy farms in Trinidad Rohini Roopnarine et al	28-32
Case Reports	
Five cases of clinical interest observed in the Small Animal Clinic at the School of Veterinary Medicine, The University of the West Indies between October 2008 and December 2008 Thotta Ganesh et al	32-36
Review article	
Medicinal Properties of Neem (<i>Azadirachta indica</i>) Kumar Kamashi et al	37-52
Student Research Abstracts	53
Book Review	
“District Laboratory Practice in Tropical Countries” by Monica Cheesbrough 2nd Edition 2005 and 2006	54
Erratum	55
Guidelines to Authors	56-58

Subscription:
US \$25.00 (per issue)

The Editor
West Indian Veterinary Journal
School of Veterinary Medicine
The University of the West Indies

Reference values of Holter electrocardiography in normal horses

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Abstract

The aim of the study was to obtain a set of relevant measurements from healthy, resting horses that can be used as reference values for Holter electrocardiography. Twenty healthy horses (eight mares, two geldings and ten stallions) were selected randomly. The animals varied in age from three to nine years. Electrocardiography was performed at rest in the stable without the presence of the examiner causing additional stress. Each horse was monitored for one hour. P-wave duration, P-wave peak interval, P-R segment, P-R interval, QRS interval, S-T segment, Q-T interval and S-T interval were determined. Median values of the above-mentioned parameters in milliseconds were as follows: 110, 65, 153, 273, 131, 218, 557 and 426, respectively. These values differ significantly from previously published results based on standard electrocardiography.

Key words: Holter, electrocardiography, ECG, horse, reference values

Introduction

One of the principal problems of examination with standard electrocardiography (ECG) is that the cardiac rhythm is only recorded over a short period of time. Consequently a significant arrhythmia may not be detected during the examination, particularly if the arrhythmia is intermittent¹. In addition, the animal is not truly at rest because of the presence of the clinician, which may cause a different heart rate and rhythm to be observed². Examining the heart rate and the cardiac rhythm of a horse by cardiac auscultation or by standard ECG usually causes some sympathetic stimulation, which may influence the cardiac function and confound the determination of the 'normal' resting sinus rate³. Holter ECG monitoring allows clinicians to examine the electrocardiogram of a horse over a longer period of time, usually up to twenty-four hours. This method also allows horses to be monitored during strenuous exercise, either on a treadmill or on the racetrack, and may be an invaluable tool in diagnosing diseases that affect performance⁴.

Although several studies have been published on the application of Holter ECG in the horse, there are no previously published data concerning the duration of the different waves, segments and intervals of the electrocardiogram while using the Holter method⁵⁻¹¹. The aim of this study was to obtain a set of relevant

measurements from healthy, resting horses that can be used as reference values.

Materials and Methods

Twenty healthy Warmblood horses (eight mares, two geldings and ten stallions), used for pleasure riding, were selected randomly. The animals varied in age from three to nine years. The average weight of the horses was 495 kg (from 400 to 550 kg). Prior to the monitoring, all horses were checked for their health status through detailed physical examination with particular attention paid to the cardiovascular and respiratory system.

Electrocardiography was performed at rest in the stable without the presence of an examiner causing extra stress. It was important to collect data from horses stabled in an environment as close to normal conditions as possible. A blanket surcingle was fitted tightly around the thorax, and the Holter device (Argusys FD Holter ECG, Innomed Medical Inc., Budapest, Hungary) was securely fitted on the left side of the horse, at the level of the flank. The positive electrode was passed across to the right side over the withers of the horse and fixed at the seventh intercostal space in the ventral region of the thorax. The negative electrode was fixed in the ventral region of the thorax, at the fifth intercostal space on the