Veterinary Bioscience: Cardiovascular System

PRACTICAL CLASS 1: THE ECG

TEACHING STAFF:

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LOCATION

Online

INTENDED LEARNING OUTCOMES

At the end of this practical class students should be able to:

- To become familiar with use of the electrocardiograph;
- To identify the various components of the electrocardiogram and the importance of standardising limb positions during recording from domestic animals;
- To interpret wave form on the ECG trace and relate this to conduction of electrical impulses across the heart
- To appreciate the limitations of Einthoven's hypothesis in recording an electrocardiogram trace in a quadruped

INTRODUCTION: THE ELECTROCARDIOGRAM

An electrocardiogram is a record of the electrical activity occurring in the heart due to the depolarization and repolarization of the physiological membranes of the conducting and muscular tissues of the heart.

It is usual to record electrocardiograms by placing small metal electrodes on convenient sites on the body surface. These are connected by lead wires to the recording instrument, or electrocardiograph. The electrical activity recorded from each combination of electrodes is referred to as a lead of the electrocardiogram. A single lead does not record all of the electrical activity occurring in the heart, but only that which is transmitted through the body tissues to the points where the surface electrodes are located.

It has long been a convention to place electrodes on the limbs in a manner that enables the three standard limb leads to be recorded.

- Lead I is obtained by connecting electrodes placed on the right arm and left arm (RA-LA).
- Lead II is obtained by connecting electrodes placed on the right arm and left leg (RA-LL).
- Lead III by connecting electrodes placed on the left arm and the left leg (LA-LL).

Selection of these connections is made inside the electrocardiograph, by connecting the lead wires to a suitably made lead selector switch. The record obtained from each lead will show the same basic waves that comprise an electrocardiogram, viz,

the P wave, QRS complex, and T wave, but the shape, amplitude and direction of the waves may be different and quite often the overall patterns are dissimilar.

INTERPRETING THE ECG TRACE

THE P WAVE

The first deflection of the electrocardiogram or the P wave is due to the electrical activity occurring in the atria. In humans, the P wave is normally a single, upright wave having an amplitude of 2-3 mm and a duration of about 0.10 sec.

THE QRS COMPLEX

This is also known as the ventricular complex and it is due to depolarization of the Purkinje system and ventricular muscle. In idealized form, it begins with an initial downward deflection, 1-2 mm in amplitude, known as the Q wave. This is followed by a large upward or positive deflection known as the R wave. If the down stroke of the R wave goes below the iso-electric level, a final deflection known as the S wave is formed. This is followed by a short period when the pen of the recording instrument moves horizontally or isoelectrically. This section of the tracing is known as the S-T segment.

THE T WAVE

This final deflection follows the S-T segment and is due to the repolarization of the ventricular muscle. The T wave is the least stable of the various components of the electrocardiogram. It has a variable amplitude and form, but in humans the T wave is usually a rounded, upright wave. It tends to become negative whenever there is a conduction disturbance within the ventricles. In contrast to humans, the majority of the domestic animals show a T wave that is normally negative, or diphasic negative-positive, and when ventricular conduction disturbances occur it tends to become positive.

As this practical class is being delivered in an online format, learning materials for the class will be made available on the Lt platform.