Short Paper

**Electrocardiographic parameters of Markhoz goat using base apex lead and six standard limb leads**

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**Summary**

Electrocardiographic study of 50 healthy Markhoz goats ranging from less than 1 to more than 3 years in age was carried out. The heart rate varied from 99 to 123 beats/min with a mean of 110 beats/min. There was a significant difference between the heart rate of goats in 3 age groups (P<0.05). The mean duration of P and T waves and QT interval in base apex lead, QRS wave in lead I, P-R and PQ interval in aVF lead were higher and duration of QRS and T waves in aVR lead, P wave in lead III, PQ and P-R intervals in lead II and QT interval in aVR lead were lower than those in the other leads. The mean duration of QT interval had significant changes with age (P<0.05).

**Key words:** Electrocardiography, Goat, Markhoz breed

**Introduction**

The importance of the cardiovascular system is the reason why many studies on identification and treatment of cardiac diseases have been carried out on different species of domestic animals.

Very few reports of using goats for studying the cardiac activity and determining different electrocardiographic parameters have been published.

Yet, there are some other reports on ECGs of normal goats of different breeds (Jha et al., 1961; Ahmad et al., 1965; Davis and Szabuniewicz, 1965; Szabuniewicz and Clark, 1967).

The shape and size of goat heart vary according to its breed and body size. This variation is expected to be reflected in ECG parameters (Andrassy et al., 2005). Although Markhoz breed is one of the well-known Iranian native goats, there is no data on ECG parameters of this breed as far as we are aware.

**Materials and Methods**

Fifty Markhoz breed goats reared at the Breed Selection Centre of Kurdistan Agriculture Organization were chosen for this study. They were divided into three age groups, 9-12 months (10 goats), 1-3 years (20 goats), and above 3-year-old (20 goats). Electrocardiogram (ECG) was recorded on standing position on a single channel portable electrocardiograph (SMART ECG, SE-1) on 7 leads (I, II, III, aVL, aVR, aVF, and base apex lead). The paper speed was adjusted to 25 mm/sec and calibration was 1 mV per centimetre.

The mean values of P, QRS, T, PQ, QT, P-R duration (in sec) and P, Q, R, S, T waves amplitude (mV) were measured. SPSS software was used for classification of results and student’s t-test was used for analysis of data, a value of P<0.05 was
considered to be significant.

Results

Three hundred and fifty traces of ECGs recorded from 50 Markhoz breed of goats were analysed for heart rate, cardiac rhythm, amplitude and duration. A sample of electrocardiograms recorded from the various leads are shown (Fig. 1). The mean heart rate in Markhoz goats was 110 ± 2.38 beats/min, ranging from 85 to 150 BPM (Table 1). The highest heart rate was recorded in goats aged below 1-year-old with 123 ± 3.23 BPM and the lowest heart rate was obtained in goats aged above 3-year-old with 99.75 ± 3.83 beats/min.

The mean durations of P, QRS and T waves and also PQ, QT and P-R intervals were shown in Table 2. Table 3 shows the mean values of amplitude of different ECG waves.

Discussion

The heart rate obtained in the present study for Markhoz breed was 110 ± 2.38 beats/min.
beats/min which is higher than the rate reported in other studies for goats. In another study, the mean value of heart rates for normal goats was 102 ± 16 beats/min (Anitra Schultz and Pretorius, 1972).

However, in some other studies the mean value of heart rates depicted for goats is higher than the value reported in the present study. The heart of the goats is reported to vary in size and form according to the breed and this variation is expected to be reflected in the ECG (Mohan et al., 2005), so this different heart rate in Markhoz goat may be due to its breed. A significant change was observed in heart rates of three age groups of Markhoz goats (P<0.05).

The highest duration of P wave was found in base apex lead (0.068 ± 0.009 sec), and the lowest was in lead III (0.03 + 0.001 sec).

The durations of QRS complex of 3 age groups in this breed were higher than those reported in other studies in goats. This could be due to the positive relationship between size and weight of heart and duration of QRS wave.

The duration of T wave in Markhoz goat with a maximum of 0.088 + 0.003 sec is significantly lower than that recorded in the study conducted on an Indian breed (Mohan et al., 2005, 2009).

The PQ interval in the Markhoz breed was similar to that observed by Montes et al. (1994) but this parameter has not been measured in other studies. The P-R interval in Markhoz goat is higher than that recorded in other studies (Davis and Szabuniewicz, 1965; Montes et al., 1994; Mohan et al., 2005, 2009).

The QT interval in Markhoz breed with maximum duration of (0.272 + 0.009 sec) was less than that observed by Mohan et al. (2005), but was similar to those recorded by others (Davis and Szabuniewicz, 1965; Montes et al., 1994).

In this study, the QT interval had significant changes with age groups of goats (P<0.05) and the same result has been reported in the study conducted by Montes et al. (1994). PQ and QT intervals can be a potential clinical value in evaluating heart activity (Mohan et al., 2005).

The amplitude of P wave in base apex lead with 0.184 + 0.032 mv was the highest and in lead III with 0.041 + 0.005 mv was the lowest in Markhoz goats. The results obtained in the other six leads were similar to those observed by others.

The mean amplitude of QRS obtained in this study was higher than the value reported in other studies in goats. The difference can be attributed to the amount of ventricular depolarization which, in turn, can be the result of breed variations (Mohan et al., 2005).

The findings of this study revealed that some of the ECG parameters of Markhoz goat are similar to those of other breeds but there are differences in other parameters which could be due to breed differences.

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References

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