



Determination of heart rate and heart rate variability in the equine fetus by fetomaternal electrocardiography

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Abstract

Heart rate is an important parameter of fetal well-being. We have analyzed fetal heart rate (HR) and heart rate variability (HRV) by fetomaternal electrocardiography (ECG) in the horse (*Equus caballus*) from midpregnancy to foaling. It was the aim of the study to detect changes in the regulation of fetal cardiac activity over time and to establish normal values in undisturbed pregnancies. A total of 22 mares were available for the study. Fetomaternal electrocardiography was a reliable technique to detect cardiac signals in fetuses between Day 173 of gestation and foaling. Fetal HR decreased from 115 ± 4 beats/min (Days 170 to 240 of gestation) to 83 ± 3 beats/min (Day 320) to 79 ± 1 beats/min (1 d before foaling; $P < 0.001$). Mean beat to beat (RR) interval and standard deviation of the RR interval (SDRR) increased ($P < 0.001$). Gestational age thus affects RR interval and HR in the equine fetus. From Days 270 to 340 of gestation, SDRR increased from 11.4 ± 1.3 msec on Day 270 to 27.8 ± 3.6 msec on Day 340 ($P < 0.05$), and the root mean square of successive RR differences (RMSSD) tended to increase ($P = 0.07$), indicating maturation of the fetal autonomous nervous system. For the last 10 d before foaling, fetal HR and HRV remained constant and did not allow predicting the onset of parturition in the horse. Only during the last 30 min before the foal was born, in 4 of 5 fetuses, HR decreased and RR interval increased. Accelerations and decelerations in HR were detectable at all times, but neither their number nor duration changed over time.

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