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Heart Rate Variability to Monitor Unborn Foals' Health

Ultrasound monitoring can reveal important health information about unborn foals, but it's an invasive procedure that could be unpleasant for the mare. Recent research by scientists in Hungary suggests that a complementary method—fetal heart rate variability analysis, which is carried out with tools that never go inside the mare's body—could be helpful in monitoring unborn foals' health.

The fetus' heart rate (or HR) can tell veterinarians about the unborn foal's health status at the precise moment of monitoring. But heart rate variability (or HRV) gives a broader and possibly more accurate look at fetal well-being—and it doesn't require an ultrasound probe, explained Boglárka Baska-Vincze, DVM, PhD, of Szent István University's Department of Animal Breeding and Genetics, in Budapest.

Heart rate variability is exactly what it sounds like—the way the HR changes, sometimes slowing, sometimes speeding up, including how often and to what extent it changes. And that can provide critical information about health and welfare, including stress, Baska-Vincze said. In equine fetuses, HR changes significantly over the course of the pregnancy, and it can even vary dramatically from one healthy fetus to another. Further, when a fetus moves, that movement will affect the HR at that specific moment. With ultrasound machines, the movement of both the mare and the fetus could obstruct proper HR readings. On the other hand, HRV detected with an external monitor could be a more reliable tool than HR measurements in horses, even if it won't replace ultrasounds entirely.

"The ultrasound has another task: pregnancy detection at Day 15 and Day 40, rectally," she said.

In their study of 17 Lipizzan broodmares and their fetuses, the team measured fetal HRV using an electrocardiogram (ECG) strapped to the mare's belly. The team's telemetric (mobile system) ECG allowed them to detect fetal heartbeats as early as 121 days—earlier than any other study has shown, Baska-Vincze said. The equipment did not seem to bother the horses, and it was easy to place and use in farm conditions, she said. Readings can be as short as five minutes (which is what the researchers recommended) or as long as 24 hours, if needed for further analysis.

They noticed that, in general, fetal heart rates dropped from about 115 to about 79 beats per minute between the Months 5 and 11. But those were merely averages, and in fact there were large differences from one fetus to another. However, the team noted that HRV's tended to decrease as the fetus aged, Baska-Vincze said. A decrease in HRV is often associated with stress or pain in adult horses, so more research will need to reveal what this could mean in fetuses, she added.

Through the study, the team established some norms with regard to HRV rates in healthy equine fetuses, which could help make a basis for comparison in a clinical or laboratory setting. This practice could be the not-so-distant future in veterinary equine gestation management.

"HRV examination is a reliable and noninvasive form of checking the health status of fetuses, especially in advanced pregnancies in horses (and in other farm animals, too)," said Baska-Vincze. "Future pregnancy management should be noninvasive, reliable and accessible for everyone."

The study, "[Fetal heart rate and fetal heart rate variability in Lipizzaner broodmares](#)," was published in *Acta Veterinaria Hungarica*.