Development of an Equine Behavior Chamber and Effects of Amitraz, Detomidine, and Acepromazine on Spontaneous Locomotor Activity

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The locomotor chamber is a sensitive and highly reproducible tool for measuring spontaneous locomotor activity in the horse. It allows investigators to determine an agent's average time of onset, duration, and intensity of effect on movement. Authors' addresses: Maxwell H. Gluck Equine Research Center and the Department of Veterinary Science, University of Kentucky, Lexington, KY 40506 (Harkins and Tobin) and Universidade Estadual Paulista, Campus de Jaboticabal, Brazil (Queiroz-Neto). © 1997 AAEP.

1. Introduction
Horses in a confined space instinctively move around their environment. This movement is defined as spontaneous locomotor activity. Baseline locomotor activity in a large number of horses was measured in a behavior chamber, which was validated by quantifying behavioral responses to fentanyl and xylazine. The goal of this project was to develop protocols for the measurement of locomotor activity in the freely moving horse.

2. Material and Methods
The locomotor activity of five Thoroughbred mares was detected by four Mini-beam sensors spaced equally around the stall. All horses served as their own controls.

As a way to validate the behavior chamber, fentanyl citrate (0.016 mg/kg) and xylazine HCl (1 mg/kg) were injected as the positive and negative controls, respectively. In subsequent tests, detomidine HCl (0.02, 0.04, and 0.08 mg/kg), amitraz (0.05, 0.1, and 0.15 mg/kg), and acepromazine (0.002, 0.006, 0.018, and 0.054 mg/kg) were injected to assess the effect of those agents on locomotor activity. In a separate experiment, yohimbine HCl (0.12 mg/kg) was administered following an injection of amitraz (0.15 mg/kg) to assess the reversal effect of that agent. An analysis of variance with repeated measures was used to compare control and treatment values at each measuring time. Significance was set at p < 0.05.

3. Results
Average daytime activity (~90 counts/5 min) remained fairly constant from approximately 0815 to 1415 h. For the entire 22-h testing period, the average activity was ~65 counts/5 min. Fentanyl citrate (0.016 mg/kg) significantly increased locomotor activity for 30 min. Xylazine HCl (1 mg/kg) significantly reduced activity for 90 min. Amitraz
reduced activity to near zero for 75, 120, and 180 min for the three doses. In a separate experiment, yohimbine HCl immediately reversed the sedative effects of amitraz (0.12 mg/kg). Detomidine significantly decreased activity for 1.5–5.0 h. There was no significant change in activity following acepromazine administration.

4. Discussion
The results obtained following administrations of a well-characterized stimulant and depressant showed that the locomotor chamber could measure drug-induced variations in spontaneous activity. The locomotor chamber enabled investigators to determine an agent's average time of onset, duration, and intensity of effect on movement.

Kamerling et al. administered fentanyl (0.01, 0.005, and 0.0025 mg/kg) and saline to horses and manually counted mean activities of 38, 27, 17, and 12 steps/2 min, respectively, which represented a threefold increase of activity for the 0.01 mg/kg dose over baseline (saline) activity. In this experiment, there was also a threefold increase in activity following the administration of 0.016 mg/kg fentanyl (443 steps/5 min) when compared with control activity (146 steps/5 min). Xylazine reduced activity to near zero, which persisted ~90 min after injection.

Amitraz produced almost total inactivity at the three doses. Because total inactivity is the maximal expression of sedation, it was the duration rather than the intensity of sedation that was observed in the locomotor chamber. The immediate reversal of the sedative effect following yohimbine injection illustrated the similarity in the mode of action of amitraz and xylazine and detomidine.

The dramatic and rapid decrease in spontaneous activity following detomidine injection was in agreement with a previous study, which also demonstrated a dose-dependent response of activity for 90–180 min after injection. Although the behavior chamber was able to detect decreased activity after detomidine and amitraz administration, horses treated with acepromazine did not show reduced activity.

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References