Behavioral and physiological effect of orally administered tryptophan on horses subjected to acute isolation stress

C.S. Bagshaw
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S.L. Ralston
Correspondence information about the author S.L. Ralston
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Hans Fisher

- Abstract

Abstract

The effect of orally administered tryptophan on horses' reaction to acute isolation stress was studied in two groups of mature mares. Group 1 consisted of six Standardbred mares, Group 2 had two Standardbreds and two Arabians. Three oral doses of tryptophan (0.1, 0.05 and 0 mg kg^{-1}) were administered in 14 g of confectioners sugar 2 h prior to testing in a 3×3 latin square design (two mares per treatment day^{-1} in Group 1, one mare per treatment day^{-1} in two treatments and two in the third in Group 2). The horses were isolated in a totally enclosed stall (5.3 m × 4.2 m) for 15 min (isolation environment). Behavior and heart rate were recorded continuously by video camera and a heart rate monitor, respectively. Blood samples were taken by venipuncture immediately before and after isolation. Four hours after dosing the horses were placed in the stall as before, but allowed visual contact with another mare (visual contact environment).

In the isolation environment, heart rate and walking-sniffing were higher ($P<0.05$), when the tryptophan dose was 0.1 mg kg^{-1} than when no tryptophan was given. There were no treatment effects on the amount of time spent standing-alert, although the mares did this more in isolation than in the visual contact environment. When the horses were in visual contact, the majority of the time across all treatments was spent standing or walking in a relaxed position. Heart rate and walking-alert, however, were highest ($P<0.05$) and standing or walking-relaxed was lowest ($P<0.05$) with a tryptophan dose of 0.05 mg kg^{-1} in the visual contact environment. There were no differences in blood concentrations of serotonin, dopamine or tryptophan among treatments or environments. However, there was a difference between the two breeds; the two Arabian mares having lower ($P<0.001$) resting serotonin concentrations than the Standardbreds. In one horse there was a dose-related reduction ($P<0.01$) of a sterotypic behavior (head twisting) with tryptophan regardless of environment. None of the other horses exhibited this or similar stereotypic behaviors. Tryptophan at 0.05 and 0.1 mg kg^{-1} increased both heart rate and activity relative to zero dose under both isolation and visual contact environments, suggesting that oral tryptophan may stimulate horses 2–4 h after dosing rather than having a sedative effect. The effect on stereotypic behavior warrants further investigation.