

BRIEF COMMUNICATION

Stimulation of Food Intake in Horses

by Diazepam and Promazine

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BROWN, R. F., K. A. HOUPPT AND H. F. SCHRYVER. *Stimulation of food intake in horses by diazepam and promazine*. PHARMAC. BIOCHEM. BEHAV. 5(4) 495–497, 1976. — In two adult horses doses of 0.02–0.03 mg/kg diazepam, intravenously, increased 1 hr intake 54–75% above control levels. Intake was stimulated when the diet was a high grain, calorically dense one and also when the diet was a high fiber, calorically dilute one. Two young rapidly growing weanling horses showed an even more pronounced stimulation of intake. Following diazepam 1 hr intake was increased 105–240% above control levels. Promazine at a dose of 0.5 mg/kg also stimulated intake in adult horses, but not as markedly as did diazepam. A tranquilizer and a neuroleptic appear to have a stimulatory effect upon short-term intake in horses.

Food intake Horses Diazepam Promazine

THE behavior of horses has been a neglected field of study until quite recently [2]. Although the nutritional needs of horses are beginning to be investigated [3], only grazing patterns and plant species selection have been studied in equine feeding behavior [5]. The physiological controls of food intake have not been studied in horses.

The question remained as to where to begin a study of the control of food intake in horses. The effect of diazepam on food intake was chosen as an initial investigation of controls of equine ingestive behavior for two reasons: (1) The agent has a robust effect; diazepam has been shown to markedly increase intake of laboratory rats [6], humans [1] and dogs [7]. (2) The mechanism has already been shown to operate in diverse types of mammals including both monogastric and ruminant animals; depressants of the central nervous system in general have been shown to increase intake in a wide variety of species. A second and more limited aim was to investigate the effect of promazine, a tranquilizer commonly used in equine veterinary practice on food intake. The phenothiazine derivative tranquilizers have been shown to increase intake in rats [4] and might be expected to do so in horses.

METHOD

Animals

Four horses were used: two mature 12-year-old castrated

males (geldings), D (460 kg) and L (493 kg), and two rapidly growing 6–9-month-old foals, H, and intact male (initial wt, 177 kg) and a female, F (initial wt, 205 kg).

Procedure

The horses were housed individually in box stalls and fed ad libitum. At 1200 hrs a weighed amount of fresh food was placed in the mangers and diazepam (Valium, Hoffman-LaRoche Inc.), promazine hydrochloride (Promazine, Fort Dodge) or equivalent volumes of 0.9% NaCl (2–5 ml) were injected intravenously in the jugular vein. Intake was measured for the hour following injection.

The experimental design was as follows: 2 or 3 days of saline injection preceded and followed each injection of either diazepam or promazine. The drug injections were counterbalanced so that all the horses did not receive a tranquilizer or neuroleptic on the same day. The large number of control measurements were deemed necessary both because the animals were housed in an unheated barn where temperature fluctuations might influence baseline intake and because the mean hourly intake of a horse fed ad lib had not been previously measured.

Experiment 1. The Intake Response of Mature Horses on a Concentrate and on a High Fiber Diet to Diazepam

In order to determine the ingestive response of horses to

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various doses of diazepam horses D and L were fed a complete pelleted ration ad lib (Choice, Agway), and given intravenous injections of diazepam at doses of 0.005, 0.008, 0.02, 0.03 and 0.04 mg/kg. On control days an equivalent amount of 0.9% NaCl was injected intravenously on the assumption that the injection procedure should not vary, although the fluid injected might. Intake was measured 1 hr and 23 hr after injection. Spillage was collected and weighed.

In a second series of experiments the horses were fed a high fiber diet. Horses D and L were fed timothy hay ad lib and in addition, the pelleted feed (Choice) was available ad lib from 0700 hr to 1200 hr at which time a weighed amount of fresh feed and injections were given. One hour intake was measured after diazepam, 0.02 mg/kg–0.03 mg/kg, promazine, 0.5 mg/kg (250 mg) or 2.5 ml 0.9% NaCl. The dose of promazine is that used clinically to sedate horses.

Experiment 2. Effect of Diazepam on Intake in Young Horses

The weanling foals H and F were fed hay ad lib and, in addition, a mixed grain concentrate feed (Trim, Agway) was available ad lib from 0700–1200. At 1200 a weighed amount of fresh grain concentrate was given, and the foals injected with 0.04 mg/kg (10 mg) of diazepam or an equivalent volume of 0.9% NaCl. The dose of diazepam was that found to be effective in the adult horse. One hour food intake was measured.

RESULTS

Definite signs of tranquilization were noted following diazepam or promazine. The horses stood quietly with lowered heads for 1–2 hr. The males occasionally showed penile prolapse. Eating usually occurred within the first 1/2 hr after administration of the tranquilizers, although the times were not precisely measured.

Experiment 1.

Diazepam significantly stimulated short-term food intake in the adult horses on a high concentrate diet (3,000 kcal/kg). The optimum dose for stimulating intake was 0.02 mg/kg diazepam for horse D and 0.03 mg/kg for horse L. One hour food intake of horse D following diazepam was 2.20 ± 0.10 kg ($n = 7$) while following 0.9% NaCl administration was 1.25 ± 0.10 kg ($n = 24$) ($p < 0.001$). One hour food intake for horse L following diazepam was 2.39 ± 0.80 kg ($n = 7$) and following 0.9% NaCl was 1.26 ± 0.08 kg ($n = 24$) ($p < 0.001$). Intake was not stimulated by diazepam for the entire 24 hr following injection. For example, horse D ate 10.83 ± 0.29 kg/23 hr ($n = 7$) following diazepam and 11.98 ± 0.22 kg/23 hr ($n = 48$) following 0.9% NaCl.

Diazepam also stimulated short-term intake when the horses were fed on a high fiber (hay) diet (2200 kcal/kg) (Fig. 1). Promazine had a similar but less marked effect. Control 1 hr food intake for horse D was 1.22 ± 0.04 kg ($n = 24$) while following diazepam intake was 2.13 ± 0.08 kg ($n = 4$) ($p < 0.001$) and after promazine intake was 1.79 ± 0.07 kg ($n = 7$) ($p < 0.001$). Control 1 hr food intake for horse L was 1.10 ± 0.04 kg ($n = 15$). Following diazepam he ate 1.91 ± 0.12 kg ($n = 4$) ($p < 0.01$), and following promazine 1.53 ± 0.42 kg ($n = 3$) ($p < 0.05$).

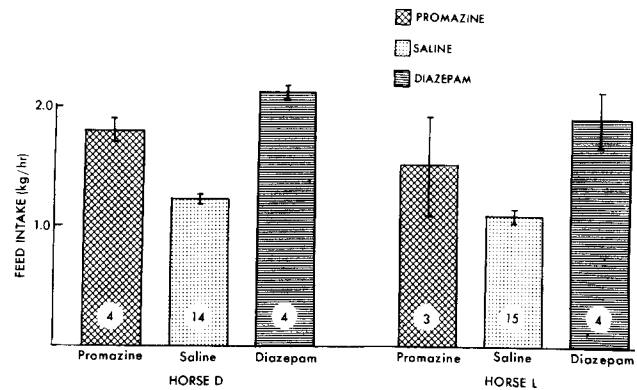


FIG. 1. The effect of diazepam and promazine on short term food intake of mature horses. The dose of diazepam was 10 mg for horse H and 15 mg for horse L. The dose of promazine was 250 mg for each of the 2 horses.

Experiment 2.

Diazepam also stimulated intake in the young, rapidly growing horses (Fig. 2). Horse H ate 1.09 ± 0.18 kg ($n = 8$) in the hour following diazepam injection and 0.32 ± 0.60 kg in the hour following 0.9% NaCl injection ($n = 14$) ($p < 0.001$).

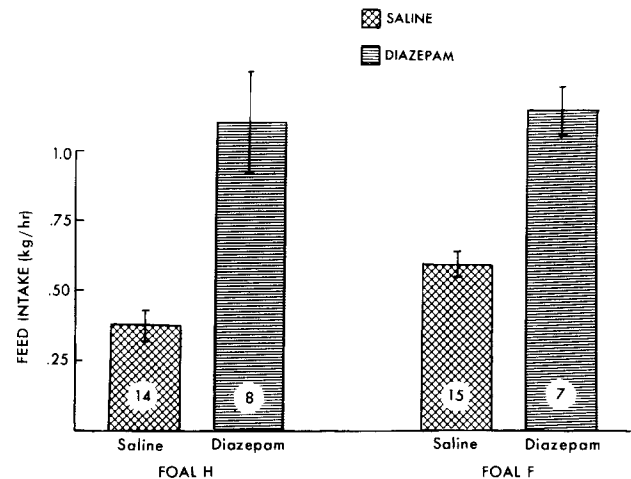


FIG. 2 The effect of diazepam on short term food intake of young, rapidly growing horses. The dose of diazepam for each of the 2 foals was 10 mg/animal.

DISCUSSION

Diazepam appears to be an effective stimulator of short-term food intake in horses as it is in rats. Intake was increased 54–74% in the adult horses and 105–240% in the young horses. Single intravenous injections did not result in daylong stimulation of intake.

Rats and horses differ not only by several orders of magnitude of body size, but also in natural diet, circadian rhythms and gastrointestinal morphology. The horse is a diurnal non-ruminant herbivore which can utilize cellulose due to bacterial fermentation in its greatly enlarged cecum and colon, but, despite the differences between horses and

nocturnal, omnivorous rats, which rely far less on microbial fermentation for energy requirements, both species increase their intake following diazepam. The effect of diazepam on food intake would appear to be generalized phenomenon, not one restricted to laboratory rats.

This study demonstrates that horses are a reasonably convenient species in which to study the controls of food intake. Horses seem particularly sensitive to tranquilizers; the dose of diazepam employed in this study is the

recommended human dose of 5–20 mg or 1/10th the human dose on a body weight basis [1]. Both mature castrated males and an immature intact male and female showed a definite increase in short-term food intake in response to diazepam. The demonstration of the feasibility of comparative studies of equine ingestive behavior open the possibility of much more extensive experiments to investigate other physiological controls of intake, such as glucostatic and thermostatic, in this species.

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