Attenuation of palatability-induced polydipsia by biperiden hydrochloride

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Biperiden hydrochloride in the dosage .3 mg/kg did not affect the normal water intake of six hooded rats. When the Ss were made polydipsic by sweetening tap-water with 0.4% saccharin and reducing food intake to 15 g per day, the drug reduced their mean daily fluid consumption from 112.2 to 81.1 ml. Intake rose to a mean of 101.3 ml per day when the drug was withdrawn.

In a previous paper (Keehn & Nagai, 1969), we reported on the attenuating effect of an anticholinergic agent, trihexyphenidyl (Artane), on schedule-induced polydipsia (Falk, 1961). In the present study, we used palatability to induce polydipsia (cf. Valenstein, Cox, & Kakolewski, 1967) and examined the effectiveness of another anticholinergic agent, biperiden hydrochloride (Akineton), in controlling fluid intake by rats.

SUBJECTS

Six male naive hooded rats, bred in this laboratory, were used. They were about 100 days old at the beginning of the experiment. They were about 140 days old when first given the drug, at which time their weights ranged from 265 to 310 g. The animals were housed in individual cages with unrestricted access to fluid contained in Richter graduated tubes.

PROCEDURE

The experiment lasted 10 weeks, with the rats in their home cages, under the following food and water schedules: Week 1–ad lib food and tap water; Week 2–15 g food for 1 h; ad lib tap water; Week 3–ad lib food and 0.4% (w/v) saccharin in tap water; Week 4–15 g food for 1 h; ad lib 0.4% saccharin; Weeks 5 and 6–15 g food for 1 h; on alternate days ad lib water or 0.4% saccharin; Weeks 7 and 8–same as for Weeks 5 and 6 plus 0.3 mg/kg biperiden HCL injected i.p. daily; Weeks 9 and 10–same as for Weeks 5 and 6.

Food was Rockland complete rat diet at all times. Weights and fluid intakes were measured daily at 2 p.m., except occasionally at week-ends. Biperiden HCl was made up in 0.9% NaCl to a concentration of 0.1 mg/ml, and was administered at 2 p.m. on drug treatment days.

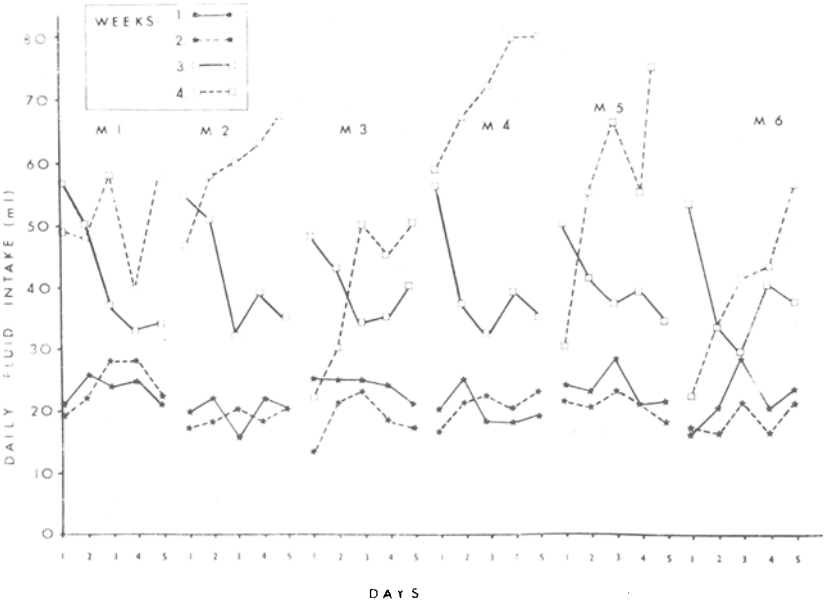

Fig. 1. Daily fluid intakes of the individual rats (measured Tuesdays through Saturdays) in Weeks 1 through 4.

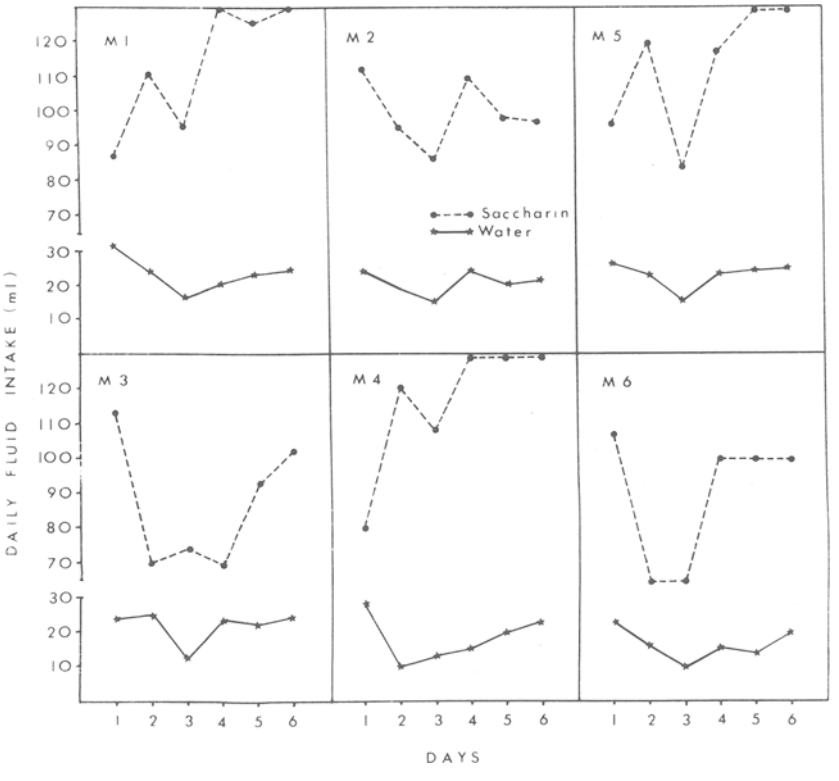

Fig. 2. Daily fluid intakes of the individual rats with saccharin and water available on alternate days in Weeks 5 and 6.

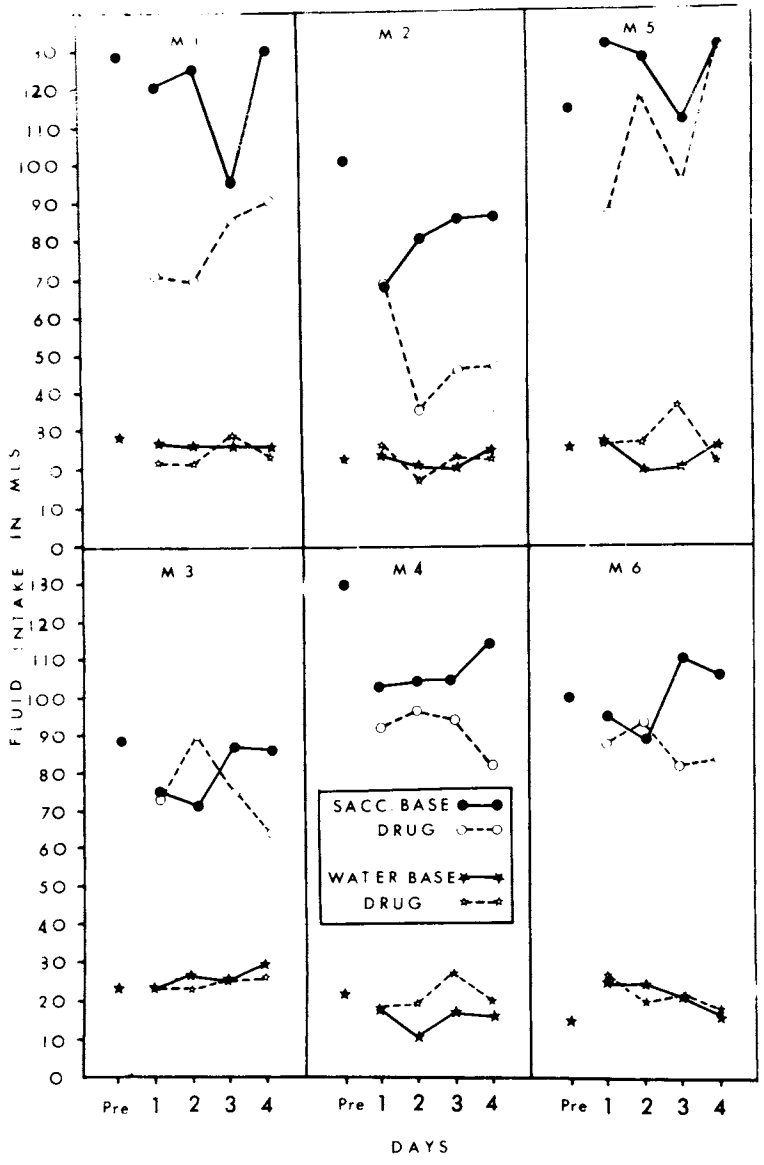

Fig. 3. Fluid intakes of the individual rats before, during, and after drug treatment with saccharin and water available on alternate days in Weeks 6 through 10.

RESULTS

Figure 1 shows the daily fluid intake of each animal measured on Tuesdays through Saturdays over the first 4 weeks of the experiment. Water intakes in Week 1 with ad lib food were generally in the normal range of 20-30 ml per day. They were usually slightly lower than these values in Week 2 when food intake was restricted to 15 g per day. Saccharin intakes with ad lib food in Week 3 began at about double the water level on the first day (40-60 ml) and fell to a stable level of 30-35 ml by the end of the week. When food was restricted in Week 4, saccharin intake steadily increased throughout the week for five of the six animals. In five cases, saccharin intake in the first day with restricted food was lower than it had been with free food, but thereafter restriction of food intake was accompanied by higher saccharin intakes than had occurred under free feeding. In Week 4, saccharin intakes reached from 56 to 76 ml by the end of the week.

Figure 2 shows the daily fluid intake of each animal over Weeks 5 and 6 in which the available fluid was water and saccharin on alternate days. Water intakes were relatively stable at the normal level of about 20 ml per day; saccharin intakes were higher and more variable, ranging between 65 and 130 ml, the maximum possible intake in any day.

The effect of biperiden hydrochloride on normal water intake and excessive saccharin intake on alternate days is shown in Fig. 3. The figure shows the average water and saccharin intakes over the 6 days prior to drug administration, and the daily intakes (recorded on Tuesdays through Fridays) of each of these fluids for 2 weeks during and 2 weeks after drug administration. Across all animals, the mean daily intakes of saccharin before, during, and after drug administration were 112.2, 81.1, and 101.3 ml, respectively; similar water intakes were 21.8, 22.7, and 21.9 ml, respectively. The drug had no effect on normal water intake of the animals, but effected a significant decrease ($p < .02$, binomial test, one-tail) in saccharin consumption.

DISCUSSION

Palatability polydipsia was easily created in our animals. Simply adding 0.4% saccharin to tap water was enough to induce polydipsic levels of drinking, but the effect was not sustained when free feeding was allowed. However, when food intake was restricted to 15 g for 1 h a day, large intakes of saccharin were maintained. This is opposite to what is normally found with water, where intake falls during food deprivation (Bolles, 1967; Falk, 1961).

The effect of biperiden hydrochloride on excessive fluid intake by rats was similar to that of another anticholinergic agent, trihexyphenidyl (Keehn & Nagai, 1969). In the present study, excessive drinking was induced by making the fluid more palatable rather than by chemical (Grossman, 1960) or reinforcement scheduling (Falk, 1961) techniques. The method employed to produce polydipsia did not appear to alter the effect of an anticholinergic drug in attenuating excessive drinking. Both of the anticholinergic drugs we have used in this laboratory have served to attenuate excessive drinking regardless of the polydipsia-inducing technique employed, but neither of them appears to have any effect on normal levels of water intake.

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