may react with this active DNA, change its transcription and translation and thus interfere with the metabolic adaptation.

Our experiments are comparable with those of Cohen et al (1965), Yamamoto et al (1967), Smith et al (1966), Way et al (1968), Feinberg & Cochin (1969), and Loh et al (1969), which demonstrated that the development of morphine tolerance and dependence may be blocked by actinomycin D, puromycin, cycloheximide, etc. The main difference between their observations and ours is that we blocked the developed existing dependence *ex post*. Other substances with similar effect, but without several toxic effects of hydroxylamine, may be found which may be useful tools in the treatment of drug dependence and tolerance.

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The consumption of saccharin and glucose solutions by mongolian gerbils*

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Mongolian gerbils exhibited a preference for 3% glucose over water, a .125% saccharin solution, and a combined 3% glucose and .125% saccharin solution that has been found to elicit excessive fluid consumption in rats. Glucose solution intakes in excess of twice the gerbil's normal water intakes were found. Consumption of the combined glucose and saccharin solution, however, did not exceed water intake consumption.

Polydipsia resulting from the synergistic action of saccharin and glucose (S+G) has been demonstrated to

Fig. 1. Mean water and glucose plus saccharin intakes for all Ss across blocks of 3 days in each of the four experimental phases of Experiment 1.

occur in rats by Valenstein, Cox, & Kakolewski (1967). Adult rats drank larger quantities of a S+G mixture of 0.125% sodium saccharin and 3% glucose than equivalent solutions of those substances presented separately. During a 24-h time period, food satiated animals would consume the S+G solution in amounts equal to approximately 55% of their body weights. This phenomenon has been empirically supported by Kakolewski, Cox, & Valenstein (1968), Hsiao & Rasmussen (1968), and Phillips, Morgan, & Magenson (1968).

Since the introduction of the Mongolian gerbil (*Meriones unguiculatus*) as a laboratory S, much has been written extolling its virtues (Thiessen, 1968). Of interest here, however, is the gerbil's ability to derive its water needs from the metabolism of food stuffs, and hence to maintain themselves without a water supply per se, although water will be consumed if provided ($\bar{X}$ = male 58.1, female 57.9 ml/kg/day) (Thiessen, 1968). The purpose of the present investigation was to measure specific solution intakes and preferences which might exist for an animal in which liquids seem to play a different role than they do in rats.

METHOD

Experiment 1

Eight male and eight female naive adult Mongolian gerbils derived from stock obtained from Tumblebrook farms, N.Y., served as Ss. All Ss were housed individually in Hoeltge solid-bottom cages under conditions of constant temperature, humidity, and illumination. Purina Lab Chow pellets were available ad lib. Ss had previous experience with tap water, but had no previous experience with sweet solutions.

This first study consisted of four phases, each lasting for a period of 15 days. During Phase 1, a tap-water baseline was obtained. On the 16th day, the second phase began. In this phase, a S+G mixture of 0.125 g of sodium saccharin and 3.0 g of glucose, dissolved in a total volume of 100 ml of tap water prepared and administered according to the directions reported

by Valenstein et al (1967), was used. On Days 31-45, both tap water and S+G were available with positions randomly changed daily to eliminate side preferences. During the last 15 days of the study, the tap-water baseline was recovered. Bottles were washed and solutions changed daily. A mean daily spillage factor was determined and taken into account. Fluid intake was measured in grams; all Ss were weighed every other day. All daily fluid and S weights were obtained with the use of a Torsion balance. The mean S weights were 94 g, males, and 83 g, females.

Experiment 2

Three male and three female experimentally naive adult Mongolian gerbils served as Ss. Housing and feeding conditions were identical to those in Experiment 1.

This second study also consisted of four phases: water baseline determined; 3% glucose administered; 3% glucose and water presented; initial water baseline reobtained. All methodological procedures were the same as in the first experiment. Mean weights for males and females were 81 and 69 g, respectively.

Experiment 3

Three male and three female experimentally naive adult Mongolian gerbils served as Ss. Housing and feeding conditions were as described previously.

The preference testing followed the same format as Experiment 2, except that .125% saccharin was substituted for glucose. Mean weights for males and females were 97 and 70 g, respectively.

Experiment 4

Three male and three female naive Mongolian gerbils served as Ss. Housing and feeding conditions were identical to those of the above experiments.

In this experiment, also consisting of four phases, a baseline water intake was measured first. The second phase consisted of presenting both 3% glucose and .125% saccharin to the Ss. In the third phase, Ss were presented with a three-bottle test with water, glucose, and saccharin available; during the last phase, a water baseline was reestablished. All procedural considerations remained the same as those in Experiment 1. Mean weights were 86 g for the males and 65 g for females.

RESULTS AND DISCUSSION

The mean water and S+G intakes from Experiment 1 that are presented in Fig. 1 show that relative to the water baseline condition, the consumption of S+G did not significantly increase over water consumption either when it was presented alone or concurrently available with water. Both males and females consumed more of the S+G solution than water during the choice situation in the third phase of this experiment. The total fluid intakes for the third phase were generally comparable to the baseline water intakes, however, that were obtained in both the first and fourth phases of this experiment.

The results of Experiment 2, depicted in Fig. 2, indicate that by both sexes the 3% glucose solution is preferred over water when both fluids are concurrently available. Moreover, the consumption of the 3% glucose solution, when it was presented alone and when it was paired as a choice with water, was significantly greater than the average water intake in any phase of Experiment 2. Clearly, the Ss in Experiment 2 ingested twice as much of the sapid test solution as did the Ss in Experiment 1.

Fig. 2. Mean water and glucose intakes for all Ss across blocks of 3 days in each of the four experimental phases of Experiment 2.

The intake of saccharin found in Experiment 3 and shown in Fig. 3 did not significantly differ from water consumption either when presented alone or concurrently with water. Clearly, the glucose solution intakes found in Experiment 2 also exceeded the saccharin intakes found in Experiment 3, by a factor of 2.

In Experiment 4, when glucose and saccharin were presented concurrently, both sexes preferred glucose, and at higher levels than those obtained in the water baseline phase. The addition of water in the three-bottle choice in Phase 3 of Experiment 4 did not alter total fluid intake or the obvious preference the Ss had for glucose over water and saccharin. These results of Experiment 4 are depicted in Fig. 4.

Contrary to the phenomenon noted to occur when S+G is presented to rats, no polydipsia for the S+G solution occurred with the gerbils in Experiment 1. The S+G solution was preferred over water, however, in the two-bottle choice situation.

Fig. 3. Mean water and saccharin intakes for all Ss across blocks of 3 days in each of the four experimental phases of Experiment 3.

Fig. 4. Mean water, glucose, and saccharin intakes for all Ss across blocks of 3 days in each of the four experimental phases of Experiment 4.

Clearly, however, glucose alone was consumed in quantities more than twice as large as the normal water intake. In the two-bottle choice with water, the water was sampled and consumed in only negligible quantities.

The behavior of gerbils is thus in direct contrast to the findings of Valenstein et al (1967), who demonstrated that rats consumed significantly more of the S+G solution than equivalent concentrations of the solutions presented separately. The fact that the gerbils in Experiment 4 preferred glucose over water and saccharin solutions when all three solutions were concurrently and freely available further illustrates the marked differences in sapid solution acceptability functions for these two species. This observation is given further credibility by the finding that the consumption of the saccharin solution did not differ from that of water and, when the two fluids were concurrently available, were consumed in similar quantities (cf. Figs. 3 and 4).

It should be noted that in all four experiments the weights of the Ss remained quite stable and exhibited no large fluctuations. Deviations greater than 5% of the baseline body weights were uncommon and, if they occurred, lasted only a few days.

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