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The effect of tetracycline on schedule-induced polydipsia

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Although tetracycline, a bacteriostatic drug, is usually administered to experimental animals via their drinking water, its effect on drinking in experimental situations has not yet been demonstrated. Three rats were given tetracycline and clear water in the home cage while they were receiving food pellets on a fixed-time 1-min schedule in the experimental chamber. Tetracycline did not affect the total session liquid intake or the pattern of drinking within a session. The study indicates that it is safe to use tetracycline on rats that are serving as subjects in studies on schedule-induced polydipsia.

Tetracycline is a bacteriostatic drug commonly used in laboratories using rats as subjects. If an experimenter fears an outbreak of a bacterial disease, tetracycline may be administered to the entire colony via the drinking water. To our knowledge, no one has determined whether tetracycline has any effect on the animals' drinking in experimental situations. Although the package directions state that no other water source should be available during treatment, in drinking studies the experimenter generally administers tetracycline in the home cage and clear water in the experimental chamber. Since our area of research involves schedule-induced polydipsia (SIP) and since it is occasionally necessary to use tetracycline in our animals' drinking water to control and prevent the spread of bacterial infections, the effect of tetracycline on schedule-induced drinking was investigated.

SIP is a phenomenon in which a food-deprived animal, given small portions of food at certain fixed or irregular intervals during daily sessions, develops patterns of excessive drinking (Falk, 1961). Generally, the majority of the water intake occurs immediately postpellet in bouts that are well regulated according to volume. This excessive intake occurs even though the animal is never water deprived. Falk (1971) and Freed, Zec, and Mendelson (1977) have provided excellent reviews of the literature on SIP.

One of the variables that has been studied in relation to SIP is the content of the fluid consumed during SIP sessions. Among the studies of fluid content are studies examining salinity (e.g., Falk, 1966), quinine adulteration (e.g., Segal & Deadwyler, 1965; Wayner & Greenberg, 1973), saccharin solutions (e.g., Colotla & Keehn, 1975; Keehn, Colotla, & Beaton, 1970; Riley, Lotter, & Kulkosky, 1979), alcohol (e.g., Colotla & Keehn, 1975; Keehn & Coulson, 1975; Samson & Falk, 1974), and conditioned taste aversion (e.g., Riley et al., 1979; Roll, Schaeffer, & Smith, 1969). If any one general conclusion can be drawn from these studies, it is that SIP is a robust phenomenon and occurs even when nonpreferred liquids are provided during experimental sessions. However, palatability may affect the total session intake (Keehn, et al., 1970; Riley et al., 1979; Wayner & Greenberg, 1973) or affect the distribution of bursts during a session (Falk, 1966). Therefore, it appeared advisable to investigate any effects that tetracycline may have on SIP before using tetracycline in the drinking water of SIP subjects.

METHOD

Subjects

Three female Long-Evans hooded rats were each reduced to 80% of their free-feeding body weights. The animals were housed individually, and water was continuously available in the home cages. Any supplemental food was provided immediately after the experimental session.

Apparatus and Materials

Experimental sessions were conducted in two identical Lehigh Valley operant chambers. The front wall of each chamber consisted of a food tray approximately 1 cm above the floor and and an aperture approximately 1.75 cm in diameter, located 2 cm to the right of the food tray. A graduated cylinder with a water tube was located behind the front wall so that the water tube was located approximately .5 cm behind the aperture. The drinking tube was connected to a drinkometer circuit to measure licks. All programming and recording equipment was located in a room adjacent to the room housing the experimental chambers. White noise, as well as noise provided by a ventilation fan, was present during all sessions.

Tetracycline hydrochloride in powdered form, manufactured by Rachelle Laboratories, Inc., was used in this study. The tetracycline was prepared in the proportions of 1.1 g of tetracycline to 2 quarts of water, an approximation based on the suggested dosage for a 350-g rat. Fresh tetracycline was mixed every 48 h. The same tetracycline supply was used for both the home cages and the experimental chambers.

Procedure

The subjects were randomly assigned to receive four conditions in different orders of presentation. The conditions consisted of varying orders of presentation of tetracycline (T) and clear water (C) in the home cage and the experimental chamber. The conditions were (in the order home cage, chamber) CC, CT, TC, TT. The subjects received these conditions in an incompletely counterbalanced order of presentation. The subjects received the treatment conditions in the following orders: Subject 6–baseline, CC, TC, CT, TT, CC; Subject 7–baseline, CT, TT, CC, TC, CT; Subject 8–baseline, TT, CT, CC, TC, TT.

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Before changing conditions, the rats had to meet a stability criterion of 3 days in which session water intake did not vary more than 2 ml from the mean intake of those 3 days.

For 3 days prior to polydipsia training, the rats were placed in the experimental chamber for 30 min with 30 pellets in the food tray and clear water available. This measure provided a baseline of water intake.

The rats were placed on a fixed-time (FT) 60-sec schedule, receiving a 45-mg Noyes pellet every 60 sec, noncontingent on behavior. The water (clear or with tetracycline) was available throughout the experimental session. Cumulative records of bouts as well as milliliters of water intake were recorded. Each session was 30 min in length.

RESULTS AND DISCUSSION

Figure 1 shows the average session intake for each animal during baseline and each of the four experimental conditions. The averages for the experimental conditions were obtained from the last three sessions in each condi-

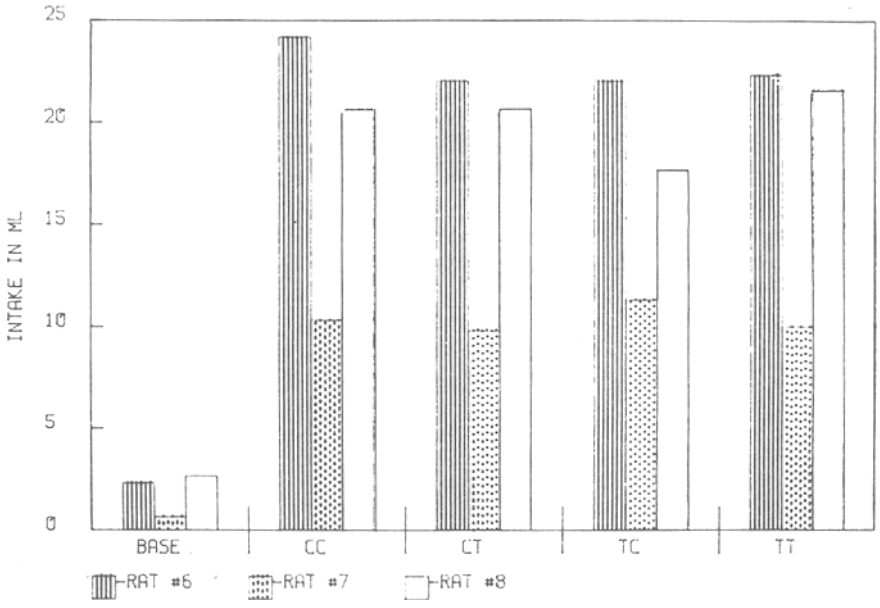

Figure 1. Average intake of water (clear or with tetracycline) during the last three sessions of baseline and the four treatment conditions.

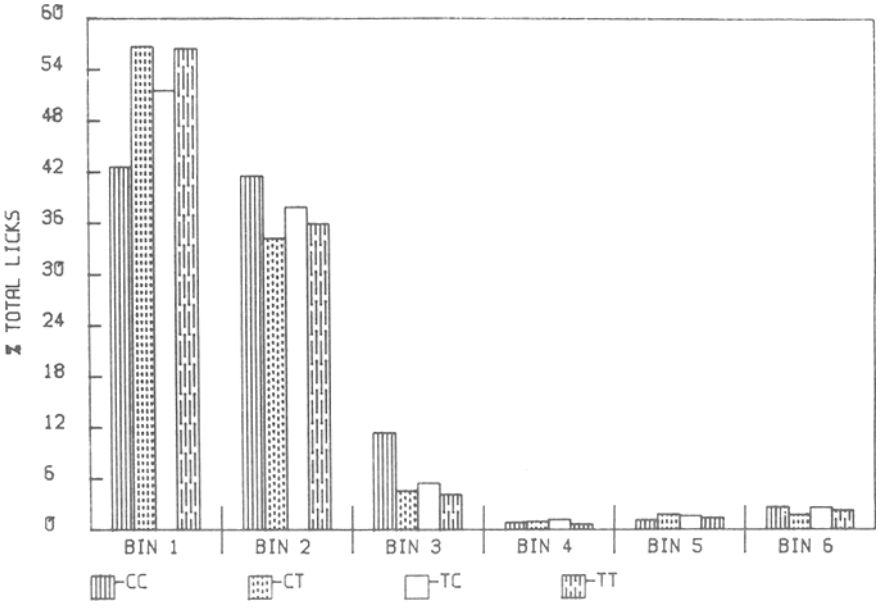

Figure 2. Distribution of licks throughout a 60-sec trial for Subject 7 in each treatment condition. The distribution is expressed as percent of total licks occurring in six successive 10-sec bins.

tion. Each animal received the same treatment as both the first and last treatment condition (i.e., Subject 6 received CC for both its first and last condition, Subject 7 received CT and Subject 8 received TT for both conditions). Therefore, the average intake of the first and last conditions has been presented for each animal in Figure 1. A comparison of baseline intake with drinking in the experimental phases show that the rats were definitely polydipsic. Intake (in milliliters) during the experimental phases was approximately 10 times as great as intake during the baseline phase. A repeated-measures analysis of variance was performed on the data, which had been transformed into milliliters per/bout. No significant differences were found among the treatment conditions [$F(3,6) = 2.6$].

An examination of the temporal distribution of licks during a session indicated no systematic effect of tetracycline on licking patterns. The temporal distribution of licks was similar for all three subjects, and therefore, the distribution for Subject 7 is presented in Figure 2 as representative of all three subjects.

This study failed to find any effect of tetracycline in drinking water on SIP. We therefore conclude that it is safe to use tetracycline on rats that are being used as subjects in SIP studies.

REFERENCES

COLOTLA, V. A., & KEEHN, J. D. Effects of reinforcer-pellet composition on schedule-induced polydipsia with alcohol, water, and saccharin. *Psychological Record,* 1975, **25**, 91-98.

FALK, J. L. Production of polydipsia in normal rats by an intermittent feeding schedule. *Science,* 1961, **133**, 195-196.

FALK, J. L. Analysis of water and NaCl solution acceptance by schedule-induced polydipsia. *Journal of the Experimental Analysis of Behavior,* 1966, **9**, 111-118.

FALK, J. L. The nature and determinants of adjunctive behavior. *Physiology & Behavior,* 1971, **6**, 577-588.

FREED, W. J., ZEC, R. F., & MENDELSON, J. Schedule-induced polydipsia: The role of orolingual factors and a new hypothesis. In J. A. W. M. Weijnen & J. Mendelson (Eds.), *Drinking behavior: Oral stimulation, reinforcement, and preference.* New York: Plenum, 1977.

KEEHN, J. D., COLOTLA, V. A., & BEATON, J. M. Palatability as a factor in the duration and pattern of schedule-induced drinking. *Psychological Record,* 1970, **20**, 433-442.

KEEHN, J. D., & COULSON, G. E. Schedule-induced choice of water versus alcohol. *Psychological Record,* 1975, **25**, 325-328.

RILEY, A. L., LOTTER, E. C., & KULKOSKY, P. J. The effects of conditioned taste aversions on the acquisition and maintenance of schedule-induced polydipsia. *Animal Learning & Behavior,* 1979, **7**, 3-12.

ROLL, D., SCHAEFFER, R. W., & SMITH, J. C. Effects of a conditioned taste aversion on schedule-induced polydipsia. *Psychonomic Science,* 1969, **16**, 39-41.

SAMSON, H. H., & FALK, J. L. Alternation of fluid preference in ethanol-dependent animals. *Journal of Pharmacology and Experimental Therapeutics,* 1974, **190**, 365-376.

SEGAL, E. F., & DEADWYLER, S. A. Determinants of polydipsia: VI. Taste of the drinking solution on DRL. *Psychonomic Science,* 1965, **3**, 101-102.

WAYNER, M. J., & GREENBERG, I. Schedule dependence of schedule-induced polydipsia and lever pressing. *Physiology & Behavior,* 1973, **10**, 965-966.

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