

Some conditions for the rapid extinction of a learned taste aversion

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The present study examined the course of extinction of a learned taste aversion using prolonged exposure to the aversive food as the extinction test. A conditioned aversion to sucrose was established in deprived rats. They were then exposed for a 4-h period to sucrose alone where it was (1) response contingent, (2) delivered intermittently, or (3) freely available. The aversion extinguished in the 4-h period under all three test conditions. The results suggest that the extinction rate of a learned taste aversion is based on the duration of the exposure to the aversive food after the poisoning experience, not on the time since poisoning.

One aspect of conditioned taste aversions that intrigued early researchers was its durability. Early studies of the phenomenon found the taste aversion effect to be apparent weeks, even months, after the initial taste-illness pairing (see Revusky & Garcia, 1970, for a review). More recently, studies have investigated the conditions that promote retention and/or extinction of the effect. Such experiments have focused on deprivation level of the subject and method of aversion testing as relevant variables affecting the extinction of a learned aversion. Studies using deprived animals have shown that larger aversion effects can be obtained in satiated rather than in deprived subjects (Grote & Brown, 1973; Peck & Ader, 1974). High deprivation level is hypothesized to increase the acceptance of a taste associated with poisoning and, thus, facilitate extinction of the conditioned aversion.

Other studies have concerned the relative efficacy of one-stimulus and two-stimulus (preference) tests of learned aversions (Dragoin, McCleary, & McCleary, 1971; Elkins, 1973; Grote & Brown, 1971). The findings indicate that two-stimulus tests are more sensitive in revealing individual differences in aversion and resistance to extinction. In one-stimulus tests, the animal is exposed only to the aversive food, while in two-stimulus tests, the animal is exposed to both the aversive food and another, neutral, food. It has been argued that deprivation level may in part account for the more rapid extinction of conditioned aversions in a one-stimulus test, for it may place the animal in conflict between the deterrent effects of toxicosis and the approach motivation of hunger or thirst (Grote & Brown, 1973; Revusky & Garcia, 1970). However, most studies that have charted the course of extinction of a learned aversion in deprived animals have used a series of short

tests over a period of days following poisoning in order to assess the extinction of the taste aversion effect (Baum, Foidart, & LaPoint, 1974; Dragoin et al., 1971; Elkins, 1973). The present experiments differ methodologically from previous ones in that food was available throughout the postconditioning test period. The study investigates the course of extinction of a learned aversion where the subject is given prolonged exposure to the aversive food when it is (1) response contingent, (2) delivered intermittently, or (3) freely available.

METHOD

Subjects

The subjects were 22 naive male rats of the Sprague-Dawley derived, specific pathogen free, CD strain obtained from Charles River Breeding Laboratories. They were approximately 60 days old at the start of the experiment. The animals were fed Charles River rat/mouse/hamster formula and maintained at 80% of ad-lib weight throughout the study.

Apparatus

Initial aversion testing was carried out in the wire mesh home cage (25 x 20 x 13.5 cm). Food was presented to the rats in stainless steel food cups. All other training and testing was carried out in experimental chambers that were housed within lightproof sound-attenuating boxes measuring 23 x 25.5 x 21 cm. The chambers contained a water bottle, Gerbrands lever, Anger feeder and associated dish, and 24-V houselight (GE 1829). The experimental boxes were served by a relay logic programmer, which set up and delivered reinforcements and operated response and reinforcement counters.

Procedure

The subjects were divided into three groups for differential extinction testing. Group 1 (N = 6) had response-contingent access to the food; Group 2 (N = 8) had noncontingent intermittent access to the food; Group 3 (N = 8) had free access to the food.

Pretraining. Group 1 was given a 4-h barpress training session for 4 days prior to aversion training. Groups 2 and 3 were both magazine trained prior to aversion training. Noyes rat pellets (45 mg) were used for all three groups in this phase.

Aversion training. At the start of the session, the subjects received 40 Noyes sucrose pellets "F" (45 mg). Rats in Group 1 received the pellets as reinforcers for the barpress response on

a fixed-interval 10-sec schedule. Groups 2 and 3 received the pellets on a response-independent variable-time 10-sec schedule. Each subject was then removed from the chamber and immediately injected intraperitoneally; half the animals in each group (the experimentals) received 16 ml/kg of .15M LiCl and the other half (the controls) received 16 ml/kg of .15M NaCl. The animals were then returned to their home cages.

Recovery. The subjects were given 1 day to recuperate. On that day their regular food (Noyes rat pellets) was fed to them in the stainless steel food cups, allowing the rats to become accustomed to eating from the cups.

Aversion testing. To establish the presence of a learned aversion, all subjects were first given a one-stimulus test in the home cage; the test consisted of 10-min access to sucrose in the stainless steel cups. Water was freely available. The subjects were then immediately placed in the experimental chamber for 4 h under one of three experimental conditions. Group 1: The animals barpressed for sucrose reinforcement on a variable-interval 1-min schedule, yielding a possible 240 pellets. Group 2: The animals received 240 sucrose pellets on a variable-time 1-min schedule. Group 3: The dish associated with the food magazine was preloaded with 240 sucrose pellets and the animals had free access to them for the 4-h period.

RESULTS AND DISCUSSION

Table 1 shows the results of the 10-min consummatory test. For all groups, the amount of sucrose consumed by the experimental animals was significantly less than the amount eaten by the control animals during this period [Group 1: $p < .05$, randomization test for independent pairs (Siegel, 1956); Groups 2 and 3: $p < .05$, Mann-Whitney U test]. The findings indicate that the procedure used was effective in conditioning a taste aversion.

The amount of sucrose consumed by the experimentals and controls of each group during the 4-h test, computed as a percentage of the food available, appears in Table 2. In no case was there a significant difference between the experimentals and controls in the amount of sucrose consumed during the 4-h period (Group 1: $p > .05$, randomization test for independent pairs; Groups 2 and 3: $p > .05$, Mann-Whitney U test). Furthermore, the mean barpress rate for the experimental animals of Group 1 during the first hour of testing (6.9 responses/min) was not significantly different from the mean response rate of the controls (8.5 responses/min, $p > .05$, randomization test for independent pairs). There was also no significant difference between the amount of sucrose consumed by the experimentals of Group 2 (2.2 g) and by the controls (2.5 g, $p > .05$, Mann-Whitney U test). Similarly, the amount of sucrose

Table 2
Mean Percentage of Available Food Consumed
During the 4-H Test

	Group 1	Group 2	Group 3
Experimental Condition	95	86	88
Control Condition	90	93	95

eaten by the experimental animals of Group 3 (3.9 g) was not significantly different from the amount consumed by the controls (8.9 g, $p > .05$, Mann-Whitney U test).

The findings are of particular interest since they demonstrate the transitory nature of a conditioned taste aversion given extended exposure to the test substance. This rapid extinction was shown in the 4-h period whether the food was response contingent, delivered intermittently, or freely available. Other studies that have used deprived subjects and one-stimulus tests have reported the persistence of the taste aversion over 3 to 4 days (e.g., Elkins, 1973). Such studies, however, have employed a series of short extinction tests rather than a prolonged exposure to the aversive food. Our results suggest that, in addition to deprivation and testing conditions, a relevant factor in the elimination of a learned taste aversion is the duration of the exposure to the aversive food. Further, the findings call for a more detailed examination of the time course of extinction of a conditioned taste aversion.

REFERENCES

- BAUM, M., FOIDART, D. S., & LAPOINTE, A. Rapid extinction of a conditioned taste aversion following unreinforced intraperitoneal injection of the fluid CS. *Physiology and Behavior*, 1974, 12, 871-873.
- DRAGOIN, W. B., MCCLEARY, G. T., & MCCLEARY, P. A comparison of two methods of measuring conditioned taste aversions. *Behavior Research Methods & Instrumentation*, 1971, 3, 309-310.
- ELKINS, R. L. Individual differences in bait shyness: Effects of drug dose and measurement technique. *Psychological Record*, 1973, 23, 349-358.
- GROTE, F. W., JR., & BROWN, R. T. Conditioned taste aversions: Two-stimulus tests are more sensitive than one-stimulus tests. *Behavior Research Methods & Instrumentation*, 1971, 3, 311-312.
- GROTE, F. W., JR., & BROWN, R. T. Deprivation level affects extinction of a conditioned taste aversion. *Learning and Motivation*, 1973, 4, 314-319.
- PECK, J. H., & ADER, R. Illness-induced taste aversion under states of deprivation and satiation. *Animal Learning & Behavior*, 1974, 2, 6-8.
- REVUSKY, S. H., & GARCIA, J. Learned associations over long delays. In G. H. Bower & J. T. Spence (Eds.), *Psychology of learning and motivation: Advances in research and theory* (Vol. 4). New York: Academic Press, 1970. Pp. 1-84.
- SIEGEL, S. *Nonparametric statistics*. New York: McGraw-Hill, 1956. Pp. 152-155.

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Table 1
Mean Grams of Sucrose Consumed During the 10-Min Test

	Group 1	Group 2	Group 3
Experimental Condition	.2	.3	.3
Control Condition	4.5	5.6	4.7