Habituation and conditioned food aversion

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Prior habituation to milk led to a marked deficit in conditioning when milk was paired with injections of atropine methylnitrate. This effect was only partially reversed with repeated conditioning trials.

Novel stimuli typically produce unconditioned suppression, i.e., a disruption of ongoing behavior (Pavlov, 1927). However, when a novel stimulus is repeatedly presented, it gradually loses disruptive properties (Carlton & Vogel, 1965). This phenomenon is termed habituation (Thompson & Spencer, 1966). Recent evidence suggests that habituation not only reduces unconditioned suppression to a stimulus, but may also block conditioning to that stimulus (Carlton & Vogel, 1967; Domjan & Siegel, 1971; Leaf, Kayser, Andrews, Adkins, & Leaf, 1968; Lubow & Moore, 1959; Lubow, 1965; Siegel, 1971).

Recently, considerable attention has been given to the phenomenon of "conditioned food aversion." In these experiments, Ss were first permitted to ingest a food and were then given doses of X-irradiation or a drug that presumably produced sickness (see review by Rozin & Kalat, 1971). When Ss recovered from the treatment, they exhibited a marked aversion to the food that preceded drug. This study describes an attenuation of food aversion conditioning when Ss were first habituated to the food.

SUBJECTS

The Ss were 21 adult male Holtzman albino rats and weighed approximately 200 g at the start of the experiment.

APPARATUS

The Ss were trained and tested in a 9 x 8 x 7.5 in. box with a Plexiglas top and sides and aluminum end walls. The box was fitted with a glass drinking tube that contained a 33% solution (room temperature) of sweetened condensed milk (Borden's Star Brand) in tap water. A drinkometer was connected to a programming apparatus and provided a reliable measure of consummatory behavior.

PROCEDURE

On Days 1-4, 14 of the Ss were given access to sweetened condensed milk for 2-h periods in their home cages (habituated groups). Six additional Ss were not treated (not habituated group). On Day 5, food and water were removed from the cages of all Ss. On Day 6, each S was placed in the apparatus and allowed 100 licks at the drinking tube.

Following completion of 100 licks of milk, all Ss in the "not habituated"

group and half of the Ss in the "habituated" group were given intraperitoneal injections of 1 mg atropine methylnitrate (methylatropine)/kg. The remaining half of the Ss in the "habituated" group received injections of 1 ml distilled water/kg (control). All Ss were returned to their cages with food and water ad lib. On Day 9, food and water were again removed from the cages. On Day 10, each S was placed in the apparatus and the time required to complete 100 licks was recorded; if 100 licks were not completed within 300 sec, the S was removed and a score of 300 sec was assigned. Approximately 40 min following the test session on Day 10, each S was given free access to food and water for 1 h. On Days 11-15, each S was retested as on Day 10 except that on these days all Ss were injected with

drug following completion of either 100 licks or 300 sec.

RESULTS

The mean times to complete 100 licks on each of the test days are shown in Fig. 1. Ss who were not habituated to sweetened condensed milk prior to injection of methylatropine demonstrated an aversion to milk on all test sessions. They took significantly longer to complete 100 licks ($p < .001$) than did either of the groups that were habituated to milk. However, Ss habituated to milk and then given the drug did not differ from Ss similarly habituated to milk but given injections of water rather than drug. That is, prior experience with milk completely obliterated the effects of a posttraining injection of methylatropine on subsequent milk drinking.

The Ss were not given drug following the first test session (Day 10). In the second test session (Day 11), "not habituated" Ss demonstrated a partial extinction of learned aversion to milk. All Ss were given methylatropine following test sessions on Days 11-15. Repeated administration of drug to Ss habituated to milk led eventually to a

Fig. 1. Effects of habituation to milk and injections of methylatropine following milk consumption on subsequent time to complete 100 licks of milk. All Ss were given methylatropine following sessions on Days 11-15.

slight lengthening of the time required for them to complete 100 licks, but these scores did not differ from their scores in the first session ($p > .05$). Similarly, both groups demonstrated significantly ($p < .05$) less aversion to milk than did Ss "not habituated" but who also received drug (Days 12-15).

DISCUSSION

Previous studies of conditioned food aversion used treatments that are known to produce nausea and emesis in man. These treatments are presumed to produce nausea in animals as well. They include: X-irradiation (e.g., Smith & Roll, 1967), apomorphine (e.g., Garcia, Ervin, & Koelling, 1966), cyclophosphamides (e.g., Wilcoxon, Dragoin, & Kral, 1971), and lithium chloride (e.g., Malone & Cox, 1971). Unlike these treatments, methylatropine does not produce nausea, particularly at low doses such as those used in the present experiment. In fact, some atropinic drugs are used to prevent nausea (Goodman & Gilman, 1965). Another drug that also does not produce nausea, amphetamine, is effective in producing conditioned food aversion (Berger, 1969). These results suggest that drug-induced nausea is not required for the formation of a conditioned food aversion.

Both conditioned food aversion and

habituation deficit in conditioning appear to be powerful phenomena. Sweetened condensed milk is a highly preferred food for the rat; yet, following a single association with a low dose of methylatropine, rats avoided the milk. This rapid, powerful conditioning was, however, completely blocked by relatively small amounts of preexposure to sweetened condensed milk. This latter finding agrees with that of previous studies using conditioned food aversion (Rozin & Kalat, pp. 471) and other single trial conditioning procedures (e.g., Carlton & Vogel, 1967) and appears even more robust. After five additional training trials, very little conditioning was evident in previously habituated Ss.

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