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BRIEF COMMUNICATION

The Effects of LiCl Preexposure on Amphetamine-Induced Taste Aversions: An Assessment of Blocking

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FORD, K. A., AND A. L. RILEY. *The effects of LiCl preexposure on amphetamine-induced taste aversions: An assessment of blocking.* PHARMACOL BIOCHEM BEHAV **20**(4) 643–645, 1984.—Preexposure to lithium chloride attenuated the subsequent acquisition of amphetamine-induced taste aversions. This attenuation was independent of the similarity of the preexposure and conditioning environments, an effect inconsistent with an associative interpretation of the effects of LiCl preexposure. These results were discussed in terms of the mechanism underyling the effects of drug preexposure on taste aversion learning.

LiCl Amphetamine Conditioned taste aversions

IT is now well known that not only does preexposure to LiCl attenuate the subsequent acquisition of LiCl-induced conditioned taste aversions, but that it produces this attenuation by an associative mechanism [2]. In relation to this associative mechanism, it has been suggested that during chronic LiCl preexposure animals learn that the environmental cues which precede LiCl administration are associated with its effects. When taste aversion conditioning is subsequently attempted in the presence of these cues, they block (see [6]) the ability of the taste cues to be paired with LiCl. Support for such an interpretation comes from research demonstrating that the attenuating effects of LiCl are only evident if animals are preexposed to LiCl and given taste aversion conditioning in the same environment [4], a condition in which the previously conditioned environmental cues could block taste aversion learning.

Although it is clear that LiCl preexposure attenuates the acquisition of LiCl-induced taste aversions and that it does so by an associative mechanism, it is unclear how such preexposure affects aversions induced by other compounds and by what mechanism such attenuation would be produced. To address these questions, the effect of LiCl preexposure on amphetamine-induced aversions was examined in the following experiment.

METHOD

Subjects

The subjects were 46 experimentally naive, female rats of Long-Evans descent, approximately 90 days of age at the beginning of the experiment. All rats were maintained on ad lib access to food but were water deprived for the duration of the study. Rats were housed in individual stainless-steel home cages and were given drug exposures in distinctive Plexiglas environments (25×16×12 cm). The home cages and drug exposure environments were located in separate rooms, both of which were maintained on a 12-hr-light/dark cycle (lights on at 0800 hr) and at an ambient temperature of 23°C.

Procedure

The general procedure was similar to that described in Dacanay and Riley [4]. Briefly, all rats were given 20-min daily access to water in the home cage for 13 consecutive days. On Day 14, all rats were placed in the Plexiglas environment and given 20-min access to water. Immediately following this period, 12 randomly selected rats (Group L) were given an intraperitoneal (IP) injection of 1.8 mEq, 0.15 M LiCl and returned to the Plexiglas environment for an additional 20 min. At the end of this period, these subjects were placed back into their home cage. A second group of randomly selected rats was treated similarly except following water access in the Plexiglas environment, they were given an equivolume IP injection of distilled water (Group W). On each of the following three days, both groups were given 20-min access to water in the home cage followed immediately by an IP injection of distilled water. This alternating pattern of drug preexposure and water recovery was repeated for five cycles.

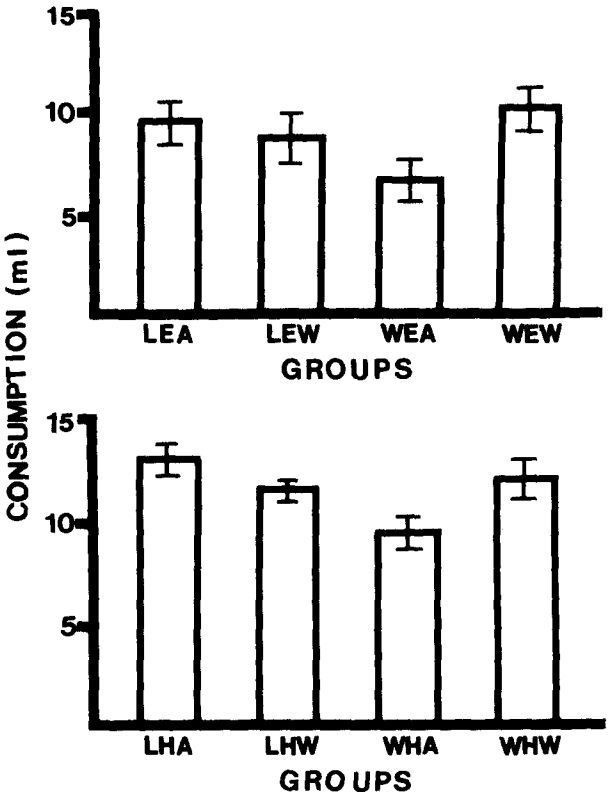

FIG. 1. Mean consumption (±S.E.M.) of saccharin for each group on the second conditioning trial. The first letter in the group designation refers to the drug given during preexposure, i.e., lithium (L) or distilled water (W). The second letter refers to the conditioning environment, i.e., Plexiglas environment (E) or home cage (H). The third letter refers to the drug given during conditioning, i.e., amphetamine (A) or distilled water (W).

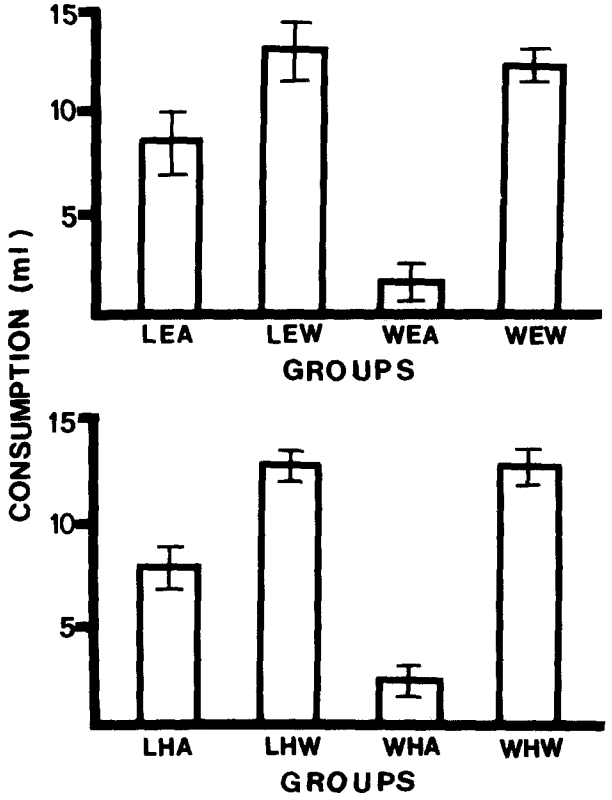

FIG. 2. Mean consumption (±S.E.M.) of saccharin for each group on the final aversion test. Group designations are the same as in Fig. 1.

On the day following the last water-recovery session, Groups L and W were divided into two groups. Rats in Groups LEA and WEA were placed into the Plexiglas environment (designated by an E) and given 20-min access to a novel saccharin solution. Immediately following this period, these subjects were given an IP injection of 2 mg/kg amphetamine (A) and returned to the Plexiglas environment for an additional 20 min. At the end of this period, these subjects were placed back into the home cage. Rats in Groups LHA and WHA were given 20-min access to saccharin in the home cage (H) followed immediately by an IP injection of amphetamine. On each of the following three days, all subjects were given 20-min access to water in the home cage followed immediately by an IP injection of distilled water. This alternating pattern of conditioning and water recovery was repeated for four cycles. Following the last cycle, all rats were given 20-min access to saccharin in their conditioning environment in a final one-bottle aversion test.

An additional 22 rats were treated similarly to the above in all respects except that following saccharin consumption during conditioning, these subjects were injected with distilled water. This yielded an additional four groups, i.e., Groups LEW, WEW, LHW, WHW.

RESULTS

A single factor ANOVA revealed significant differences ($p<0.05$) among groups in saccharin consumption over conditioning trials. Further analysis using a Least Significant Differences Test [7] revealed that by the second conditioning trial subjects preexposed to distilled water and given saccharin followed by amphetamine (Groups WEA and WHA) displayed an aversion to saccharin, drinking significantly less than their nonconditioned controls (Groups WEW and WHW). On the other hand, subjects preexposed to LiCl and given saccharin followed by amphetamine (Groups LHA and LEA) did not display an aversion, drinking saccharin at levels similar to their nonconditioned controls (Groups LHW and LEW). Both of the LiCl-preexposed groups injected with amphetamine (LHA and LEA) drank significantly more saccharin than the water-preexposed and conditioned subjects (Groups WHA and WEA). The degree of attenuation was independent of where conditioning occurred, i.e., home cage (H) or Plexiglas environment (E). These differential patterns of consumption on the second conditioning trial are illustrated in Fig. 1.

The effects of LiCl preexposure were maintained over repeated conditioning trials. Although by the final aversion test Groups LHA and LEA were drinking less than their nonconditioned controls, these groups were still drinking significantly more than Groups WHA and WEA, the water-preexposed and conditioned subjects. As above, the degree of attenuation was independent of where conditioning occurred. These differential patterns of consumption on the final aversion test are illustrated in Fig. 2.

DISCUSSION

As described earlier, preexposure to LiCl attenuates the subsequent acquisition of LiCl-induced taste aversions only when the preexposure and conditioning environments are similar [4], an effect consistent with a blocking interpretation of the LiCl preexposure effect (see [6]). While in the present experiment preexposure to LiCl also attenuated the acquisition of amphetamine-induced taste aversions, this attenuation occurred independently of the similarity of the preexposure and conditioning environments. As such, this atttenuation is more consistent with a nonassociative interpretation. Although a range of possible pharmacological interactions exists between LiCl and amphetamine, e.g., physiological antagonism, receptor or metabolic changes [1,5], it is unclear what specific interactions might be responsible for the effect. What appears evident, however, is that the mechanism underlying the effects of LiCl preexposure on taste aversion learning is in part dependent on the drug given during conditioning [3,4].

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