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BRIEF COMMUNICATION

Mescaline Treated Rats Attack Immobile Targets[1]

BROOKS CARDER AND ROBERT SBORDONE

Department of Psychology, University of California, Los Angeles, CA 90024

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CARDER, B. AND R. SBORDONE. *Mescaline treated rats attack immobile targets.* PHARMAC. BIOCHEM. BEHAV. 3(5) 923–925, 1975. – Rats were exposed to a series of targets in a shock induced aggression situation. Control rats fought most with moving targets, such as another normal rat, and did not attack immobile targets, such as a dead rat or a rat model. Rats treated with 15 mg mescaline/kg showed a similar pattern of target control though they bit frequently while controls did not bite. Rats treated with 50 mg/kg delivered vigorous biting attacks to a variety of targets but fought most with the immobile dead rat. They failed to attack only the rat model. Much of the data were consistent with the hypothesis that mescaline releases aggressive behavior from inhibitory control, leading to longer and more vigorous attacks on a wider variety of targets. This hypothesis, however, failed to explain why stationary targets were most effective for animals treated with 50 mg mescaline/kg while only moving targets were effective for controls.

Mescaline Aggression Violence Disinhibition

VERY recently Sbordone and Carder [4] reported that mescaline hydrochloride increased shock-induced aggression in rats. Moderate doses (10 mg/kg) increased the total duration of fighting in a session, while higher doses (50 mg/kg) produced a more striking increase in aggressive behavior including an increase in the duration of bouts, severe biting and a continuation of fighting during a 5 min observation period following the final shock.

The authors proposed that mescaline, particularly in high doses, might enhance aggressive behavior by inactivating an inhibitory system normally responsible for the prevention or limitation of aggressive behavior. When this system is inactivated by mescaline, aggressive behavior is prolonged (bouts are longer) and more violent (biting occurs).

The present study examines one prediction that would follow from this hypothesis of the action of mescaline on aggression. If the system which normally limits or inhibits aggressive behavior is inactivated by mescaline, aggressive behavior should occur in the presence of targets which would not normally elicit it. For instance, Ulrich and Azrin [5] have shown that a rat in a shock-induced aggression situation will usually attack another rat but will not attack a motionless dead rat or an inanimate object. In the present study, a continuum of targets including a normal rat, a dead rat and finally a model of a rat was presented to rats treated with mescaline. If mescaline released aggressive behavior from inhibition, it was predicted that the mescaline treated rat should direct aggressive behavior at a wider variety of targets than should the controls.

METHOD

Animals

Ninety-six experimentally naive, male Sprague-Dawley rats, over 120 days old (385–520 g) were obtained from the Simonsen Breeding Laboratory in Gilroy, California and were housed in individual cages with food and water available at all times.

Apparatus

An experimental chamber (29 X 24 X 20 cm) was used for aggression testing. The two ends were of sheet metal; the sides and the top were of Plexiglas. The floor was a set of stainless steel rods spaced 1.25 cm apart. Shocks were delivered to the animals through this grid from a constant current source operating through a Davis Model 255 grid scrambler. The duration of shock and the interval between shocks were automatically controlled by a series of timers.

The number and duration of aggressive contacts made by each animal were recorded on cumulative counters. Specific features of each aggressive episode, such as biting, were recorded on additional counters.

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Procedure

The rats were weighed at the beginning of the experiment and assigned to groups of 4 on the basis of equal weight. One rat in each of these groups was designated as a test rat while the remaining 3 became targets. One of the targets, the normal (T_1), received no treatment prior to aggression testing. A second, the taped target (T_2), had its forepaws taped together and its hindpaws taped together prior to aggression testing. The third rat, the anesthetized target (T_3), was treated with 40 mg Pentobarbital/mg (Abbot Labs) intraperitonically at least 20 min prior to testing.

The test rats were assigned to 1 of 3 drug treatments: placebo (distilled water), 15 mg mescaline HCL/kg and 50 mg mescaline HCL/kg. All drugs were administered intraperitonically in a distilled water solution. Concentrations were such that each animal received a volume of one ml/kg bodyweight.

Each test rat was placed in the apparatus 15 min after drug administration and paired with the targets described above and 2 additional targets, T_4, a recently deceased rat (killed by an overdose of Pentobarbital), and T_5, a crude model of a rat made by inserting two tennis balls in a white wool sock and tying the end of the sock. Half of the test rats were presented with a series of targets in the following order: T_1, T_2, T_3, T_4, T_5. The order was reversed for the remaining half. The test rat was exposed to each target for 15 shocks. The interval between targets was only the time required to change targets and record data, and seldom exceeded 2 min. The shocks were of 2 mA intensity and 1.5 sec duration and were administered every 30 sec.

Aggressive contacts were recorded by 2 observers who had considerable experience observing shock induced fighting. The first observer depressed a single micro-switch when the test rat either pushed, wrestled, boxed or bit the target. The second observer only recorded the number of bites made by the test rat. Neither observer was aware of the particular drug treatment given the test rat although the 50 mg/kg dose produced a flat, crouched posture which was easily distinguishable from the posture of other animals. Each experimental session lasted approximately 42 min.

RESULTS

Figure 1 presents the mean total duration of aggressive contact for animals in the 3 drug conditions with the 5 targets. The behavior of control animals is that which would be expected from previous reports. Aggressive contact is a decreasing function of the similarity between the target animal and a normal animal. The rats treated with 15 mg/kg of mescaline did not differ significantly from this pattern.

The rats treated with 50 mg/kg of mescaline, however, evidenced a different pattern of target control from either of the other 2 groups. These rats were the only rats to attack T_4. These attacks on T_4 were of exceedingly long duration. Application of analysis of variance to the data of Fig. 1 produced a statistically significant interaction between drug treatment and target, $F(2,18) = 3.69$, $p<0.05$.

Figure 2 presents the mean number of bites made by each test animal in the 3 drug conditions over the 5 targets. As the figure indicates, the controls bit very little. When they did bite, the biting was not severe and did not produce injury to the target. The rats treated with 15 mg/kg of mescaline bit frequently in the presence of T_2 although this

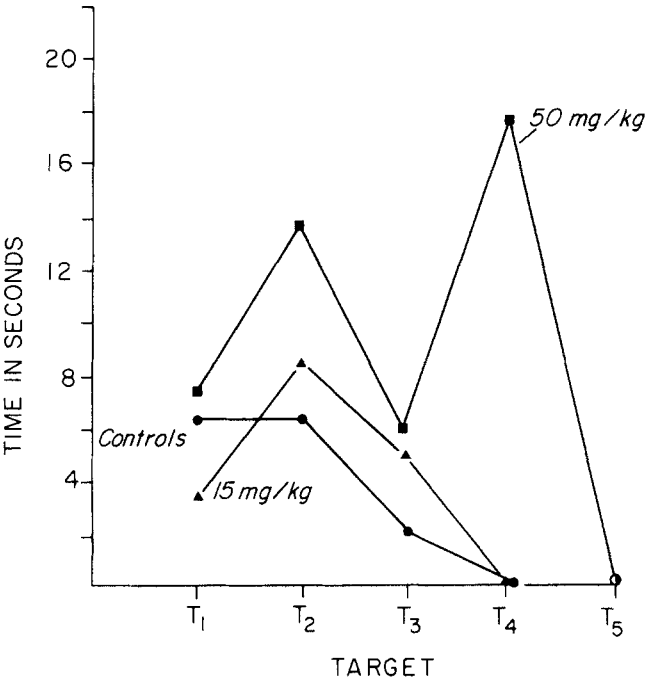

FIG. 1. Mean duration of total aggressive contact with each target for 3 treatment groups.

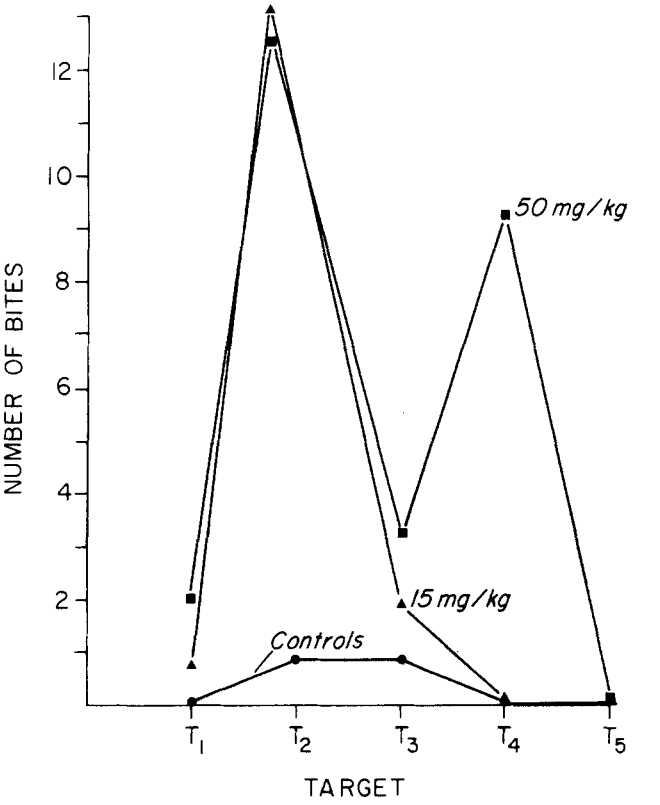

FIG. 2. Mean number of bites made upon each target for 3 treatment groups.

biting did not cause injury. Several animals in the 15 mg/kg group also bit T_3. The 3 animals that accounted for the biting of T_3 were all animals that had been tested with and bit T_2 previously. The rats treated with 50 mg/kg exhibited prolonged and severe biting particularly in the presence of T_2 and T_4. These bites were quite vigorous, and unlike bites of animals in other conditions, frequently caused severe wounds.

Three of four 50 mg/kg mescaline rats tested first with T_1 and last with T_5 failed to attack T_1. This was similar to our previous finding that rats treated with 50 mg mescaline/kg would not attack controls [4]. Rats tested first with T_5 and last with T_1, did attack T_1. These animals also delivered more bites to T_1 and T_2 than did animals tested first with T_1 (Mann-Whitney U-Test, $p = 0.036$).

DISCUSSION

Mescaline, at a dose of 50 mg/kg, drastically altered the stimulus control of aggression. Control rats fought with normal, taped and anesthetized rats, but never with dead rats or a model of a rat. When control rats fought they assumed an upright posture and made brief, boxing attacks which began at the onset of shock and terminated soon after the offset of shock. By comparison, rats treated with 50 mg/kg of mescaline attacked all targets except for the rat model. They spent especially long periods attacking the dead rat and the taped rat. Their fighting behavior consisted mainly of a vigorous and prolonged biting attack, usually directed at the head of the target. These attacks usually began during the intershock interval, and often terminated when shock was presented.

Rats treated with 15 mg/kg of mescaline were more like controls than like 50 mg/kg treated rats in that their fighting posture was upright, their bouts were brief and their biting, when it did occur, was much less vigorous than that of the 50 mg/kg treated rats.

Perhaps the simplest hypothesis to account for these data, is to propose that the higher dose of mescaline releases aggressive behavior from inhibition. Thus the aggressive behavior would be directed at a wider variety of targets. Once initiated, the behavior would continue until inhibitory control resumed or until the target animal was successful in terminating the attack. This would account for the fact that the longest bouts were with the taped rat and the dead rat, a target incapable of terminating the bout.

In some ways, the aggressive behavior of mescaline treated rats is like the aggressive behavior of wild rats since biting is involved [1]. The behavior of control rats in the shock-induced aggression situation consists only of boxing, a minor component of the aggressive behavior of wild rats. Thus it appears that mescaline, in combination with shock, elicits from laboratory rats, a type of aggressive behavior usually observed only in wild rats. Thus, it may be that in the laboratory rat, aggressive behavior is under rather extensive inhibitory control, and that mescaline removes the behavior from inhibition so that it more closely resembles the aggressive behavior of wild rats.

It remains to be explained why mescaline treated rats attack immobile targets. Movement of the target appears essential to the initiation of aggression in both wild [1] and laboratory rats [2,3]. It is possible that mescaline reduced inhibitory control of aggressive behavior so much that the threshold for initiation was greatly reduced, so that normally ineffective targets could elicit aggression. This explanation may not be entirely satisfactory however, since the immobile targets appeared to be even more potent as elicitors of aggression than moving targets. Rats treated with 50 mg/kg of mescaline and tested first with a normal rat, failed to attack. These rats attacked a dead target whenever it was presented. Thus, not only was target movement not a necessary condition for aggression, but immobile targets were especially effective. It is difficult to account for this through a disinhibition hypothesis, since that would predict only that immobile targets should more closely approximate moving ones, not surpass them. Thus, there remains the possibility that the aggressive behavior seen in rats treated with high doses of mescaline and shocked may represent a different catagory of agonistic behavior, with different conditions of elicitation and different functions than the shock induced aggression of normal rats.

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