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Fluprazine hydrochloride decreases play behavior but not social grooming in juvenile male rats

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Treatment with 8 mg/kg fluprazine hydrochloride strongly inhibited the play behavior of juvenile male rats but had no effect on social grooming. The results indicate that fluprazine affects play behavior as well as conspecific and predatory attack, male copulation, and maternal behavior. These drug actions may result from a rather generalized disruption in higher order stimulus processing or a drug-induced potentiation of fearfulness.

The piperazine derivative fluprazine hydrochloride (DU 27716) strongly inhibits the attack behavior of rodents (e.g., Flannelly, Muraoka, D. C. Blanchard, & R. J. Blanchard, 1985; Racine, Flannelly, & Blanchard, 1984) but has little effect on defensive behavior (e.g., D. C. Blanchard, Takushi, R. J. Blanchard, Flannelly, & Kemble, 1985; Bradford, Olivier, van Dalen, & Schipper, 1984; Olivier, Mos, van der Poel, Krijzer, & Kruk, 1984). Initial observations suggested that the drug also had little effect on some other forms of social interaction, such as introductory social behavior (Bradford et al., 1984; Olivier, et al., 1984). Recent data, however, indicate that fluprazine has somewhat more generalized behavioral effects than previously suspected. Fluprazine treatment disrupts male copulatory behavior (Flannelly, Lim, Diamond, D. C. Blanchard, & R. J. Blanchard, 1985), maternal behavior (Kemble & Schultz, in press), and some forms of predation (Schultz & Kemble, 1986), and increases interanimal distances during social encounters (Kemble, Thornton, & Schultz, 1987). These data suggest that fluprazine may disrupt other forms of social interaction as well. Since play behavior is a prominent form of social interaction among juvenile rats (Fagen, 1981; Meany & Stewart, 1981), it seemed an obvious candidate for further study. In the present experiment we explored fluprazine's effects on the play of juvenile male rats.

METHOD

Subjects

The subjects were 16 male Sprague-Dawley rats that were 38 days of age at the beginning of the experiment. The animals were individually housed, received free access to Purina Lab Chow and water, and were maintained on a 12:12-h light:dark cycle throughout the experiment. Testing was conducted during the light phase.

Apparatus

The rats were observed in a 60×40×35 cm open field. The floor and three walls were constructed of plywood painted flat gray. The remaining wall was of clear Plexiglas. Illumination was provided by nine incandescent bulbs (7.5 W) suspended 2.0 cm above the white Plexiglas ceiling. The open field was housed in a semiacoustic chamber and observations were carried out from an adjacent chamber through a one-way vision screen.

Procedure

Subjects were individually habituated to the open field for 10 min per day for 2 days prior to testing. They were then weighed and assigned to eight pairs having similar body weights (±22 g), and the pairs were randomly designated to receive either an 8-mg/kg dosage of fluprazine hydrochloride (drug, $N=4$) or an equivalent volume of isotonic saline (saline, $N=4$). The dosage of fluprazine selected is well below sedative/ataxic levels and is known to produce strong antiaggressive and anticopulatory effects (Flannelly, Lim, et al., 1985; Olivier et al., 1984). Both members of each pair then received either drug or saline injections, were returned to their home cages for 30 min, and were then simultaneously placed in the open field. The duration of three play behaviors (chasing, boxing, and wrestling), the number of play bouts, and the frequency and duration of social grooming were recorded for 10 min. Three days after the first test, the rats were once again weighed and paired with novel partners with identical drug histories. The drug conditions were reversed for the second test (i.e., prior saline pairs now received the drug and vice versa) and observations of play and grooming behavior were repeated.

RESULTS

The results of this experiment are summarized in Figure 1. The upper panel clearly shows that fluprazine strongly suppressed both the frequency and duration of play behavior. The number of play bouts invariably declined following drug treatment, with 10 of the 16 rats showing no play behavior at all. Following saline injections, all rats engaged in substantial levels of play, with 12 of the 16 rats displaying 40 or more play bouts ($p < .002$). Duration of play yielded closely similar results, with 10 of the 16 rats playing for less than 5 sec following fluprazine treatment, whereas 12 of the 16 rats played for more than 80 sec following saline injections ($p < .002$). In contrast, both frequency and duration of social grooming (lower panel) were quite similar following drug and saline treatment, with no suggestion of reliable differences ($ps > .10$).

DISCUSSION

The present results further extend the range of social behaviors disrupted by fluprazine treatment. Since juvenile play behaviors are simi-

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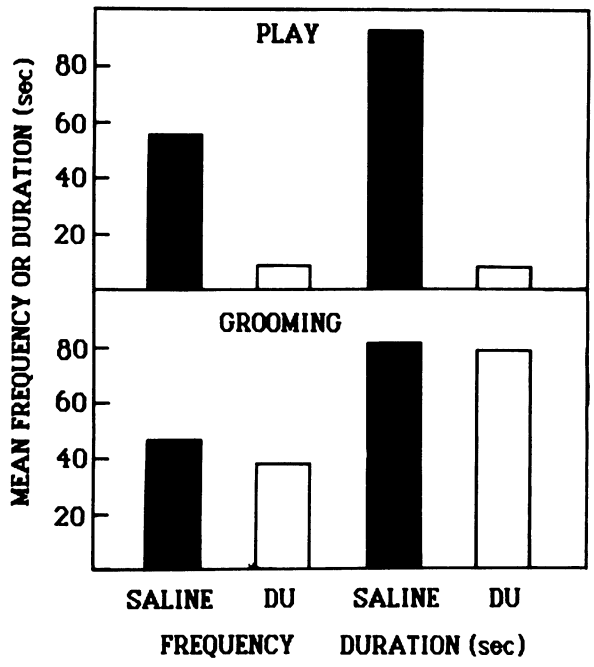

Figure 1. Mean total frequency of play bouts and duration of play (upper panel) and frequency and duration of social grooming (lower panel).

lar in form to those later employed during conspecific agonistic interactions, these results are perhaps not surprising. It should be noted, however, that play and serious fighting behaviors appear to differ in their motivation (Panksepp & Beatty, 1980) and their sequencing of responses (Fagen, 1981) and in the mode, as well as targets, of attack (Pellis & Pellis, 1987). It seems reasonable to suggest, therefore, that fluprazine's effects on play and aggression reflect at least somewhat distinct drug actions.

Although the data extend the range of fluprazine's effects, they do not clarify its mechanisms of action. The persistent sniffing of conspecifics noted by several investigators (e.g., Olivier et al., 1984; Racine et al., 1984) suggests that the drug may interfere with the higher level processing of conspecific olfactory stimuli that underlies the initiation of attack. Since olfaction is important for a variety of rodent social behaviors (e.g., Bean, 1982; Bronson, 1974; Murphy & Schneider, 1970; Thor & Holloway, 1982), play disruption might have been secondary to some more generalized impairment in olfactory function. Since fluprazine also inhibits exploration of various novel environments and enhances some responses to footshock (Kemble et al., 1987), however, such a mechanism could not be restricted to olfactory stimuli and would have to extend to the processing of a very wide range of stimuli indeed. Alternatively, both the inhibition of exploratory behavior and some forms of predation and the enhanced responsiveness to footshock (Kemble et al., 1987; Schultz & Kemble, 1986) suggest that fluprazine strongly potentiates fear. Increased fearfulness would also be expected to suppress a wide range of social behaviors. If so, however, one might have expected the drug to reduce social grooming as well as play in this experiment. Clearly, a fuller characterization of fluprazine's actions will require further study.

REFERENCES

Bean, N. J. (1982). Modulation of agonistic behavior by the dual olfactory system in male mice. *Physiology & Behavior*, **29**, 433-437.

Blanchard, D. C., Takushi, R., Blanchard, R. J., Flannelly, K. J., & Kemble, E. D. (1985). Fluprazine hydrochloride does not decrease defensive behaviors of wild and septal syndrome rats. *Physiology & Behavior*, **35**, 349-353.

Bradford, L. D., Olivier, B., van Dalen, D., & Schipper, J. (1984). Serenics: The pharmacology of fluprazine and DU 28412. In K. A. Miczek, M. R. Kruk, & B. Olivier (Eds.), *Ethnopharmacological aggression research* (pp. 191-207). New York: Liss.

Bronson, F. H. (1974). Pheromonal influences on reproductive activities in rodents. In M. C. Birch (Ed.), *Pheromones* (pp. 344-365). New York: American Elsevier.

Fagen, R. (1981). *Animal play behavior*. New York: Oxford University Press.

Flannelly, K. J., Lim, H., Diamond, M., Blanchard, D. C., & Blanchard, R. J. (1985). Fluprazine hydrochloride decreases copulation in male rats. *Pharmacology, Biochemistry & Behavior*, **22**, 1-4.

Flannelly, K. J., Muraoka, M. Y., Blanchard, D. C., & Blanchard, R. J. (1985). Specific anti-aggressive effects of fluprazine hydrochloride. *Psychopharmacology*, **87**, 86-89.

Kemble, E. D., & Schultz, L. A. (in press). Effects of fluprazine hydrochloride on maternal behavior in mice. *Behavioural Processes*.

Kemble, E. D., Thornton, A. E., & Schultz, L. A. (1987). Some fear-potentiating effects of fluprazine hydrochloride in mice. *Aggressive Behavior*, **13**, 269-280.

Meany, M. J., & Stewart, J. (1981). A descriptive study of social development in the rat. (*Rattus norvegicus*). *Animal Behavior*, **29**, 34-45.

Murphy, M. R., & Schneider, G. E. (1970). Olfactory bulb removal eliminates mating behavior in the male golden hamster. *Science*, **167**, 302-304.

Olivier, B., Mos, J., van der Poel, A. M., Krijzer, F. N. C., & Kruk, M. R. (1984). Effects of a new psychoactive drug (DU27716) on different models of rat agonistic behaviour and EEG. In K. J. Flannelly, R. J. Blanchard, & D. C. Blanchard (Eds.), *Biological perspectives on aggression* (pp. 261-279). New York: Liss.

Panksepp, J., & Beatty, W. W. (1980). Social deprivation and play in rats. *Behavioral & Neural Biology*, **30**, 197-206.

Pellis, S. M., & Pellis, V. C. (1987). Play-fighting differs from serious fighting in both target of attack and tactics of fighting in the laboratory rat (*Rattus norvegicus*). *Aggressive Behavior*, **13**, 227-242.

Racine, M. A., Flannelly, K. J., & Blanchard, D. C. (1984). Anti-aggressive effects of DU 27716 on attack and defensive behaviors in male mice. In K. J. Flannelly, R. J. Blanchard, & D. C. Blanchard (Eds.), *Biological perspectives on aggression* (pp. 281-294). New York: Liss.

Schultz, L. A., & Kemble, E. D. (1986). Prey-dependent effects of fluprazine hydrochloride on predatory aggression in northern grasshopper mice (*Onychomys leucogaster*) and rats (*Rattus norvegicus*). *Aggressive Behavior*, **12**, 267-275.

Thor, D. H., & Holloway, W. R. (1982). Anosmia and play fighting behavior in prepubescent male and female rats. *Physiology & Behavior*, **29**, 281-285.

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