responding were engendered by point subtractions attributed to another person, and maintained by initiation of intervals free of point subtractions. Triazolam produced dose-dependent decreases in point-maintained responding, while very different dose-response functions were observed for aggressive and escape responding.

CHOLINESTERASE INHIBITOR MSF ENHANCES ONE-TRIAL REWARD LEARNING IN AGED RATS. David H. Malin, Patricia J. Toups, Linda D. Osgood, David E. Fowler, K'Ann A. Warren and Stephanie J. Crouse. University of Houston—Clear Lake, Houston, TX.

Eighteen-month-old rats show significantly less retention than 2–3-month-old rats on a one-trial food-rewarded task in a five-arm sunburst maze. Methanesulfonyl flouride (MSF) is a selective CNS acetylcholinesterase inhibitor. Ten 18-month-old rats injected IP with 0.5 mg/kg MSF before the single training trial showed significantly better retention 24 hours later in terms of speed and errors than eleven 18-month-old rats receiving injection vehicle. Pretreatment with 0.5 mg/kg MSF failed to increase retention in 2–3-month-old rats. MSF administered prior to the retention trial was ineffective, suggesting that it may effect memory formation rather than memory retrieval. (Supported by Moody Foundation and UH-CL Fac. Res. Fund.)

MONOAMINE OXIDASE INHIBITORS IMPROVE PERFORMANCE IN ANIMAL MODELS OF HYPERACTIVITY. Elizabeth A. Reyes, M. Jack Lee, Allen E. Butt and Gordon K. Hodge. University of New Mexico, Albuquerque, NM.

Attention deficit hyperactivity disorder (ADHD) is characterized by impulsivity and attention deficits. The relationship between dopamine (DA) deficiency and ADHD symptoms was examined and the therapeutic efficacy of *d*-amphetamine, pargyline, and clorgyline was assessed. To delineate the extent of DA involvement, 6-hydroxydopamine was administered to 5-day-old rats. A modified differential reinforcement of low rate responding light discrimination task was used to measure impulsivity, defined as commission errors. Rats treated with 6-hydroxydopamine demonstrated impulsive behavior, which was attenuated by clorgyline or pargyline; amphetamine treatment was less efficacious. (Supported, in part, by NIH grant RR08139; UNM RAC grant 88-45; and APA Neuroscience Fellowship to E. A. Reyes.)

SCOPOLAMINE ANTAGONIZES HALOPERIDOL'S EFFECTS ON RATE AND FORCE OF RESPONSE. Stephen C. Fowler and Michael A. Kirkpatrick. University of Mississippi, University, MS.

Scopolamine hydrochloride (0.1 mg/kg), a centrally-acting anticholinergic, substantially reversed the rate decrementing and peak force incrementing effects of the antipsychotic drug haloperidol (0.08 mg/kg) in laboratory rats. The peripherally active methyl form of scopolamine did not antagonize haloperidol's effects. Not only do these data support the idea that neuroleptic-induced decrements in rats' behavior are similar to extrapyramidal side effects in man, but the data also suggest that the neuroleptic-related elevations in peak force of rats' operant responses are manifestations of the same process whereby neuroleptics decrease response rate.

BEHAVIORAL EFFECTS OF TWO D_2-SELECTIVE DOPAMINE ANTAGONISTS, RACLOPRIDE AND SPIPERONE. Leonard L. Howell, DeLoris M. Wenzel and Larry D. Byrd. Yerkes Regional Primate Research Center, Emory University, Atlanta, GA.

Raclopride (0.001–0.03 mg/kg) and spiperone (0.001–0.01 mg/kg) were administered intramuscularly (IM) and intravenously (IV) to squirrel monkeys (*Saimiri sciureus*) trained to lever-press under a fixed-interval (FI) 300-sec stimulus-shock termination schedule. A session consisted of 10 or 13 consecutive FI components, each followed by a 60-sec timeout. Drugs were administered IM 5 min presession, and IV either 5 sec presession or during sequential periods of FI responding (cumulative-dosing). Both drugs produced dose-dependent decreases in response rates, and 0.01 mg/kg of either completely suppressed responding. Although raclopride and spiperone were equipotent, they differed markedly in onset and duration of action. Peak effects occurred 5–10 min after raclopride administration, and partial recovery of responding was seen within 30–40 min. Test sessions one day after raclopride administration were typical of control performance. In contrast, peak effects occurred 25–30 min after spiperone administration, and response rates were markedly suppressed up to 48 hr. Complete recovery of rate and pattern of responding occurred 2 days after an intermediate dose (0.003 mg/kg) and 3 days after the highest dose (0.01 mg/kg) of spiperone. Route of administration did not affect potency or time course of action of either drug. (Supported, in part, by USPHS Grants DA-01161 and RR-00165 to the Yerkes Research Center from the Division of Research Resources, NIH.)

EFFECTS OF *d*-AMPHETAMINE ON CHOICE OF SOCIAL VS. MONETARY REINFORCEMENT. Stephen T. Higgins, John R. Hughes, Warren K. Bickel and Mimi Benedict. University of Vermont, Burlington, VT.

Two mutually exclusive options (socializing versus obtaining monetary reinforcement) were concurrently available to eight volunteers during 60-min experimental sessions under controlled laboratory conditions. Using a discrete-trial choice arrangement, subjects chose every three minutes between an option in which they could converse with another same-sex volunteer and an option in which money was earned by providing speech monologues. *d*-Amphetamine (12.5 and 25 mg/70 kg) significantly increased the percent of trials subjects chose the social over the monetary option, and produced a nonsignificant increasing trend in total seconds of social conversation. Additionally, *d*-amphetamine significantly increased subject ratings of effects indicative of greater sociability such as friendliness, elation and energetic. The present results provide further evidence suggesting that *d*-amphetamine may increase the relative reinforcing effects of social interaction.

TRAINING DOSE AS A DETERMINANT OF MORPHINE'S DISCRIMINATIVE STIMULUS PROPERTIES. Sondra R. Mattox, Mitchell J. Picker and Linda A. Dykstra. University of North Carolina at Chapel Hill, Chapel Hill, NC.

The purpose of this study was to evaluate the influence of training dose on morphine's discriminative stimulus properties. Rats were trained to discriminate either 3.0 or 10 mg/kg of morphine sulfate from saline. After a stable discrimination was established, substitution tests were conducted in both groups with the mu opioid agonists, morphine, fentanyl, and *l*-methadone and the kappa opioid agonists, U50,488, bremazocine, ethylketocy-

clazocine and ketocyclazocine. The results indicate that the kappa opioid agonists, as a group, generated less drug-appropriate responding in rats trained to discriminate a high dose of morphine (10 mg/kg) than in rats trained to discriminate a low dose of morphine (3.0 mg/kg).

ENHANCED SENSITIVITY TO MIXED-ACTION OPIOIDS IN MORPHINE-TOLERANT SQUIRREL MONKEYS. Alison H. Oliveto, Linda A. Dykstra and Mitchell J. Picker. University of North Carolina at Chapel Hill, Chapel Hill, NC.

Various opioid compounds were examined in squirrel monkeys responding under a fixed-ratio 30 schedule of food presentation. Dose-effect curves were obtained prior to and during a chronic regimen in which monkeys received 6 mg/kg/day of morphine. During chronic morphine, the dose-effect curves for the mu agonists morphine and *l*-methadone shifted 1 and ½ log units to the right, respectively; whereas those for the kappa agonist U50,488 did not change. The dose-effect curves for the opioid antagonist naloxone and the mixed-action opioids nalorphine, nalbuphine, and butorphanol shifted approximately 3, 2, 2, and ½ log units to the left, respectively; whereas those for the mixed-action opioid pentazocine were unaltered.

DISCRIMINATIVE STIMULUS REINFORCING AND PHYSICAL DEPENDENCE PROPERTIES OF ACETORPHAN. Janet S. Knisely. Medical College of Virginia, Richmond, VA; Patrick M. Beardsley. G. D. Searle and Company, Skokie, IL; and Mario D. Aceto, Robert L. Balster and Louis S. Harris. Medical College of Virginia, Richmond, VA.

Drug discrimination, self-administration and physical dependence procedures were employed to assess the abuse potential of acetorphan, a parenterally-acting enkephalinase inhibitor. Rats trained to discriminate 2 mg/kg morphine from saline did not generalize to acetorphan at any dose tested (5–50 mg/kg). Also, acetorphan did not reliably serve as a reinforcer in rhesus monkeys trained to lever press for intravenous delivery of cocaine. In physical dependence studies, acetorphan also failed to produce opioid-like effects. No overt withdrawal signs were observed in rats following chronic administration of acetorphan and acetorphan did not prevent withdrawal in morphine-dependent rats and rhesus monkeys. Collectively, these results indicate that acetorphan does not produce opioid-like effects using these procedures and has minimal abuse potential.

TOLERANCE TO AN AMPHETAMINE DISCRIMINATIVE STIMULUS. Elizabeth S. Steigerwald and Alice M. Young. Wayne State University, Detroit, MI.

Tolerance to an amphetamine discriminative stimulus was examined as a function of the dose and duration of repeated amphetamine treatment. Rats (N = 12) were trained to discriminate saline and 0.8 mg/kg *d*-amphetamine under FR schedules of food delivery. Amphetamine stimulus control was examined before, during, and after repeated treatment with saline or amphetamine. During each treatment phase, training sessions were suspended and each rat received daily injections of either saline or a total dose of 6.4 or 12.8 mg/kg amphetamine for 3 or 18 days. Treatment with saline produced no change in the dose of amphetamine required to evoke generalization or alter response rates. Treatment with 6.4 mg/kg amphetamine for 3, 7 or 14 days increased the dose of amphetamine required for stimulus control by 2- to 3-fold and that required to suppress response rates by more than 2-fold. In contrast, treatment with 12.8 mg/kg amphetamine for 3 or 7 days produced lesser tolerance, and in 4 of 12 animals treatment for 14 days produced evidence of sensitization. Thus, repeated treatment with amphetamine may produce biphasic changes in amphetamine stimulus control, with lower treatment doses or shorter durations yielding tolerance, and higher doses producing sensitization. (Supported by DA-03796.)

DISCRIMINATIVE STIMULUS PROPERTIES OF ANTIHISTAMINES MAY INVOLVE MEDIATION BY SEROTONIN. Tammy A. Winters and Barbara L. Slifer. University of New Orleans, New Orleans, LA.

Although histamine H1-receptor antagonists are among the most widely taken drugs, their behavioral effects in animals have not been studied extensively. The most common side effects of antihistamines are drowsiness and sedation, however, more recently their stimulant-like properties have been reported. Besides antagonism of histamine receptors, antihistamines are known to exert their effects on other neurotransmitter systems as well, including serotonin. A drug discrimination study was conducted to further examine serotonergic involvement in the discriminative stimulus properties of antihistamines using cyproheptadine (CYP), an effective H1-receptor blocker that has prominent serotonergic blocking activity. Rats were trained to discriminate IP injections of CYP (3 mg/kg) from saline under a two-lever fixed-ratio 30 schedule of food presentation. Doses of select antihistamines were tested. Neither tripelennamine (0.3–10 mg/kg) nor chlorpheniramine (1.0–30 mg/kg) substituted for CYP at any dose tested. A dose-related substitution was achieved with diphenhydramine (1–20 mg/kg) with >90% drug lever responding at doses of 17.5 and 20 mg/kg. Promethazine (1–10 mg/kg) also substituted in a dose-related manner for CYP with >95% drug lever responding at doses of 5.6 and 10 mg/kg. Thus, the discriminative stimulus properties of some antihistamines appear to involve a serotonergic component. (Supported by DA-03838 and DA-04851.)

EFFECTS OF H_1 ANTAGONISTS ON PUNISHED RESPONDING IN THE RAT. Paul A. Gore, Jr. and Barbara L. Slifer. University of New Orleans, New Orleans, LA.

In addition to the well known therapeutic effects of the antihistamines in treating allergic reactions and cold symptoms, these drugs may occasionally be prescribed for anxiety. The present study investigated the possible anxiolytic activity of antihistamines in rats trained to respond under a multiple FI3 minute FR10 (food + shock) punishment schedule. The H_1 antagonists tested [tripelennamine (0.3–10 mg/kg), diphenhydramine (1–20 mg/kg), chlorpheniramine (0.3–17.5 mg/kg), and hydroxyzine (1–20 mg/kg)] resulted in nonselective increases followed by decreases in overall rates of responding, whereas diazepam (0.3–10 mg/kg) selectively increased rates of responding during punished components. Additionally, the effects of the antihistamines on local rates of nonpunished responding differed from those of diazepam. While the latter produced significant rate-dependent effects, the antihistamines' effects on local rates of responding were not consistently related to control rates of responding. These data replicate previous findings and suggest that although the antihistamines may occasionally be prescribed as anxiolytics, their effects on responding suppressed by punishment in the rat differ from those of the CNS depressants. (Supported by NIDA Grant DA-03838.)