shown to reduce subjective withdrawal symptoms in general, there may be a potentiation of conditioned withdrawal symptoms with nicotine replacement.

MONDAY P.M.

PAPER SESSION

Stimulants and Anxiolytics: Behavioral and Physiological Effects
Chair: *Stephen C. Fowler,* University of Mississippi, University, MS

COCAINE BASE SMOKING IN RHESUS MONKEYS. Marilyn E. Carroll, Gilberto N. Carmona and Kelly L. Krattiger. University of Minnesota, Minneapolis, MN.

Three rhesus monkeys had been trained to drink a drug and/or water by making lip-contact responses on solenoid-operated drinking spouts. Responding on a similar spout activated a circuit that heated a coil of wire containing 10 mg of cocaine base. The coil was heated for 75 msec and the smoke exited the smoking tube protruding into the monkey's cage. The number of licks and sucking responses on this tube were recorded, and the results showed that the monkeys were actively inhaling on the tube. The monkeys rapidly self-administered the cocaine-base smoke *without* additional reinforcement with food or water. The fixed-ratio requirement for a smoke delivery was gradually increased to 16. Subsequently, a second-order schedule was implemented, whereby responding on a lever resulted in a brief stimulus associated with cocaine delivery after every 16 lever presses. The first FR 16 responses on the smoking spout completed after 85 brief stimulus deliveries activated the smoking device. A maximum of 4 deliveries were allowed per 1-hr session, and these were almost always earned. Lidocaine (10 mg) was then substituted for cocaine for 8 days and responding decreased substantially indicating that cocaine was functioning as a reinforcer. Extinction responding (increased intertrial licks and sucking responses) was also associated with the presentation of lidocaine. When access to the cocaine base was reinstated, responding increased and 4 deliveries were reliably earned each session. In subsequent experiments the number of smoking opportunities per day was increased to 8, a dose response function was obtained, withdrawal effects were examined and the effects of serotonin reuptake inhibitors, fluoxetine and sertraline as well as dietary L-tryptophan (a serotonin precursor), on cocaine-base smoking were investigated. (This research was supported by DA 02486.)

INTRANASAL COCAINE: EFFECTS OF LEARNING AND PERFORMANCE IN HUMANS. Stephen T. Higgins, John R. Hughes, Warren K. Bickel, Mark A. Capeless and Mary R. Lynn. University of Vermont, Burlington, VT.

The acute effects of intranasally administered cocaine (4, 48, 96 mg/70 kg) on human learning and performance were investigated in two recreational drug users. Subjects performed under a multiple schedule of repeated acquisition and performance of response sequences and the digit symbol substitution test (DSST), and also completed visual-analog ratings of drug effect. These tasks were performed immediately before and every 15–30 min for 2 hr after drug administration. Heart rate was measured every 5 min. Cocaine produced no discernible effects on accuracy of responding in the repeated acquisition and performance procedure; effects on overall rates of responding in that procedure differed as a function of drug dose and subject. In the DSST procedure, overall rates of responding and the total number of trials completed correctly increased as a function of drug dose in both subjects. Visual-analog ratings of drug effect and heart rate also increased as an orderly function of drug dose. Cocaine's effects on DSST performance, visual-analog ratings of drug effect and heart rate were discernible throughout the 120-minute session. These preliminary results contribute important new information on the human behavioral pharmacology of cocaine.

COCAINE-RELATED EXPECTANCIES: THEIR DOMAIN AND IMPLICATIONS FOR TREATMENT. Adam J. Jaffe. Yale University School of Medicine, New Haven, CT; and M. Marlene Kilbey and Gerald R. Rosenbaum. Wayne State University, Detroit, MI.

The present study involved the construction of a Cocaine Expectancy Questionnaire (CEQ) designed to explore the domain of adult cocaine-related expectancies. The questionnaire was based on extensive open-ended interviews with 73 adult noncocaine users, 12 experimental users and 20 abusers, as well as a review of the relevant literature. The items were then administered to a second, similar group. Item analysis was conducted to determine final item inclusion. A content analysis of the interviews and resulting questionnaire revealed that adults seem to hold well-formed expectancies about the effects of cocaine. Etiological and treatment implications of expectancies and the CEQ are discussed.

DISCRIMINATIVE STIMULUS EFFECTS OF *d*-AMPHETAMINE, METHYLPHENIDATE AND DIAZEPAM IN HUMANS. Stephen J. Heishman, W. Robert Lange and Jack E. Henningfield. National Institute on Drug Abuse Addiction Research Center, Baltimore, MD.

Human subjects were trained to discriminate between 30 mg *d*-amphetamine (Drug A) and placebo using a second-order schedule color tracking procedure. Daily experimental sessions tested one drug dose or placebo. All subjects learned the discrimination and reported increased subjective ratings of drug liking, drug strength, and good drug effects after administration of *d*-amphetamine compared to placebo. Subjects were then tested with *d*-amphetamine (3.75, 7.5, 15 and 30 mg), diazepam (5, 10, 20 and 40 mg), and methylphenidate (7.5, 15, 30 and 60 mg) to determine if the discriminative stimulus effects of these drugs would substitute for Drug A. Doses of *d*-amphetamine substituted for Drug A in some, but not all subjects; however, subjective effects corresponded to discriminative stimulus effects. None of the doses of diazepam substituted for Drug A. Only the highest dose of methylphenidate (60 mg) substituted for Drug A in all subjects, producing Drug A-like subjective effects. These results indicated that this procedure is useful for studying the discriminative stimulus effects of drugs in humans and that the subjective and discriminative stimulus effects of the tested drugs closely paralleled one another.

EFFECTS OF BUSPIRONE AND DIAZEPAM ON MOOD AND BEHAVIOR. Warren K. Bickel, John R. Hughes, Stephen T. Higgins and Mark Capeless. University of Vermont, Burlington, VT.

The present study examined the effects of buspirone and diazepam on subjects' reports of drug effects and on performance. Subjects were administered either buspirone (0, 10, 20, and 30 mg/70 kg of bodyweight) or diazepam (0, 10, 20, and 30 mg/70 kg

of bodyweight). The effects of these drugs were then assessed on a variety of self-reports and on a performance measure, the digit-symbol substitution task (DSST). Buspirone produced dose-related increases in self-reported bad effects. On the DSST, buspirone produced increases in response rate and on the percent of trials finished correctly. Diazepam produced dose-related increases in strength and produced a very shallow increase in self-reported bad effect. On the DSST, diazepam decreased response rate and the percent of trials done correctly. This study indicates that these two anxiolytics have a different profile of effects and therefore may have different liabilities associated with their use.

EFFECTS OF NICOTINE UPON PUNISHED AND NONPUNISHED RESPONDING IN HUMANS. Robert H. Bennett and Don R. Cherek. Substance Abuse Research Center, The University of Texas Health Science Center, Houston, TX.

Male subjects are administered varying doses of nicotine through tobacco smoke using the smoke inhalation spirometry procedure which ensures constant puff volume and introduces the smoke deep into the lungs. The doses delivered through research cigarettes are 0.3, 1.2, and 2.7 mg of nicotine (F.T.C. yield) per cigarette plus a sham condition in which no smoke is delivered. Prior to and following smoke administration, subjects are exposed to a punishment schedule of random interval point presentations with a concurrent variable ratio schedule of point subtractions (first half of study) and a random interval schedule of point presentations (second half of study). Preliminary results indicate dose-related, stimulant-like effects of nicotine upon responding.

NICOTINE, STRESS, AND CORTICOSTEROID ACTIVITY. Ovide F. Pomerleau and Cynthia S. Pomerleau. University of Michigan School of Medicine, Ann Arbor, MI.

Recent studies in animals have shown that application of nicotine to the hypothalamus releases corticotropin releasing factor (CRF), which in turn releases ACTH and corticosterone. Adrenalectomized mice, which exhibit low corticosterone levels, are more sensitive behaviorally and physiologically to the effects of nicotine; administration of exogenous corticosteroids restores nicotine tolerance. We have explored this phenomenon with male human smokers in 2 studies; 1) Administration of dexamethasone (a synthetic corticosteroid) in a double-blind, placebo-controlled design not only produced the expected marked depression of baseline cortisol in 5 smokers, but also damped peak cortisol response to nicotine administration, suggesting diminished sensitivity to additional corticosteroid stimulation. Trends toward diminished heart rate reactivity (increased tolerance), increased desire to smoke, and nicotine intake in the dexamethasone condition were also observed. 2) Psychological stress (competitive mental arithmetic) and nicotine intake (smoking a usual cigarette) were presented in a complete factorial design involving 8 smokers. There were no significant differences in plasma nicotine boost between the stress and control conditions. Mental arithmetic produced a significant increase in plasma cortisol; a tendency towards a significant elevation was seen for smoking. The effects of smoking and mental arithmetic were additive, suggesting that cortisol stimulation by nicotine and by stress involve a common mechanism. While the conditions under which stress-induced smoking reliably occurs are not known, the increased nicotine intake often reported during stress may represent behavioral compensation in response to enhanced nicotine tolerance by stress-induced increases in corticosteroid activity rather than to anxiety reduction per se.

NEW FELLOWS ADDRESS

Chair: *Warren K. Bickel,* University of Vermont, Burlington, VT

PERINATAL DRUG ABUSE: RESEARCH AND CLINICAL ISSUES. Theo B. Sonderegger. University of Nebraska, Lincoln, NE.

Substance abuse in this country occurs with alarming frequency in all age groups including women of childbearing age. In 1985, for example, such illegal drugs of abuse as cocaine, heroin, and marijuana reportedly were used at least once by 30% and monthly or more frequently by 18% of the women aged 18 to 35 years of age. Chemical dependency units in every large city have large numbers of patients who continue to take one or more drugs during pregnancy although it is well known that drugs of all kinds can be detrimental to the unborn. Research in this area, of necessity, is a multidisciplinary effort. Psychologists play an exceedingly important role as behavior is the most sensitive indicator of changes in underlying neural systems. When the developing organism is exposed to a drug(s), both the changes that occur depend upon: the nature of the substance; amount and number of the substance(s); genetic make-up of the mother and the embryo or fetus; duration of drug exposure(s); and developmental stage at exposure time. These and other methodological issues will be discussed. Neither data collected from drug-exposed human infants nor those from infrahuman laboratory studies answer all compelling questions. Each approach has advantages and disadvantages. When one examines data obtained from both clinicians and laboratory researchers, however, some similarities emerge. As an example, the neuroendocrine system is often altered although changes may not be detected until later in the life span. In addition, other data will be reviewed. Finally, examination of these research findings also suggests that policy and educational/intervention changes are needed. Psychologists, as concerned citizens, need to be aware of these issues which will be presented briefly.

RECENT DEVELOPMENTS IN THE EFFECTS OF CNS STIMULANTS ON ADD CHILDREN. William Pelham. Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine, Pittsburgh, PA.

Over the past two decades, the most common form of treatment for children with attention deficit disorder (ADD) has been medication with a CNS stimulant drug. Most ADD children are treated with a stimulant at some time in their elementary-age years, and a number of studies have shown that the stimulants are effective in reducing ADD symptomatology in the short-term. However, most studies have employed ratings on global measures of adjustment and subjective rating scales. Only within the past five years have studies begun to appear that employ objective methods to characterize and quantify stimulant effects in ADD. The purpose of this presentation is to describe a series of recent studies that has been conducted in my laboratory with the goal of elucidating the precise effects of stimulant drugs on a wide range of ecologically relevant dependent measures in ADD children, including measures of classroom functioning, peer interactions, social cognition, and information processing tasks. The studies have evaluated dose-response effects of methylphenidate in the zero to 0.6 mg/kg range and have focused on individual differences in dose-response as a function of the domain of assessment.