chloride (BUP) in a 30% (v/v) ethanol solution given daily for 16 days. Six hours following BUP administration on days 14, 15 and 16, subjects were randomly assigned to receive a single intravenous (IV) or intramuscular (IM) injection of hydromorphone hydrochloride (HDM), 0, 2 or 4 mg. Using a parallel groups design, subjects were randomly assigned to one of two groups (A or B). Group A continued to receive 8 mg of BUP daily for another 18 days (days 17 through 34); Group B received 8 mg every other day (alternating with placebo) over the same 18-day period. Six hours following BUP administration on days 29 through 34, subjects again received a randomly determined single daily IV or IM injections of HDM, 0, 2 or 4 mg. The last BUP dose was given to each group on day 34, and placebo continued through day 54. Six hours following BUP placebo administration on days 51 through 54, subjects received a randomly determined single daily IV or IM injection of naloxone hydrochloride (NAL), 0, 3, 6 or 12 mg. Physiological and behavioral observations were performed at −1 and −0.5 (preHDM/NAL) as well as 0.5, 1, 2 and 4 hr following HDM or NAL administration. Physiological observations included measurements of supine and standing blood pressure and heart rate, respiratory rate, pupil diameter, and body temperature. Subscales of the Addiction Research Center Inventory, Observer and Subject Drug Effect Questionnaires, and the Withdrawal Symptom Questionnaire were used to rate behavioral signs and symptoms of acute opioid effect and withdrawal.

INVITED ADDRESS

Food Effects on Brain and Behavior
Richard J. Wurtman, Massachusetts Institute of Technology, Cambridge, MA
Chair: *Peter B. Dews,* Harvard Medical School, Boston, MA

SYMPOSIUM

CNS Stimulants, Aggression and Prosocial Behavior: ADD Children and Animals
Chair: *James M. Swanson,* Child Development Center, University of California, Irvine, CA
Discussant: *Markus Kreusi,* National Institute of Mental Health, Bethesda, MD

AMPHETAMINE'S EFFECTS ON THE SOCIAL BEHAVIOR OF GROUP-LIVING MONKEYS. Larry D. Byrd and Euclid O. Smith. Yerkes Regional Primate Research Center, Emory University, Atlanta, GA.

The chronic administration of sympathomimetic drugs, e.g., *d*-amphetamine and methylphenidate, has become a primary pharmacological treatment for children exhibiting the behavioral syndrome, Attention Deficit Disorder (ADD). The acceptance of this treatment strategy has derived largely from the outcome of case studies involving human children. However, variability in therapeutic efficacy suggests the need for an animal model that is more amenable to a systematic analysis of the variables that can influence drug effect. An interest in the behavioral effects of sympathomimetic and other stimulant drugs within a social context led us to undertake studies with group-living nonhuman primates to identify and characterize changes in several behavioral measures as a function of dose of *d*-amphetamine. In adult male stumptail macaques living within a heterogenous social group, *d*-amphetamine (0.003–0.56 mg/kg) decreased affiliative (prosocial) behavior. In contrast, *d*-amphetamine either increased or had little effect on aggressive behavior as a function of the monkey's dominance position in the group. Moreover, *d*-amphetamine increased aggression initiated by adult male monkeys against nonadult monkeys in the group and decreased aggression toward adult members. Also, the drug increased aggression toward kin-related members of the group and decreased aggression toward nonkin monkeys. The results indicate that *d*-amphetamine can modify the behavior of drug-treated members of a group, and that the drug can indirectly affect other members of the group even though they did not receive the drug. (Supported in part by USPHS grants DA-02128 and DA-01161, and NIH grant RR-00165 from the Division of Research Resources to the Yerkes Primate Research Center.)

ROLE OF BIOGENIC AMINES IN MAINTAINING HYPERACTIVITY IN NEONATAL RATS. Lewis S. Seiden. University of Chicago, Chicago, IL; Frederick E. Miller. University of Illinois, Chicago, IL; and Thomas G. Heffner. Parke Davis-Warner Lambert Drug Co., Ann Arbor, MI.

Monoamine neurotransmitters play an important role in the treatment and possible etiology of Attention Deficit Disorder with Hyperkinesis (ADDH). Evidence for the involvement of monoamines stems from both clinical work and studies exploring animal models of the ADDH syndrome. The primary pharmacological treatment of ADDH involves the use of sympathomimetic drugs such as *d*-amphetamine, methylphenidate and pemoline. The fact that these agents act to increase the synaptic concentration of monoamines has been one of the major reasons for the focus on monoamines in research on ADDH. Normally, rats are very inactive between 0 and 9 days postpartum. Between days 10 and 15, locomotion in the form of ambulation increases greatly, reaching a peak of activity on day 15, and between days 15 and 30, they gradually return to normal activity. However, when rats were depleted of forebrain dopamine by administration of the neurotoxin 6-hydroxydopamine (6-OHDA), the normal developmental pattern of locomotion was altered dramatically. Although the early developmental pattern was relatively normal, when the 6-OHDA rats reached the 15-day peak, their activity declined much more slowly, if at all, when compared to rats treated with vehicle. The degree to which the activity returned to normal depended on the extent of destruction of the catecholamine system. The results suggest relationships between the dopamine and serotonin systems in the expression of hyperkinesis and its treatment with amphetamine and related compounds.

AGGRESSION AND PROSOCIAL BEHAVIOR IN ADD CHILDREN: EFFECTS OF METHYLPHENIDATE. Stephen P. Hinshaw. University of California, Los Angeles, CA.

Stimulant medication, the most prevalent treatment regimen for Attention Deficit Disorder (ADD), has consistently been shown to reduce many of the core symptoms of the disorder, including problem behavior in the social realm. Yet two response domains that are of critical prognostic importance for children—prosocial behavior and aggression—are inconclusive with respect to medication response. First, although stimulants have repeatedly been shown to diminish socially disruptive and noncompliant behavior, their ability to decrease actual aggression has been demonstrated less