

research has resulted in the development of a 34 item inventory which seems to discriminate individuals experiencing a mood disturbance as a result of the ingestion of either caffeine or sucrose. The cross-validation phase of this research revealed that the inventory successfully discriminated between individuals who were sensitive to these dietary substances as opposed to those individuals who were not sensitive to these substances. The sensitive individuals were identified by the use of double-blind challenges. Consequently, this research has resulted in the development of an instrument that can be used by researchers to identify the individuals experiencing a dietary induced mood disturbance.

POSSIBLE MECHANISMS FOR DIET-INDUCED CHANGES IN MOOD Michael E. Trulson, Texas A&M University

Recently, a great deal of research has been directed at elucidating the effects of dietary manipulations on mood. The most commonly studied dietary constituents are proteins, amino acids, and carbohydrates. Ultimately, all three of these categories of foodstuffs concern the role of amino acids on brain function. This is due to the fact that proteins are broken down to their constituent amino acids. In addition, carbohydrates elicit the secretion of insulin which, in turn, has an effect on plasma levels of amino acids. Of the amino acids, tryptophan and tyrosine have been most intensively studied. Tryptophan is converted in brain to the neurotransmitter serotonin, while tyrosine is converted to the neurotransmitters dopamine and norepinephrine. All three of these monoamine neurotransmitters have been postulated to be involved in mood regulation. It has been established that it is the ratio of a given neutral amino acid to the sum of the competitive neutral amino acids in the plasma that determines how much of that amino acid is taken up into the brain. The concentration of tryptophan divided by the concentration of the sum of the competing neutral amino acids will determine how much tryptophan is taken up into the brain. Likewise, the concentration of tyrosine divided by the concentration of the sum of the remaining neutral amino acids that will determine how much of tyrosine is taken up into the brain. When tryptophan is taken up into the brain it is converted to serotonin and produces an increase in brain serotonergic function, due to the unsaturated state of the rate-limiting enzyme, tryptophan hydroxylase. Similarly, dietary manipulations that change the ratio of tyrosine to the sum of the competing neutral amino acids would change brain tyrosine and, since the rate-limiting enzyme in catecholamine biosynthesis, tyrosine hydroxylase, is unsaturated, would change the amount of catecholamines synthesized. Such changes occur rapidly in a subject with no mood disturbances and there appears to be a simple relationship between synaptic monoamines and mood. On the other hand, individuals with clinical symptomatology do not respond immediately to dietary manipulations. Rather, there is a lag time in the treatment of patients with mood disorders. The reason for this lag time in patients with mood disorders is not clear. However, it is interesting to note that a similar lag time exists for treatment of mood disorders with drugs such as tricyclic antidepressants or lithium. That is, even though a single administration of these drugs elevates synaptic levels of monoamine neurotransmitters, clinical improvement is not seen for approximately two weeks of drug therapy. This has been attributable to the need for adjust-

ments at postsynaptic receptor sites. Thus, there appears to be two separate mechanisms by which dietary-induced mood changes occur. First, in normal subjects the changes seem to be directly attributable to alterations in synaptic levels of monoamine neurotransmitters and occur after acute administration of dietary change. Secondly, individuals with clinical mood disturbances require a prolonged administration to achieve a therapeutic effect, which appears to be due to post-synaptic adjustments.

SYMPOSIUM

Motivational Determinants of Alcohol Use: A Multidisciplinary Perspective

Monday August 31, 1987 • 3:00 p.m. - 4:50 p.m.

Marriott Marquis Hotel • Julliard/Imperial Room

Chair: Eric Klinger, Division of Social Sciences, University of Minnesota, Morris, MN

INVOLVEMENT OF MONOAMINES IN DRINKING BEHAVIOR OF SELECTIVELY BRED ALCOHOL PREFERRING RATS W. J. McBride, J. M. Murphy, L. Lumeng and T.-K. Li, Department of Psychiatry, Medicine and Biochemistry, The Institute of Psychiatric Research and The Regenstrief Institute, Indiana University School of Medicine and the VA Medical Center Indianapolis, IN

There is convincing evidence that heritable factors contribute significantly to the development of alcoholism. In addition, there is evidence that there are probably several subtypes of alcoholism, affected to different degrees of environmental and genetic factors. One experimental approach toward understanding the biological basis of the factors which contribute to the genetic predisposition to alcoholism is to establish, through selective breeding, an animal model of alcoholism. We have developed such an animal model through the selective breeding of a line of alcohol-preferring (P) rats. This P line of rats (a) freely consumes 5-7 g ethanol/kg body wt/day, (b) drinks sufficient alcohol to produce intoxicating blood alcohol concentrations, (c) works to obtain alcohol, (d) self-administers ethanol for its CNS pharmacological effects, (e) develops chronic tolerance to alcohol, and (f) demonstrates signs of physical dependence upon withdrawal of alcohol. Neurochemical data indicate a deficit in the serotonergic and dopaminergic pathways projecting to the nucleus accumbens of the P line of rats. Evidence also indicates that acute or chronic ethanol affects both of these monoamine pathways in the P line. Pharmacological studies demonstrated that serotonin uptake inhibitors (e.g., fluoxetine) can reduce the oral consumption or intragastric self-administration of alcohol in the P line of rats. In addition, it appears that IP fluoxetine increases the physiologically active pool of serotonin in the nucleus accumbens. Since the nucleus accumbens is thought to be a critical part of the brain reward system, the data suggest that serotonin and possibly dopamine may be involved in the alcohol drinking behavior of this selectively bred line of rats. (Supported in part by HHS AA-03243)

CONDITIONING AND LEARNING VARIABLES THAT DEFINE THE REINFORCING PROPERTIES OF ALCOHOL Peter E. Nathan, Rutgers, The State University

The role of learning factors in the development and main-

tenance of alcohol abuse and dependence has been studied, debated, questioned, accepted, and minimized for decades. Classical conditioning mechanisms, operant conditioning mechanisms, vicarious reinforcement and, most recently, social learning and cognitive social learning factors have all been identified as crucial factors, singly or jointly, in alcoholism. Despite the widespread conviction on the part of many, however, that these factors bulk large in alcohol abuse and dependence, empirical data supporting the central role of these factors in human alcohol abuse and dependence remain both scanty and equivocal. Most recently, researchers have begun to explore the role of learning factors in specific aspects of alcoholism rather than, as before and more broadly, in broader contexts. One of the most promising such programs of research of this kind investigates the role of learning factors, specifically, classical and operant mechanisms, in tolerance development. Tolerance may, in turn, play an important role both in the etiology of alcoholism and in its maintenance. Accordingly, it is possible that individuals whose tolerance for alcohol is or becomes high early in life may want or be able to drink more alcohol than others, in that way putting themselves at heightened risk to develop alcoholism. It is also likely that persons whose abusive drinking has led to heightened tolerance tend to drink more than others, in that way accelerating the alcoholic process. Broadly defined, tolerance is probably both an antecedent to, as well as a consequence of, the development of alcohol's reinforcing properties. In 1978, Siegel advanced a classical conditioning model of drug tolerance that accords environmental cues consistently present during prior drug exposure the power to elicit conditioned homeostatic responses that attenuate the systemic effect of the drug. In a series of animal experiments using both ethanol and morphine, Siegel and his colleagues demonstrated that rats who have developed tolerance will continue to display a high degree of tolerance only if tested under the same environmental conditions previously associated with drug administration. In 1986, Shapiro and Nathan reported on data to the effect that tolerance to alcohol in human beings also appears to be influenced by similar classically- and operantly-mediated learning factors. This paper will summarize the results of these studies, report on subsequent studies of learning factors in tolerance by Nathan and his colleagues, and speculate on the nature of the role of learning factors in alcohol abuse and dependence, all from the vantage point of the strong empirical support the line of research reviewed in this paper accords these factors.

THE MOTIVATIONAL INFLUENCE OF ALCOHOL EXPECTANCIES

Damaris J Rohsenow Veterans Administration Medical Center, Providence, RI

Both drinkers and nondrinkers have a network of beliefs about the effects of alcohol on behavior and affect. These beliefs have been assessed by various researchers. Light and heavy drinkers have been found to share the same expectancies of negative effects from alcohol, but heavy drinkers expect themselves to receive more positive effects from alcohol than do light drinkers, which will provide more motivation for the heavy drinkers to consume alcohol. Considerable research using the balanced-placebo design has shown that the beliefs heavy drinkers have about alcohol are a major determinant of social and emotional behavior after drinking, resulting in changes in anxiety, sexual responses,

aggression, etc. Attribution of responsibility has provided a parsimonious explanation for some of these results. In a series of studies provoking subjects to aggress, the belief that alcohol increases pleasure was a stronger determinant of behavior after consumption than the belief that alcohol increases aggression, so that heavy drinkers who thought they had consumed alcohol were less aggressive than those who thought they had consumed only tonic. This suggests that when drinkers are stressed, many may seek the pleasure enhancing effects of alcohol to counteract the aversive affect. A decision theory model of relapse shows how these expectancies interact to predict relapse and suggests areas of intervention.

HOW NONCHEMICAL INCENTIVES AFFECT THE MOTIVATION TO USE ALCOHOL

W Miles Cox Veterans Administration Medical Center and Indiana University School of Medicine, and Eric Klinger University of Minnesota

Alcohol use is intertwined with people's incentive motivation and the affective changes that they experience as a result of the incentives in their lives. For example, the affect that people experience prior to imbibing alcohol, and which they expect to change by drinking, is likely to have arisen from their goal-striving activities and their success or lack of success in reaching their goals. In turn, drinking alcohol, especially in excessive quantities, changes people's affect, their incentive motivation, and their subsequent motivation to use or not to use additional alcohol. Thus, either directly or indirectly drinking alcohol influences, and is influenced by, the other incentives in people's lives. Convincing evidence has been gathered to indicate that alcoholics' nonchemical incentives influence their motivation to drink. For instance, studies comparing relapsed and nonrelapsed alcoholics have consistently found that alcoholics who do not relapse have more positive changes and fewer negative changes in their lives than alcoholics who do relapse. Frustration of goal-directed activities, moreover, appears to be a common reason why recovering alcoholics return to drinking. Thus, incentive motivational factors appear to play a crucial role in recovery from alcohol dependence. Accordingly, we have developed an intervention program for alcoholics that focuses on the nonchemical incentives in their lives, thus helping them to find sources of satisfaction and rid themselves of sources of frustration. The intervention has two major components. The first component involves carefully assessing patients' motivational structure (the goals that are the compelling forces in their life) in order to identify points for intervention. For this purpose, we have developed the Motivational Structure Questionnaire for Alcoholics, which combines idiographic and nomothetic assessment and which has been shown to be both reliable and valid. The second major component involves actual modification of the motivational structure and consists of 12 steps. We will present details of the assessment and counseling procedures and results that we have obtained with them.

SOCIOCULTURAL AND ENVIRONMENTAL INFLUENCES ON THE USE OF ALCOHOL

Dwight B Heath, Ph D Professor of Anthropology, Brown University

It is generally accepted that sociocultural and environ-