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Reprinted from The Connecticut State Medical Journal
July 1955 Issue, Vol. XIX, No. 7, Page 560

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SUMMARY

From the standpoint of the clinical problem involved, drug addiction is defined as "pharmacological dependence" (both "psychic" and "physical"), and its diagnosis is based on the demonstration of an abstinence syndrome. Currently, opiates, barbiturates and alcohol are the most commonly used "addicting" drugs. Other agents, like cocaine, amphetamine and marihuana may produce dangerous toxic effects when used in excessive amounts, but the clinical problem involved differs from that of addiction, since abrupt withdrawal of such agents produces neither intensified "craving" nor distressing physical disturbances. Treatment of drug addiction may be divided into two phases: withdrawal of drugs and rehabilitation. Withdrawal of opiates can be accomplished most readily by the substitution of methadone by the oral route, and rapid reduction of methadone dosage over a period of seven to ten days following a short period of "stabilization." Barbiturates should be withdrawn by gradual reduction, over a period of three weeks or more, following a short period of stabilization on pentobarbital. The problem of the management of alcohol withdrawal requires further investigation. The rehabilitation program includes confinement in a drug-free environment for four to six months, vocational training and occupational therapy, and formal psychotherapy when possible.

The rationale of the diagnosis and treatment of drug addiction is discussed from the standpoints both of empirical evidence and of theoretical formulations of the psychological and physiological mechanisms of addiction. Abstinence phenomena are viewed from the standpoint of the "counter-adaptation" theory, and attention is directed to the important role which, among other factors, previous pharmacological dependence may play in the genesis of subsequent relapse. Areas for future research, both of a psychological and a physiological nature, are indicated in relation to both the "nonpurposive" and "purposive" abstinence phenomena that characterize the clinical problem of drug addiction.

PROGRESS in any field of medicine is measured, not only in terms of the efficacy of methods available for the relief of human suffering, but also the degree to which treatment is based upon scientifically acceptable explanations of the genesis of particular illnesses. Viewed from both of these standpoints, considerable "progress" in the management of addictions appears to have been made in recent years, but many problems of major importance remain to be solved. It is the purpose of this discussion to indicate the extent of our present knowledge in relation to currently used methods of diagnosis and treatment of opiate and barbiturate addictions. Although some allusions will be made to alcoholism, this problem will be considered only to the extent that it has been investigated at the Lexington hospital.

DEFINITION OF ADDICTION

The United Nations Expert Committee on Drugs Liable to Produce Addiction has defined drug addiction as follows: "Drug addiction is a state of periodic or chronic intoxication detrimental to the individual

From the National Institute of Mental Health Addiction Research Center, Public Health Service Hospital, Lexington, Ky. Based on a lecture delivered before the Clinical Congress of the Connecticut State Medical Society, New Haven, September 16, 1954

and to society, produced by the repeated consumption of a drug (natural or synthetic). Its characteristics include: (1) an overpowering desire or need (compulsion) to continue taking the drug and to obtain it by any means; (2) a tendency to increase the dose; (3) a psychic (psychologic) and sometimes a physical dependence on the effects of the drug." Undoubtedly this definition is very useful for the purpose of facilitating international control of traffic in potentially harmful drugs. However, for the needs of the practicing physician, "drug addiction" should be defined in terms of the problem with which he is called upon to deal. In general, the problem involved is the management of persons who display pronounced disturbances in behavior when they are deprived of certain drugs which are considered to be harmful to the individual, society or both. In this sense, "drug addiction" is synonymous with "pharmacological dependence," and is said to exist when abrupt and complete withdrawal of certain agents is followed by an "abstinence syndrome," which may consist only of "craving" and persistent seeking out of drugs, or these "purposive" abstinence phenomena may be associated with more transitory "nonpurposive" changes involving the neuromuscular, autonomic and endocrine systems. Both "purposive" and "nonpurposive" abstinence phenomena are associated with the regular, continuous use of opiates, barbiturates or alcohol. The abuse of other agents, such as amphetamine, marihuana or cocaine constitutes a distinctly different problem in medical management. In sufficiently large amounts, these agents can produce dangerous effects, from which both the user and society may suffer. However, sudden withdrawal of such drugs produces few or no "nonpurposive" abstinence changes, while "purposive" abstinence phenomena are rarely as insistent or difficult to cope with as in the case of opiates, barbiturates or alcohol. As will be indicated later, it is probably more than a coincidence that of all the so-called "euphoriant" agents that are available, those are "craved" most by addicts which, after regular continuous use, produce "nonpurposive" abstinence phenomena.

Diagnosis of Addiction

In accordance with this definition, the diagnosis of drug addiction involves the demonstration of an abstinence syndrome. Because they are more easily measured, and are less subject to the influence of uncontrollable factors, the "nonpurposive" abstinence phenomena are used as the basis for diagnosis. Their demonstration, however, should be carried out only in a hospital by a physician specially trained in the recognition of the specific abstinence syndromes that characterize opiate, barbiturate and alcohol addictions. These are quite distinctive, and will therefore be discussed separately.

The Opiate Abstinence Syndrome

Following abrupt and complete withdrawal of morphine, heroin, dilaudid, codeine, methadone, meperidine or a number of other morphine derivatives and potent synthetic analgesics, a train of symptoms and signs ensues which conforms to a general pattern, though differences in time, course and intensity of particular disturbances characterize addictions to individual drugs of the opiate-like class. In the case of morphine, the fully developed abstinence syndrome consists of the following train of events: yawning, lacrimation, mydriasis, rhinorrhea, perspiration, chilly sensations, piloerection (arms, forearms, axillary regions, abdomen), muscular aching, muscle twitches (especially in the legs), nausea, vomiting, diarrhea, restlessness, anxiety, tachypnea, hypertension, anorexia, insomnia, weight loss, ejaculations in men and orgasms in women. Significant laboratory findings include leukocytosis, pronounced drop in counts of circulating eosinophiles, and increased urinary excretion of 17-ketosteroids. Such changes can be detected as early as the 14-20th hour, reach peak intensity between the 48-72nd hour of abstinence, and subside rapidly during the next five to ten days. However, minimal abstinence changes may persist for as long as six months. At any time during the acute abstinence period, a single dose of morphine (e.g., 30 mg.) produces a prompt and pronounced reduction of the intensity of all of the disturbances listed, which lasts six to twelve hours, after which the intensity of the abstinence syndrome returns to the value that it would have reached at that time if untreated. This phenomenon may be utilized as confirmatory evidence that the disturbances are indeed morphine abstinence changes. The over-all intensity of the morphine abstinence syndrome varies individually, but is remarkably reproducible in any given subject under controlled experimental conditions, and varies within limits with the dosage and duration of morphine addiction.

The heroin and dilaudid abstinence syndromes resemble that of morphine except that withdrawal phenomena appear and reach peak intensity sooner, and they subside more rapidly. That of codeine is

milder, while the methadone abstinence phenomena, while mild, are more persistent than in the case of morphine. Addiction to meperidine, however, presents unique problems. Abstinence phenomena (yawning, lacrimation, rhinorrhea, perspiration, isolated muscle twitches and extreme restlessness) may appear within two hours after the last dose, and impel the user to increase the frequency as well as the amounts of merperidine injected. When a daily dose level of approximately 3,000 mg. has been reached, direct toxic effects of the drug, in the form of myoclonic jerks and/or generalized convulsions may be superimposed on the abstinence phenomena.

Very recently a more rapid method of precipitating abstinence syndromes in cases of addiction to morphine, heroin, methadone and a number of other opiate-like drugs, except meperidine, has been developed. This utilizes the remarkable opiate-antagonistic properties of N-allylnormorphine ("nalorphine," U.S.P.; "Nalline," Merck). In nonaddicted, previously nonmedicated individuals, 5-15 mg. of this compound produces effects that are quite similar to smaller doses of morphine, including depression of respirations. In nonaddicted persons who have received "therapeutic" doses of morphine, N-allylnormorphine, in the doses mentioned, antagonizes many of the morphine effects (particularly "euphoria"), but not the depression of respirations. In nonaddicted individuals whose respirations and arousability have been seriously depressed by larger doses of opiates, relatively small doses of N-allylnormorphine produce a spectacular, though transient restoration of respiratory rate and depth to normal or supernormal values, and facilitate arousal. In opiate addicts (with the exception of those addicted to meperidine), however, N-allylnormorphine precipitates well defined abstinence syndromes of short duration (1-2 hours) within 15 minutes after subcutaneous injection, even when the addicted individual has been rendered comatose and almost apneic by an overdose of an opiate-like drug. The intensity of such N-allylnormorphine-precipitated abstinence syndromes varies directly with the intensity of addiction and the amount of N-allylnormorphine administered. If the latter is excessive, dangerously intense "withdrawal" phenomena may ensue. For the diagnosis of addiction the initial dose of N-allylnormorphine should not exceed 3 mg. If yawning, lacrimation, mydriasis, rhinorrhea, perspiration and/or piloerection do not appear within 15 minutes after subcutaneous injection, an additional dose of 5 mg. may be administered by the same route. If such abstinence phenomena fail again to make their appearance, a final dose of 7 mg. (15 mg. total) may be given in a similar manner. A positive result indicates that the subject has been using an opiate-like drug in sufficient amounts, and with sufficient regularity to have developed pharmacological dependence. This has been demonstrated to occur in former opiate addicts who have received as little as 15 mg. of morphine, 15 mg. of heroin or 10 mg. of methadone four times daily for as short a period as two or three days. A negative result indicates either that the subject has not developed pharmacological dependence, or that he has been abstinent for as little as perhaps one week, since it has been shown that immediately after subsidence of an opiate abstinence syndrome, N-allylnormorphine exerts effects identical with those in nonaddicted, nonmedicated individuals.

The mechanisms of action of N-allylnormorphine have not yet been fully elucidated. However, a considerable body of evidence obtained in clinical studies, and in investigations on animals and animal preparations, justifies the following tentative explanation. Single doses of opiate-like drugs produce a mixture of "depressant" and "excitant" actions at all levels of the central nervous system, the pattern of which differs from that characterizing the effects of other drugs with somewhat similar actions, like barbiturates and mephenesin. The depressant effects of single doses of opiate-like drugs are often followed by secondary "rebound" changes in the same functions, with consequent enhancement of activity. When multiple, fixed doses of opiate-like drugs are administered daily for variable periods of time, the initial depressant effects become progressively less noticeable, while the "rebound" enhancement of functional activity becomes intensified. In part, such "tolerance" may be ascribed to the development of hypothetical cellular "counter-adaptations" in the central nervous system which can be held in check only by additional opiates, the dose of which must be increased progressively up to a limiting value in order to prevent the appearance of an "abstinence syndrome." It is further hypothesized that the N-allylnormorphine molecule "competes" with molecules of opiate-like drugs for the cellular receptors of the central nervous system, that they enter the cell more rapidly, have a greater "affinity" for the receptor sites, and that they do not "mask" the counter-adaptations. Consequently, N-allylnormor-

phine can not only antagonize the depressant actions of opiate-like drugs, but it can also "unmask" the counter-adaptations which are responsible for the abstinence syndrome. At present, the concepts "counter-adaptation," "molecular competition" and "affinity" are not phenomena that can be measured independently of those that they purport to explain. However, they appear to be useful postulates, since they have served to facilitate the prediction of many observable effects of single and repeated doses of various drugs.

THE BARBITURATE ABSTINENCE SYNDROME

Following abrupt and complete withdrawal of short-acting barbiturates, such as secobarbital, pentobarbital or amobarbital, a series of phenomena develops, the intensity of which is related directly to the degree, continuity, and duration of drug intoxication, with the usual individual variations. In persons who have received 1.0 Gm. or more of such barbiturates daily for six weeks or longer, tremulousness, weakness, postural hypotension and syncope, anxiety, anorexia and insomnia appear regularly by the end of the first day of abstinence. In addition to these phenomena, one to four generalized convulsions may be expected in approximately 80 per cent of such individuals on the second or third day, in association with pronounced abnormalities, often of the paroxysmal "spike and dome" variety in the electroencephalogram. In roughly 60 per cent, psychoses, most often indistinguishable from alcoholic delirium tremens, can be expected to occur between the fourth and seventh days, with spontaneous recovery within a week thereafter. Replacement on barbiturates serves to suppress all of the abstinence phenomena, except the psychoses which, once well under way, tend to run their course, although occasionally rapid recovery occurs after prolonged sleep has been induced by anesthetic doses of a barbiturate. It has also been established experimentally that in subjects who have received 0.6-0.8 Gm. of short-acting barbiturates daily for similar periods, only anxiety, tremulousness, postural faintness, anorexia, insomnia and weight loss are likely to appear on abrupt withdrawal of the agents concerned. In about 10 per cent of those taking 0.6 to 0.8 Gm. daily, convulsions may develop, and a similar incidence of mild, transitory psychotic episodes has been observed. Data are not yet available to enable the prediction of the nature and intensity of abstinence phenomena, if any, that can be expected to occur in individuals taking less than 0.6 Gm. daily. In general, however, it appears that the intensity of abstinence phenomena is related directly to the degree and duration of chronic intoxication that existed before withdrawal.

At present, little is known concerning the mechanisms that are involved in the genesis of the barbiturate abstinence syndrome. The fact that convulsions occur after withdrawal of drugs with anticonvulsant properties, suggests again that "counter-adaptations" may develop at cortical or subcortical cellular levels during chronic barbiturate intoxication. On the other hand, alternative hypotheses can be advanced, based upon recent evidence that barbiturates exert selective depressant actions on the brainstem reticular activating system, and the role of this and the diffuse thalamic projection system in the genesis of seizures. Unfortunately, practically no studies have been made on the neurophysiological changes that occur during recovery from the initial depressant effects of barbiturates. Carrying out of such investigations would entail technical difficulties of formidable proportions, but they appear to be necessary for the ultimate resolution of the problem.

THE ALCOHOL ABSTINENCE SYNDROME

Very recent experimental studies support strongly the view that "rum fits" and delirium tremens, currently regarded by many as toxic effects of alcohol, are, in fact, alcohol abstinence phenomena. In addition, this syndrome includes other well known but less dramatic changes such as tremulousness, nausea, perspiration, insomnia, vomiting, diarrhea, hyperreflexia, fever, hypertension and transient visual and auditory hallucinations. These may occur several hours after the last previous drink during chronic alcoholic intoxication, but they are suppressed temporarily by another drink. If, on the other hand, alcohol is withheld, and other "sedative" drugs are not administered, they increase in intensity over a period varying from one to several days. Thereafter they may subside, or classical delirium tremens may supervene, with or without antecedent seizures. The intensity of the alcohol abstinence syndrome appears to be related directly to the degree and duration of continuous alcoholic intoxication prior to abrupt withdrawal. Sufficient data are not yet available to enable one to quantify this relationship, but in a group of six former opiate addicts who received up to 489 cc. of 95 per cent alcohol daily for as long as 87 days, abrupt withdrawal of alcohol was followed by seizures in two cases, transient hallucinations in two, and classical delirium tremens in two

(possibly three) instances, while other abstinence phenomena could be demonstrated in nearly all of the subjects. In general, the alcohol and the barbiturate abstinence syndromes are very similar, but some differences are notable. Thus, demonstratable abstinence changes appear only after 14 hours or more following abrupt withdrawal of barbiturates, while alcohol withdrawal changes may appear between drinks during chronic alcoholic intoxication, and increase in intensity progressively when alcohol is withheld. Seizures appear to occur more commonly, and paroxysmal abnormalities in the electroencephalogram are far more prominent and persistent after abrupt withdrawal of barbiturates than in the alcohol abstinence syndromes. Also, psychoses become manifest only after a lucid period of four to seven days following abrupt withdrawal of barbiturates, while a continuum of transient hallucinosis with clear sensorium changing imperceptibly to the confusional, disoriented, agitated, delusional and hallucinatory state characteristic of delirium tremens may begin within a few hours after the last drink of alcohol.

As in the case of the barbiturate abstinence syndrome, little is known of the mechanisms that contribute to the genesis of the alcohol withdrawal phenomena. Because of the striking similarities of the two syndromes, it may be anticipated that similar mechanisms operate, and that further research of the sort indicated above is needed.

Treatment of Addiction

In this section, discussion of treatment will be limited to that of opiate and barbiturate addiction, since active addiction to alcohol is rarely encountered among patients admitted to the Lexington hospital, and studies on the treatment of experimental alcohol addiction have not yet been made at this institution.

Treatment of opiate and barbiturate addiction should be carried out only in an institution specially designed for this purpose. Facilities should include not only the usual medical and surgical services, but also an adequate psychiatric "team," consisting of psychiatrists, psychologists and social service workers. Opportunities for vocational training, realistic occupational therapy and recreation should be available, and rigorous exclusion of contraband drugs should be possible. Immediately on admission, the patient should receive a careful physical and at least a preliminary psychiatric examination. In obtaining the history, special attention should be given to the type, amounts and frequency of drug intake. Ideally opiates and/or barbiturates should be administered for a few days in amounts just sufficient to prevent the appearance of abstinence phenomena. During this "stabilization" period, the necessary examinations can be made, and systematic therapy planned. The latter can be divided into two phases: first, withdrawal of drugs, and second, rehabilitation. Psychotherapy is utilized in both phases, but with different emphasis and will therefore be discussed separately in connection with drug withdrawal and rehabilitation.

Withdrawal of Opiates

Before the introduction of methadone, this phase of treatment was managed most successfully by the method of "rapid reduction." In brief, this consists of subcutaneous injections of successively diminishing doses of morphine, or whatever opiate-like drug had been used in stabilization, in amounts and with frequencies of injections calculated to complete withdrawal within five to ten days without inducing excessive vomiting, diarrhea, tachycardia or fever. However, this method demands much of the time of physicians and attendants, and may prove to be rather stormy if the intensity of pharmacological dependence has been estimated inaccurately. A much simpler method consists of the substitution of methadone for the drug used in "stabilization," and subsequent withdrawal of this synthetic analgesic by rapid reduction. Formerly, methadone was administered subcutaneously in a dose ratio of approximately 1 mg. of methadone for 3 mg. of morphine or in equivalent ratios for other opiate-like drugs. With subcutaneous injections, substitution was begun by "overlapping" successively diminishing doses of the "stabilization" drug with methadone in the course of one day, in order to prevent the appearance of severe abstinence phenomena during the transition period. "Stabilization" on methadone was then continued for five to seven days, after which the drug was withdrawn in steps over a period of three to four days. Recently, however, the methadone substitution method has been simplified even further, by administering the drug orally in approximately the same ratios described above. In the case of the average opiate addict admitted to the Lexington hospital, no "overlapping" appears to be necessary, and the daily amount of methadone needed for "stabilization" can be administered in two divided doses. Rapid reduc-

tion of methadone can be begun after two days of "stabilization," and completed in seven to ten days. However, in patients with active pulmonary tuberculosis or myocardial disease, withdrawal of methadone should be carried out with special caution, over a period of perhaps a month or more.

The methadone substitution method offers many advantages over the "rapid reduction" technic. The clinical course is apt to be less stormy, and, as noted above, the methadone abstinence phenomena are much less intense than those of morphine. Furthermore, the feasibility of administering methadone orally obviates the necessity for sterilization of needles and syringes as well as the administration of multiple daily injections, and hastens the "weaning" of the patient away from whatever symbolic significance injections may have. On the other hand, special care must be exercised to guard against cumulative depressant effects of methadone, which are greater than those of morphine, and although the patient's complaints are fewer during the withdrawal period, they persist longer than after withdrawal has been accomplished by the "rapid reduction" method.

WITHDRAWAL OF BARBITURATES

At present only a "gradual withdrawal" method has been found useful in the treatment of barbiturate addiction. As in the case of opiate addiction, this should be preceded by a "stabilization" period of several days' duration, during which adequate amounts of a barbiturate are administered to suppress all abstinence phenomena, and induce a state of mild intoxication. Also as in opiate addictions it has been found that various barbiturates can substitute for one another, and, in practice, pentobarbital appears to be the drug of choice for "stabilization," since its duration of action is such that four oral doses daily in the proper amounts can prevent the appearance of abstinence phenomena, without producing more than a mild degree of intoxication. However, abrupt withdrawal of any of the relatively short-acting barbiturates (secobarbital, pentobarbital or amobarbital) may be followed by the dangerous abstinence phenomena described above. Consequently, withdrawal of pentobarbital must be carried out with caution. In the average case this can be accompilshed by reducing the "stabilization" daily dose of barbiturates by 0.1 or 0.2 Gm. each day, with close observation for early abstinence changes such as tremulousness, weakness and postural hypotension. If these supervene, further reduction should be suspended. Generally they will disappear in a day or two, when the reduction schedule may be resumed. As a precautionary measure the patient should rest on a mattress laid on the floor, lest injuries be sustained if convulsions occur. Because of the danger of psychotic disturbances, the patient should be observed at all times by attendants and physicians trained to recognize early manifestations. Since fully developed barbiturate withdrawal psychoses are not readily reversed, it is better to err on the side of excesssively slow reduction than the opposite. In severely addicted individuals a month or more may be required for complete withdrawal of barbiturates.

If barbiturate and opiate addiction coexist, as is not infrequently the case, withdrawal of opiates should be accompished first, while the patient is stabilized on barbiturates. Curiously many patients who tolerated a given daily stabilization dose of barbiturates well previously will exhibit more evidence of barbiturate intoxication after opiates have been withdrawn. In such cases the "stabilization" dose may be reduced somewhat before systematic withdrawal is initiated.

PSYCHOTHERAPY

During this phase of therapy the physician should orient his activities toward the primary object at hand, namely, withdrawal of drugs. His role should be sympathetic but firm, and discussion of problems likely to arouse intense emotional reaction should be avoided. On the other hand, he should be alert to the development of severe depressive reactions because of the danger of suicide, especially immediately after all drugs have been withdrawn. Fortunately such disasters have occurred very infrequently, but milder depressions of temporary duration are not uncommon. Physicians who are confident of their own skill in the management of drug withdrawal generally have much less difficulty with patients who are quick to "size up" the therapist and to seize control of the situation, if indecision, anxiety or hostility are displayed toward them.

The rationale of the methods described can be considered from several points of view. In some areas the "cold turkey" method of abrupt withdrawal is still used, on the assumption that suffering will act as a deterrent. That this is not the case is indicated by the frequent relapses of addicts who have undergone such "treatment" in various institutions, principally penal ones. Furthermore, there is reasonable inferential evidence that such suffering may actually allay any feelings of guilt that are present,

thus justifying relapse on the grounds that the addict "has paid his debt to society." Since, in any case, measurement of relapse rate has been exceedingly difficult, if not impossible to accomplish, the more humane methods outlined can be more readily justified. Of these, the "rapid reduction" method is based on the empirical observation that the total duration of the opiate abstinence syndrome is not prolonged by successively reduced "braking" doses of opiates. The methadone substitution method is based on the repeatedly observed fact that when drug A is substituted for drug B, the agent on which the addict has been stabilized, and A reproduces the state maintained by regular use of B, abrupt withdrawal of A is followed by the same abstinence syndrome that would have occurred if the stabilizing drug had been A. Both of these empirical facts are consistent with the "counter-adaptation" explanation of drug addiction which was discussed earlier. While this postulate is inferred from abundant evidence of a physiological nature, there is clinical evidence that psychological mechanisms also contribute to the genesis of even the "nonpurposive" abstinence phenomena. As yet these have not been investigated experimentally in a controlled manner, but theoretical considerations indicate that psychotherapy may be very useful in the drug-withdrawal phase of treatment, if properly applied.

REHABILITATION

This phase of the treatment of drug addiction is designed to prevent relapse, or at least to reduce its incidence. As currently practiced at the Lexington hospital, rehabilitation includes controlled abstention from drugs, correction of medical and surgical disorders, vocational training, recreational activity and psychotherapy. Unfortunately, a reliable method for measuring relapse rate after discharge from the institution has been very difficult to devise, and at present it is not possible to evaluate the comparative efficacy of this, versus other possible programs, on an empirical basis. Therefore, the rationale of such treatment can be discussed only in terms of the assumptions and hypotheses upon which it is based.

Perhaps the most generally applicable statement that can be made is that by the continuous use of certain drugs, the addict has developed a "modus vivendi" which is of value to him, however undesirable it may be from the standpoint of others. Consequently, re-education in a drug-free environment appears to be essential if the probability of relapse is to be reduced. However, no "controlled" environment can duplicate the everyday life situations to which the patient must return. Hence the period of confinement in an institution should be limited ideally to that which affords sufficient time for available methods of re-education to be given a thorough trial. This will vary from patient to patient, but currently, a period of four to six months is considered sufficient. In re-education, vocational training assumes a very important role, since many addicts have never acquired socially useful skills which could serve as a basis for self support, or for sources of satisfaction and preservation of self esteem. Likewise, the desirability of recreational activity and improvement in general health requires little justification.

The problem of psychotherapy is much more complicated. What the psychotherapist does, says, looks for, finds, misses, emphasizes or ignores depends to a great extent on the body of concepts concerning behavior which he accepts as valid and relevant to the problem at hand, and these, in turn, determine to a considerable degree the responses elicited from the patient. Yet validation of such concepts by the scientific test of predictive utility has proved to be a difficult task in all areas of interest to psychiatrists, including that of drug addiction. Hence, it is not surprising that psychiatrists differ widely in their views concerning the psychodynamics of drug addiction and the particular problems which should be explored in formal psychotherapy.

Perhaps the most prevalent view is that drug addiction is not a "disease" but a symptom of an underlying personality defect. Because of their "anxieties," such persons are attracted to drugs which produce "euphoria." Pharmacological dependence tends to perpetuate drug use because of the patient's fear of withdrawal discomfort, but otherwise it is unimportant. Relapse after a period of abstention is due again to the underlying personality defects, the correction of which is the object of psychotherapy. These defects have been variously described. From a symptomatological standpoint the majority of addicts at the Lexington hospital have been classified as "psychopathic" or "neurotic," or in equivalent terms consistently over a period of almost 20 years. A very recent study, using the Minnesota Multiphasic Personality Inventory, has yielded similar results, with more emphasis on "psychopathy." In dynamic terms these patients

have been characterized as narcissistic, oral-dependent and passive-aggressive. It is further assumed that these defects antecede, and are etiologically related to drug addiction.

However, this formulation fails to account for the facts that only a small proportion of persons with such defects are drug addicts, that addicts exhibit very strong preferences for one or another drug, and that major addiction problems arise, at least in the United States, mainly in relation to drugs which produce "nonpurposive" as well as "purposive" abstinence phenomena. What appear to have been ignored in the formulation summarized above are the pharmacological factors—the facts that because of the nature of their associations and contacts, "psychopathic" and "neurotic" individuals are more apt to become acquainted with drug effects, that these are quite specific for particular drugs, and that the regular use of one or another may alter the users' goals in life, as well as satisfy previously existing needs.

In other words, drug addiction, as defined in the introduction of this paper, must be viewed as a consequence of experience with drugs in a setting that endows such experiences with important values to the user, of which he may or not be aware. Furthermore, the most enduring experiences are not the fleeting effects of the first few "trial" doses (which may or may not be "pleasant"), but the long maintained state of pharmacological dependence. Contrary to the "conscious" interpretations of most addicts, there is much inferential evidence that "being hooked" serves many "unconscious" purposes, varying in kind and degree from one to another individual. In some, pharmacological dependence represents a continuous enaction of hostile behavior toward special figures or society in general. In others, it represents a process of gradual self destruction. But in many, this state fulfills a need which has generally been overlooked, but appears to be of prime importance to human beings—the need for continuous activity directed toward attainable, but recurring goals. The consequence of failure to satisfy this need is an intolerable state of boredom. This may be relieved temporarily by the use of any of a large number of drugs which alter affective behavior, but only those that produce pharmacological dependence can furnish a continually recurring "synthetic" need that can be readily satisfied. The activity necessary for assuring a continuous supply of drugs (termed "hustling" in the addicts' jargon), provides a sense of accomplishment, much as the acquisition of money by law-abiding citizens, and serves to enhance the prestige of the "hustler" in the eyes of himself and fellow addicts. Under favorable circumstances, particularly if different goals for sustained activity are acquired by re-education, relapses to drug use may not occur. But since the manifestations of "natural" needs can become "conditioned," those of "synthetic" needs may also be activated in response to specific stimuli, and hence previous pharmacological dependence can become an important factor in the genesis of subsequent relapse.

However, while various types of pharmacological dependence are similar with regard to the recurrent cycle of acquired need and satisfaction thereof, they differ with respect to over-all changes in behavioral patterns that different drugs produce. At least in a controlled experimental situation, pronounced differences are observed between the behavior of persons actively addicted to opiates and others to barbiturates or alcohol. In amounts used by addicts, the latter two agents facilitate loss of restraint and aggressive "acting out" on slight provocation, whereas opiates generally produce an opposite state, characterized by passivity, rather than overt aggressiveness, and "detachment," rather than embroilment in the interpersonal aspects of the environment. "Primary" needs, such as sexual urges, hunger and fear of pain may be unaltered or enhanced by barbiturates or alcohol, but they are reduced in intensity by opiates. Both of these classes of drugs may be said to relieve "anxiety," but if so, the "anxieties" relieved are of different sorts. Likewise, the term "euphoria" has been applied to the states produced by these and many other drugs, but even the addict, untrained in semantics and in self observation, is quick to note that there are various kinds of "euphoria." Analyzed operationally, the term "euphoria" seems to denote little else than that in a particular setting, an individual "likes" certain drug effects very much. Who will "like" the effects of one class of drugs more than those of another, may very well be related to previously established preferences for particular patterns of behavior. The opiate addict, generally speaking, lacks aggressivness and competitiveness, and prefers to handle "anxiety-producing" situations by withdrawing from, or circumventing them. Such individuals would therefore prefer opiates. On the other hand, since barbiturates, and particularly alcohol, facilitate "pseudo-masculine" behavior patterns, they

would be preferred by individuals with strong aggressive and competitive strivings. No doubt the hypothesis here advanced represents an over-simplification of the problem of specificity of drug preferences, but it may serve as a basis for future research.

At present little is known of the physiological mechanisms that contribute to the genesis of relapse. In large part this is due to the fact long enduring, drug-seeking behavior following termination of experimental addiction has not been reproduced experimentally in animals. Therefore, severe limitations are imposed on the extent to which the structure-function aspects of relapse can be investigated. It has been shown, however, that in man bilateral frontal lobotomy abolishes or reduces the intensity of "purposive" morphine abstinence phenomena, without altering the "nonpurposive" changes. How permanent this effect is cannot be estimated until reliable methods for measuring relapse rate are devised. In the light of our current knowledge it appears that this procedure should be employed only in the treatment of addicted patients with chronic, intractable pain after careful weighing of the consequences of continued addiction against the consequences of frontal lobotomy in each individual case. Electroconvulsive therapy has also been advocated for the treatment of drug addiction, but the published evidence does not permit a critical evaluation of its efficacy, either with respect to the management of the drug-withdrawal phase of treatment, or the prevention of relapse. Present methods for drug withdrawal are quite satisfactory, and electroconvulsive therapy would seem to offer no particular advantages. However, the possibility of using this treatment in the prevention of relapse merits further investigation.

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