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DRUGS, THE BRAIN AND THE LAW†

GABRIEL G. NAHAS*

The legalization of dependence producing drugs, such as heroin, cocaine and cannabis has become a new topic for debate.¹ Such a solution to the drug epidemic besetting the Americans was first advocated by Alfred Lindesmith² in his classical treatise "The Addict and the Law" (1965). Lindesmith believed that regulation rather than prohibition and punishment was the most effective and socially acceptable way to control popular "vices" such as drug dependence. In his view, and that of his current disciples, prohibition creates an illicit traffic that perpetuates the problem, driving it underground and out of control. The banning of illicit drugs requires an enforcement bureaucracy depending on illicit traffic for its own existence and breeding corruption. Decriminalizing drugs would thus eliminate the crime associated with their illegal use. Furthermore, as clearly demonstrated by the failure of alcohol prohibition, there is no point, in a free society, to prohibit other drugs. Prohibition, the main argument of the relegalizers, only complicated the problem of alcoholism by breeding crime and more delinquency. Illicit drugs should therefore be dealt with like lawful ones, alcohol and tobacco, and sold under government control. And revenue derived from drug taxes should finance services for prevention treatment and rehabilitation of drug addiction.

In short, the relegalization of drugs would shift control of their use from the law enforcement model to the medical model which, as Lindesmith states, "is consistent with our basic ideals of justice, of individual rights and of the proper treatment of the sick."³ But in fact, the equivalence between licit (alcohol) and illicit drugs is not based on sound scientific evi-

† Condensed from G. NAHAS, *COCAINE: THE GREAT WHITE PLAGUE* (Eriksson, publisher, Middlebury, VT, 1990).

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1. See Nadelmann, *Drug Prohibition in United States: Costs, Consequences, and Alternatives*, 245 *SCIENCE* 939-46 (1989); Koshland, *The War? Program? Experiment? On Drugs*, 245 *SCIENCE* 1309 (1989); Nahas, *Letter to the Editor*, 246 *SCIENCE* 1103-04 (1989) (editorial reply on the drug wars).

2. A. R. LINDESMITH, *THE ADDICT AND THE LAW* (1965).

3. *Id.* at 273-74.

dence provided by physiology, pharmacology, and epidemiology, and there is no cure for addiction.

It is to use Occam's reductionist razor to lump together illicit and licit drugs. I do not mean to minimize the disastrous effects of the latter, but their properties⁴ are less toxic to the brain. For this reason, alcohol and tobacco have been tolerated by national and international legislations, while illicit ones are banned except for medical or scientific purposes.⁵

COMMON PROPERTIES OF ILLICIT DRUGS: FOUR ENTRAPMENTS OF THE BRAIN

The word "drug" or drugs is used to designate in current language chemical substances derived from *cannabis* (*marihuana*), *opiates* and *cocaine*. Their use causes a dependency, namely a drug-seeking, drug-consuming behavior. This behavior results from impairment of brain functioning which can become permanent. These drugs produce their effect with minute amounts of a single dose, which is 10,000 times less than the dose of alcohol required for intoxication.⁶

The prime target for drugs is the brain, where they disrupt transmission mechanisms by inducing biochemical modifications. These abnormalities of brain function are reflected by acute signs (after each drug intake) and by chronic signs (after repeated intakes) displayed by the drug users, and they are manifestations of *entrapment* of the brain by drugs.⁷

The acute signs are: a departure from reality and tendency to daydreaming, which is associated with an inability of the brain to process sensory information and interpret the outside world as it really is. Such is the *first entrapment of the brain caused by drugs*. Tobacco (nicotine) *does not* impair brain functions that maintain alertness and a normal relationship to the environment. The same is true for alcohol in small doses for adults.

The *chronic signs* of drug addiction reflect impairment of brain function after repeated exposure to the drug. They include: tolerance, withdrawal and reinforcement, which con-

4. G. NAHAS, LEGISLATION AND DRUG ABUSE TIPS 11, 101-02 (1990).

5. *Single Convention on Narcotic Drugs, 1961, as Amended by the 1972 Protocol Amending the Single Convention on Narcotic Drugs*, U. N. Sales No. E.77.XI.3.

6. An intoxicating dose of alcohol associated with impairment of brain function has been related to a blood concentration of 500 mg/liter, (thousandths of a gram). Opiates, cocaine and cannabis impair brain function with concentrations of 100 to 50,000 ng/liter, (billionths of a gram). Illicit drugs, unlike alcohol react with "specific receptors" in the brain.

7. Nahas, *A Pharmacological Classification of Drug of Abuse*, 33 BULL. NARCOTICS 1-14 (1981).

stitute three additional entrapments of drugs. "Tolerance" is the *resistance* of the brain to the effects of drugs. This "resistance" will result in a need to rapidly increase initial intake in order to obtain the initial effect of the drug on the brain. This "resistance" (or tolerance) of the brain to drug effects causes the consumer to self-administer increasingly larger, therefore increasingly harmful doses. Tolerance is the *second entrapment of the brain by drugs*.

Withdrawal is manifested by signs of distress and pain, resulting from the deprivation of the drug. Withdrawal symptoms are related to an imbalance within the brain, which is trying to adjust to the absence of the drug but is suffering from this attempt. Withdrawal is the *third entrapment of the brain by drugs*.

Reinforcement is the tendency to resume drug usage after their effects have worn off, even when one knows that the drug is damaging to oneself. This propensity towards drug taking behavior is due to dominant memories, imprinted by the drug in the user's brain; such memories compel the addict toward a resumption of drug use, even after a long period of abstinence. This is the *fourth entrapment of the brain by drugs* which demonstrates that drug addicts have lost their freedom of choice; they are no longer free persons, and have fallen slaves to a substance. The drug creating the strongest reinforcement is cocaine, which the Rhesus monkey will self-administer until death.⁸ Similar self-destructive behavior is displayed by the "crack" cocaine smokers.

All of these symptoms reflect functional and biochemical changes induced by drugs in the brain, only recently described by scores of scientists, and which we will now summarize.

DRUG ADDICTION, A SELF-INFLICTED IMPAIRMENT OF BRAIN NEUROTRANSMISSION

It is clear that man has a limited power to control the intake of drugs once he has started using them. Compulsive drug-consuming behavior, which is also displayed by other mammals, may be attributed to the inherent property of addictive drugs to stimulate in a most rapid and potent fashion brain mechanisms which induce feelings of pleasure and reward. These brain mechanisms, identified in man by the great American neurologist Robert Heath,⁹ are centered in the limbic sys-

8. Deneau, Yanagita & Seevers, *Self-Administration of Psychoactive Substances by the Monkey*, 16 *PSYCHOPHARMACOLOGIA* 30-48 (1969).

9. R. HEATH, *THE ROLE OF PLEASURE IN HUMAN BEHAVIOR* (1964).

tem of the old primitive brain which controls drives and emotions and favors the dominant activities of nutrition and reproduction essential for survival of the individual and the species.¹⁰ The Old Brain is entirely surrounded by the New Brain, or neocortex, which is the center of intelligence, symbolic expression, and self-consciousness. Old and New Brains are closely knit to one another, and their respective activities are highly integrated and complement each other at every moment.

We often assume that "the power of reason" expressed through the neo-cortex is dominant and will keep in check the strong impulses of the Old Brain, a mere assumption, as the French scientist and philosopher Blaise Pascal¹¹ tells us in his famous saying of 300 years ago: "The heart has its own reasons that reason does not know." Pascal did not realize at the time, like many of us today, that the heart he was referring to was "located" in the limbic part of the brain, but he was able to formulate the basic duality of the human brain.

The extraordinary miracle of the human brain rests in its capacity to express itself in a coherent, reasonable fashion by integrating and balancing the activities of its "emotional" old part and its "rational" new part. To this effect every thousandth of a second the brain prioritizes and marshals myriads of signals according to modalities that adjust to the conditions of the environment and to its own memory banks. Drugs destabilize these two parts of the brain by amplifying the signals arising from the Old Brain and distorting those emanating from the New Brain. All of these signals are chemically transmitted through minute quantities of substances called neurotransmitters secreted by billions of nerve cells or "neurons." Neurotransmitters will regulate the transmission of nerve impulses racing through the cerebral network, across a hundred billion relays or "synapses." Drugs perturb and may even damage biochemical regulations which allow the normal turnover of the neurotransmitters, and their attachment to specific receptors.¹²

The brain is continuously producing neurotransmitters in order to maintain its proper functioning. Under the influence of drugs the production of these neurotransmitters is altered

10. J. OLDS, DRIVES AND REINFORCEMENTS: BEHAVIORAL STUDIES OF HYPOTHALAMIC FUNCTION (1977).

11. B. Pascal (1623-1662). French mathematician, physician, and natural philosopher. This quotation is from his *Pensées* (Paris, 1662).

12. J. JAFFE, DRUG ADDICTION AND DRUG ABUSE, *quoted in* GOODMAN AND GILMAN'S PHARMACOLOGICAL BASIS OF THERAPEUTICS 522-73 (8th ed. 1990).

and induces a pleasant feeling. With repeated administration of the drug, addiction develops, the brain being forced to function at a new level of rewarding activity, which may be maintained only by more drug. Such a mechanism could explain the compulsive aspect of drug addiction.

One might wonder whether it would be possible to neutralize a drug with another chemical. Such a "brain penicillin" could restore the balance impaired by the drug and chemically condition the free play of the mental faculties, thus directing the individual toward rational behavior. This possibility was suggested in 1979 by Arthur Koestler¹³ who saw in it the only way to preserve the survival of Homo Sapiens, eternal victim of the destructive instincts of his old brain. In his book, *Janus*, Koestler suggested that new chemical substances ought to be able to repress the aggressive tendencies of an individual and allow his rational mind to express itself freely. It is possible to *neutralize* the *acute* effects of drugs by administering specific antidotes.¹⁴ But this treatment is only temporary and does not eliminate the memory of the pleasant intoxicating experience which seems imprinted on the brain as a very compelling memory.

The requisite for normal physiological brain function is a stable, natural, chemical composition of its environment; if this environment is contaminated by addictive drugs, it is contradictory to assume that it could be restored to normalcy by using other psychoactive substances foreign to body compositions (xenobiotics). As Claude Bernard wrote in his "Introduction to Experimental Medicine" in 1874, "The constancy of internal environment is the condition for a free life."¹⁵ Walter Cannon¹⁶ elevated this axiom into a general law and then coined a new word "homeostasis," to describe the natural physiological state characterized by the maintenance of constant conditions in the internal environment.

13. A. KOESTLER, *JANUS*, A SUMMING UP (1979).

14. An antagonist of morphine, naloxone will restore respiration stopped by an overdose of opiate. See Jaffe & Martin, *Opiate Antagonists*, 19 PHARMACOLOGICAL REV. 463-531 (1973). Calcium antagonists will neutralize the cardiac toxicity of cocaine. See R. TROUVÉ & G. NAHAS, *ANTIDOTES TO LETHAL COCAINE TOXICITY* (1990).

15. Claude Bernard (1813-1878). French physician and founder of modern physiology. His book, *INTRODUCTION À LA MÉDECINE EXPÉRIMENTALE* (Paris, 1865), formulated the main rules of biological experimentation. He held that the body mechanisms strive to maintain a constant inner environment through feedback regulations.

16. W. B. Cannon (1871-1945). American physiologist, author of *THE WISDOM OF THE BODY* (1932) in which he defines "homeostasis."

The brain is, of all the organs of the human body, the one where the "homeostasis" principle applies most perfectly. The stability of the chemical composition of its internal environment, a fluid in which billions of neurons bathe, is the very condition of their normal, physiological activity. But drugs alter the recycling of substances that are secreted by brain cells in order to transmit a free flow of coherent messages. This wondrous, self-regulating performance of the brain, resting on internal recycling, is first altered, then damaged, by drugs.

If it were possible to use drug treatment to permanently restore the balance of a brain perturbed by drugs, would it also be possible to chemically condition human behavior? Nature has so engineered the brain that such a chemical manipulation appears doomed to failure. A balanced expression of the intellectual and emotional functions of the brain may only occur within a cerebral environment with a composition delicately regulated by the cyclical renewal of its neurotransmitters. The only physiological way to treat drug addiction is therefore to cleanse the brain and retrain it to function without the drug. Nothing but complete abstinence can restore the well-balanced internal milieu needed for continuous normal brain performance. Abstinence is made possible by the extraordinary resiliency of the brain and its spontaneous tendency to recover its balance when the acute effect of the drug wears off. The periodic return, after drug intoxication, to a normal state frequently gives the addict the impression that he can stop using the drug when and if he really wants to. But the reprieve is short and the withdrawal symptoms appear, enticing the addict to return to his poison so that the brain can continue to operate in the new neuro-chemical conditions caused by the drug. Furthermore, the pleasant experience associated with the consumption of drugs has imprinted a most dominant memory on the brain, so dominant that it will lead a former addict, who has been abstinent for years, to consume his drug again, if it is available to him.

The presence of this affective memory consequent to drug use explains why a rehabilitated addict may never be considered "cured," since he will not be able to consume his drug again without reverting to his addiction. All individual experiences are imprinted on the brain in the form of memories which, when considered in their entirety, determine to a great extent the behavior of each person.

Some have claimed that the freedom of the addict to consume his drug of choice should be respected.¹⁷ But is it not a delusion to speak of the freedom of the addict who has, in fact, become the slave of a substance that disrupts the normal chemistry of his brain which is then unable to exert its rational function? Because of their specific impairing properties, illicit drugs curtail the exercise of free will. Today the scientist is in a position to measure the fallacy of John Stuart Mill's general statement: "Over himself, over his own body and mind, the individual is sovereign" when it applies to drug consumption. The exercise of freedom requires a relationship of authenticity between the brain and the surrounding environment, as stated in 1858 by the French poet, Baudelaire,¹⁸ long before the scientist: "It is forbidden to man, under threat of degradation and spiritual death, to disrupt the equilibrium which prevails between his mental faculties and the environment in which they express themselves, in other words, to tamper with one's own destiny and place it under another kind of fate." And here Baudelaire was referring to the disrupting effect of hashish on the mind which he had experienced but refused to pursue.

We may recall that the frailty of the balance of brain regulations was described by the French psychiatrist, Joseph Moreau,¹⁹ a hundred and fifty years ago: "What brain alterations, what reordering of brain molecules can be linked to the mistaken notions, the false beliefs which all of us harbor whether dunce or scholars?"

New imaging techniques (N.M.R.P.E.T.) have illustrated how drugs distort the natural interplay of basic brain regulations which depend on a normal recycling of chemical substances produced by nerve cells to maintain a coherent brain function.²⁰

Affected by the drug, these natural substances will not be properly recycled, thus preventing the expression of the rational mind. By its crippling effects on the fine balance of brain regulations, drugs will "elicit the mistaken beliefs we all harbor."

By inducing in the brain a new biochemical regimen and "imprinting" a dominating memory which supersedes all

17. Bonnie & Whitebread, *Laws and Morals*, 172 SCIENCE 703-05 (1971).

18. C. BAUDELAIRE, *LES PARADIS ARTIFICIELS* (1865).

19. J. MOREAU, *HASHISH AND MENTAL ILLNESS* (H. Peters & G. Nahas, ed. 1973).

20. Volkow, *Use of Positron Emission Tomography to Investigate the Action of Marijuana and Cocaine on the Human Brain*, in *PHYSIOPATHOLOGY OF ILLICIT DRUGS* 3-12, 124-42 (G. Nahas & C. Latour eds. 1991).

others, drugs establish patterns of behavior solely oriented towards unending self-gratification. In some cases such brain alterations appear to be irreversible, and a man is transformed into a drug-seeking robot. Alterations of basic neurotransmission pathways will also have repercussions on the reproductive function of men and women, which is programmed by brain hormones "the releasing factors."²¹ These factors control the secretion of the pituitary and sexual hormones which in turn account for the normal maturation of the germ cells.²² Opiates, marihuana and cocaine impair the development of these cells by their effects on the brain and possibly on the germ cells themselves. All of these drugs also cross the placenta and harm the fetus at every stage of its development.²³ In the course of the last few years, hundreds of thousands of children have been born in the United States with defects or deficits linked to maternal consumption of marihuana, heroin and cocaine.²⁴

The presence in a society of many individuals hopelessly addicted to illicit drugs and unable to exert their free will result in damaging social effects, as documented by a study of history and also by the science of epidemiology.

THE REHABILITATION OF THE DRUG ADDICT: AN UNCERTAIN OUTCOME

The changes induced by illicit drugs in areas of the brain that regulate pleasure-reward and memory, thereby affecting personality and survival, are foreboding; they are, in too many cases, irreversible.

These stark observations must not be overlooked when one is referring to the treatment of the addict for whom there is no specific cure, as the early reformers, physicians or laymen of the turn of the century had already emphasized. The outpa-

21. Schally, Arimura & Kastin, *Hypothalamic Regulating Hormones*, 174 SCIENCE 341-50 (1973).

22. Falek, Donahoe, Shaffer & Madden, *Opiates Immunodepression and Genotoxicity Effects*, in PHYSIOPATHOLOGY OF ILLICIT DRUGS 249-260 (G. Nahas & C. Latour eds. 1991). See also Hembree, Nahas, Zeidenberg & Huang, *Changes in Human Sperm Associated with Marihuana*, *id.* at 67-78. Bracken & Eskenazi, *Association of Cocaine Use with Sperm Concentration and Morphology*, *id.* at 255.

23. Parker, Zuckerman & Tuchmann Duplessis, *Effects of Maternal Marihuana Use During Pregnancy on Fetal Growth*, *id.* at 55-66. Hutchings & Aurox, *Opiates During Pregnancy*, *id.* at 285-96. Finster, Petersen & Henrion, *Maternal Effects of Cocaine*, *id.* at 233-48.

24. Chasnoff, Landress & Barrett, *Prevalence of Illicit Drug or Alcohol Use During Pregnancy*, 322 N. ENGL. J. MED. 1202-06 (1990).

tient treatment of addiction by pharmacological or psychological methods has yielded disappointing results in spite of the remarkable achievements in most other areas of medicine. A fact that compounds this therapeutic uncertainty is that the addict rarely seeks "treatment" spontaneously because of his predicament, so well-described by the psychoanalyst Sandoz Rado.²⁵ "The addict," says Rado, "does not suffer from his disease but enjoys it" and therefore has a great reluctance to be treated because treatment means he must give up his favorite reward and literally break up a love affair.

Attempts to treat heroin addiction with chemical substances such as methadone, naltrexone, or clonidine have been disappointing to the scientists and physicians who developed these treatments after painstaking efforts.²⁶ And yet they were based on the use of specific agents targeted to the brain mechanisms that induce either euphoria or withdrawal symptoms. The suppression of the latter does not result in a cure, since a powerful dominant memory remains imprinted on the brain and orients the addict towards renewed drug taking. Furthermore, the medications which are used for the treatment of opiate withdrawal or for opiate maintenance are not effective in the case of cocaine addiction. Some investigators have attempted to alleviate cocaine withdrawal symptoms, depression and anxiety, by anti-depressant medications, with uncertain outcome. This should not be construed as a "treatment" of drug addiction, but as the first step towards total abstinence which may only be achieved through a prolonged period of rehabilitation.

Today, group living in specialized centers, or "therapeutic communities" ("T.C.'s" as they are called),²⁷ offers the best chance of recovery for the cocaine or heroin addict. The goal of the T.C. is to restore the former addict to a drug-free existence, based on a socially productive life centered around family and community activities, very much like the model of the extended family pioneered with success by "Alcoholics Anony-

25. S. Rado (1890-1965). Psychoanalyst pupil of Freud. In 1931 he initiated the New York Psychoanalytical Institute of Columbia University. He reported his studies on addiction in *Fighting Narcotic Bondage and Other Forms of Narcotic Disorder*, 4 COMP. PSYCHIAT. 160 (1963).

26. M. GOLD, 800 COCAINE (1985). See also D. MUSTO, THE AMERICAN DISEASE ORIGINS OF NARCOTIC CONTROL (1987); Jaffe, *Drug Addiction and Drug Abuse*, in GOODMAN AND GILMAN'S PHARMACOLOGICAL BASIS OF THERAPEUTICS 522-73 (8th ed. 1990).

27. Rosenthal, *The Therapeutic Community: Exploring the Boundaries*, 84 BRITISH J. OF ADDICTION 141-50 (1988).

mous." Unlike the alcoholic who, after a three week "drying out" period in a specialized center, may return to his daily activities while following at the same time an outpatient, weekly program, in most cases the cocaine or heroin addict will have to remain as a resident in a therapeutic community for an extended period of time: six months or more.

Staffed in great part by recovered addicts, directed by dedicated leaders, the programs of the T.C.s do represent a significant improvement over the detoxification regimens of the medical clinics. The T.C.s have developed effective programs, unknown in the past, which offer a new hope for rehabilitation from addiction in the present era. In terms of overall rehabilitative goals, as documented by Dr. Mitchell Rosenthal, the T.C. is effective, especially for those who remain beyond a year in residence.

Rehabilitation, however effective it may be, is not a cure for drug dependence. Lasting abstinence depends in great part on the social milieu. As long as the social climate condones or promotes drug use, such as alcohol, marihuana and cocaine, rehabilitation and the efforts of the addict striving for a drug-free life will be weakened. Rehabilitated addicts must adjust to a society still profoundly influenced by the need for chemical gratification and by the all-persuasive message of the drug cult. According to Professor de Leon,²⁸ enforced treatment by court order often leads drug abusers to rehabilitation. A measure of coercion has resulted in increased retention time in the T.C. which is in turn related to long-term success.

However, rehabilitation alone will not curtail an epidemic of drug addiction. "Indeed," writes Bejerot,²⁹ "only a minority of drug addicts will spontaneously enlist in a treatment center, and if they do so, it usually is four to five years after they started drug self-administration." "Treatment" or "rehabilitation" of the addict is not a substitute for general interdiction measures, which have been successfully applied in other countries or in other times.

28. De Leon, *The Therapeutic Community for Substance Abuse: Perspective and Approach*, in *THERAPEUTICS COMMUNITIES FOR ADDICTIONS: READINGS IN THEORY, RESEARCH AND PRACTICE* 5-18 (G. De Leon & J. Ziegenfuss eds., 1986).

29. N. BEJEROT, *ADDICTION AND SOCIETY* (1970). See also N. BEJEROT, *ADDICTION: AN ARTIFICIALLY-INDUCED DRIVE* (1972).

THE EPIDEMIC SPREAD OF DRUG ADDICTION

The compulsive drug-seeking behavior produced by drugs and explained by the changes in brain chemistry induced by the drug is also illustrated by the science of "epidemiology," or the study of epidemics. Indeed, the "recreational" use of addictive drugs, spreads in an epidemic fashion, as the Swedish sociologist N. Bejerot clearly documented in his classical treatise "Addiction and Society."³⁰

The addict spreads the addictive behavior (injection of heroin or amphetamine, snorting cocaine or smoking crack) and the use of drugs to friends and sexual partners. Sweden experimented in the sixties with a permissive policy of providing amphetamines and opiates to addicts with medical prescriptions. The result was a drug epidemic, causing immense individual and social harm. A restrictive policy of drug availability was then instituted, and curtailed the epidemic. "The Swedish example," writes Bejerot: "provides an experimental model for studies of incidence of illicit drug use in function of the availability of the drug. Our studies demonstrate that a permissive drug policy leads to rapid spread of drug use: when there are plenty of drugs and the risks are small even addicts who have been off drugs for many years may relapse. A restrictive drug policy may not only check the spread of addiction, but even bring about a considerable reduction in the rate of current consumption in the addict population."³¹

In 1954, it was estimated that 2 million Japanese out of a population of 100 million consumed amphetamine tablets, and that 500,000 self-injected the drug intravenously, a situation far more serious than in Sweden at any time. Under strong government leadership, Japanese public opinion was mobilized by the media to fight amphetamine addiction and accept the drastic measures required to stop the epidemic. Supply was curtailed by strictly controlling availability of amphetamines as well as the chemicals used for their fabrication. Conviction for illicit manufacture carried a ten year jail sentence. Severe penalties were meted out to decrease the demand: three to six months in jail for use or possession, two to four years for sale, and five to ten years for traffic. In 1954, the first year of the antidrug campaign, 55,600 persons were arrested for drug related offenses. In 1956 there were 271 arrests, and the epi-

30. Bejerot, *Drug Abuse and Drug Policy*, in ACTA PSYCH. SCAND., suppl. 256 (1975).

31. *Id.* at 137.

demic was checked.³² Convicted addicts were not referred to out-patient treatment centers but confined in jails or in specialized detention centers. Later, in the 1960's, Japan faced (as did western nations) an epidemic of heroin addiction, involving at its peak an estimated 50,000 people. Severe interdiction measures curtailed the epidemic within four years.

In taking such drastic measures to stamp out drug addiction, the Japanese were aware of the damaging effects wrought by widespread opiate consumption on the social fabric and national integrity of China in the 19th century. In the early part of the 19th century, British mercantilism imposed on China an open-door trade policy including opium. A massive epidemic of opium use ensued among the Chinese people: imported opium rose from 325 tons in 1820 to 6,200 tons in 1873. A period of overwhelming opium addiction resulted which drained the faltering Chinese economy; the Chinese, who could not buy all the drug from abroad, had to remove the ban on local cultivation. At the end of the 19th century, out of a population of 300 million Chinese, 90 million were addicted to opium; the old Chinese empire was threatened by fragmentation and foreign powers were poised, ready to divide it into economic zones of influence.³³ The dismantling did not occur. During the first part of the 20th century a national revival stressing the basic Chinese values prevailed in the country and restored China, 50 years later, to the rank of a world power. It was a period of revolution and civil strife pitting traditionalists against reformers, nationalists against communists. But in spite of their conflicting political allegiances, all of the Chinese were united in their determination to stamp out opium addiction from their country. In this endeavor they received the support of the United States and of the European powers.³⁴

The Chinese were able to solve their problem of massive opium addiction by decreasing the demand for the drug and concurrently cutting off the supply. The demand for opium was curtailed when a national consensus against the drug finally surfaced at the turn of the century. This national consensus was independent from political allegiances. It was an

32. The amphetamine epidemic in Japan after World War II is described in Brill & Hirose, *The Rise and Fall of a Methamphetamine Epidemic: Japan 1945-1955*, 1 SEMINARS IN PSYCHIATRY 179-94 (1989). See also N. MOTOHASHI, ADDICTION IN JAPAN (1973).

33. The opium epidemic in China is reported in I. BIRD-BISHOP, *THE YANGTZE VALLEY AND BEYOND* 106-17 (1899), and A. WALEY, *THE OPIUM WAR THROUGH CHINESE EYES* (1958).

34. W.W. WILLOUGHBY, *OPIUM AS AN INTERNATIONAL PROBLEM* (1930).

ethical Chinese commitment which started under the imperial dynasty and continued under the Republic, the Kuomintang, and the Communists. Opium addiction has been eliminated in mainland China and Taiwan as well as Singapore. It still prevails only in Hong Kong, a British Crown Colony.³⁵

In stark contrast with Japan and China, Australia has failed to control an epidemic of illicit drug consumption which has swept this young and dynamic country since the early seventies. It all started with marihuana smoking. The locally grown cannabis plant provided large amounts of the drug and was supplemented by the stronger Buddha "sticks" and hashish blocks imported from Malaysia and Thailand. In 1977 the Senate Committee on Social Welfare concluded, on the basis of available surveys, that as many as 400,000 Australians, or about 3% of the total population, smoked cannabis at least once a month and that use of the drug was three to five times higher among adolescents and young adults. The trivialization of recreational marihuana smoking was followed by an epidemic of intravenous heroin use. In Sydney more than 20,000 addicts were identified in 1984. Australia has been spared until now from a cocaine epidemic, most probably because of its geographic location, separated as it is from the producing countries by the Pacific Ocean.³⁶

By contrast, Spain, which has multiple direct ocean and air links with South America, has a major problem of cocaine usage, including that of crack in the past five years. In 1988, one ton of cocaine was seized in Barcelona and one in San Sabastian. Addiction to this drug has compounded the current epidemic of heroin and of marihuana usage, the latter fanned by its decriminalization.³⁷

Holland, before Spain, adopted a liberal drug policy and decriminalized marihuana which was offered cheaply for sale in "hash coffee shops," to anyone above age 16. Heroin addicts were given free methadone and syringes, and formed a union to defend their rights.³⁸ Certain Dutch officials claimed that such a policy contained the epidemic of drug addiction. However, statistics do not support this contention: Amsterdam and Rotterdam have become the centers of illicit drug trade in

35. *Id.*

36. AN AUSTRALIAN HANDBOOK ON DRUG USE (Australian Government Publishing Service, 1984):

37. Use or possession of less than 300 grams of marijuana was decriminalized in Spain in 1984 by the government of Philippe Gonzales.

38. Engelsman, *Dutch Policy on the Management of Drug-Related Problems*, 84 BRIT. J. ADDICTIONS 211-18 (1989).

Europe, to the great dismay of their neighbors. Seizures of heroin increased from 144kgs to 450kgs from 1984 to 1987, and of cocaine from 178kgs in 1984 to one ton in 1990. The number of hash coffee shops in Amsterdam rose from 10 to 300 within a decade.³⁹ In the same city, heroin addicts numbered 20,000 in a population of 800,000, as many per capita as in New York City, and death by overdose rose from 42 in 1985 to 70 in 1987.⁴⁰ Holland today is under strong pressure from other members of the European Community to apply the anti-drug laws which they have ignored until now, but which will have to be enforced in 1992 when the economic unity of Europe will be achieved and all custom and trade barriers are removed.

It is now clear that the law enforcement model of controlling the epidemic type of drug addiction to heroin and to psychostimulants is most effective and requires a goal close to "zero tolerance" of drug addiction. This goal may be reached by a disciplined and structured society. The "medical" model which consists in providing the addict with his drug of choice, in order to eliminate criminality, has merely aggravated the problem in Sweden as well as in England where it was first adopted.

The British were the first, in 1925, to adopt a medical model allowing physicians to prescribe heroin to heroin addicts. This "British system" worked satisfactorily as long as addicts were few in number and all registered: 400 a year between 1930 and 1960. It became unmanageable after 1960, when heroin had to be dispensed to more than 1,000 users.⁴¹ Each addict had to be provided with daily doses of heroin, as well as the equipment required for the injection of the drug four to six times a day. Because of this logistical problem and because of the potential for diversion of the drug to nonregistered addicts, heroin began to be progressively replaced by methadone maintenance. But the number of registered British addicts had grown to 2,800 by 1980, double the total seeking treatment seven years earlier. In 1985 there were an estimated 80,000 heroin addicts in Britain, most of whom were not in

39. P. SANDWIJK, I. WESTERTEP & S. MUSTERD, *HET GEBRUIK VAN LEGALE EN ILLEGALE DRUGS IN AMSTERDAM*, Universiteit van Amsterdam, Instituut Sociale Geographie (1988).

40. Van de Wijngaart, *Herion Use in the Netherlands*, 14 AM. J. DRUG ALCOHOL ABUSE 125-36 (1988).

41. For an account of opiate addiction in the United Kingdom, see A. TREBACH, *THE HEROIN SOLUTION* 85-117, 171-225 (1982).

treatment programs. Despite this failure of the British system, it is still advocated by some in the United States.⁴²

But the successful control of epidemics of drug addiction was also achieved by western nations. Widespread addiction to cocaine and opiates, as a result of free availability of medications containing these drugs, prevailed in the United States in the first part of the century.⁴³ A 1915 health survey reported that there were 250,000 habitual users of cocaine or opiates in the nation with its population of 100 million.⁴⁴ An aroused public opinion and the enlightened leadership of the progressives resulted in interdiction measures, following the implementation of the Harrison Act, to control the epidemic. As a result, during the period 1923 to 1939, the number of addicts was reduced to approximately 50,000, which represents an 80% drop, and in reference to the population of the country a 90% decrease.⁴⁵ This dramatic reduction was achieved by a restrictive control policy, with minimal education or medical intervention. A social refusal of illicit recreational drug use prevailed in the country. A similar popular consensus supported the restrictive policies which rolled back cocaine epidemics in Germany, France and Switzerland after the First World War.⁴⁶

THE DISTRIBUTION OF CONSUMPTION OF ALCOHOL AND ILLICIT DRUGS: AN EPIDEMIOLOGICAL COMPARISON

The consumption of alcohol, one of the oldest drugs known to man, is endemic all over the world except in Islamic countries where it is strictly banned by the Koran.⁴⁷ The French mathematician Sully Ledermann⁴⁸ was the first scientist

42. *See id.*

43. D. MUSTO, *THE AMERICAN DISEASE, ORIGINS OF NARCOTIC CONTROL* (1987).

44. Annual Reports of the Commissioner of Prohibition, 1927-1930 (quoted in D. MUSTO, *THE AMERICAN DISEASE* (1987)). These figures have been disputed by Alfred Lindesmith, *THE ADDICT AND THE LAW* 104-22 (1965). His arguments are not convincing, and it appears that during the 1920s and 1930s, as a result of the vigorous interdiction measures applied by the Narcotics Division of the Prohibition Bureau and the Federal Bureau of Narcotics, there was a marked decline in addiction which occurred within a climate of social refusal of addictive drugs, widely supported by the media.

45. M. HARVEY & J. CROSS, *THE NARCOTIC OFFICER'S NOTEBOOK* (1965).

46. G. NAHAS, *COCAINE: THE GREAT WHITE PLAGUE* 57-79 (1989).

47. "O you who believe. Wine and gambling are an abomination of Satan. Therefore avoid them that you may prosper." *THE KORAN*, Sura 5, Verse 90.

48. S. LEDERMANN, *ALCOOL, ALCOOLISME ET ALCOOLISATION* (1956).

to study the distribution of consumption of alcohol in different populations. His systematic surveys report the frequency and amount of alcohol consumption in the French population. He reported that the more consumers of alcohol there were in society, the more alcoholics and problems associated with alcoholism. This observation seems to derive from common sense, but Ledermann gave it a mathematical formulation which relates the number of "excessive" users of alcohol to the overall average of consumption of all consumers. If mean consumption decreases by approximately one-half, excessive drinking will decrease by two-thirds. He reported that in France, which holds the world record of per capita consumption of alcohol, 7% to 9% of the consumers of alcohol drink excessively, which represents 2 million alcoholics, a staggering number when translated into premature death and disability. Ledermann concluded that in order to decrease the incidence of alcoholism and alcohol-related damage, one had to attempt to decrease the overall consumption of alcohol in the population. This conclusion was validated by the marked decrease in cases of alcoholic-induced liver cirrhosis or dementia observed in France during the German occupation when alcoholic beverages were rationed and average consumption was drastically cut.

A similar analysis of "distribution of consumption" may be applied to the consumption of other dependence-producing drugs. Surveys of cannabis consumption made in Jamaican villages, where the drug is freely available and socially acceptable, indicate that over 50% of the villagers who smoke marihuana consume an equivalent of ten joints a day.⁴⁹ In the United States, it has been found that among the population of high school seniors who reported smoking marihuana during 1978, 18% of them consumed the drug daily.⁵⁰ Carter reports that 90% of the Indians of the Andes who chew coca leaves consume them daily in thirty to fifty gram amounts equivalent to 300 to 500 mg of cocaine base, a hefty dose.⁵¹ And it is com-

49. Nahas, *The Ledermann Model Applied to the Frequency of Marijuana Use Among U.S. High School Seniors*, in BANBURY REPORT II, COLD SPRING HARBOR LABORATORY 485-90 (1982), reprinted in Nahas, *La Distribution de la Consommation des Drogues Toxicomanogènes d'après le modèle de Sully Ledermann* 168 BULLETIN ACADEMIE NATIONALE MEDICINE 195-201 (1984).

50. L. JOHNSTON, J. BACHMAN & D. O'MAILLEY, HIGHLIGHTS, DRUGS AND THE NATION'S HIGH SCHOOL STUDENTS (1980).

51. Carter, Parkerson & Mamani, *Traditional and Changing Patterns of Coca Use in Bolivia*, in COCAINE 159-64 (J. Jeri ed. 1980).

mon knowledge that heroin addicts have to consume their drug of choice every day.

The results of these epidemiologic surveys indicate that in populations of drug consumers, the respective percentage of users which will become addicted is related to a specific addictive property of the drug in the brain of the user. This addictive potential may be gauged by the incidence and the rapidity of the development of compulsive drug consuming in amounts damaging to health, after exposure to a given drug.

On the basis of epidemiologic surveys, which have been summarized above, the dependency-producing potential of cannabis, and that of cocaine and heroin, would be respectively, 7 and 14 times greater than the addictive potential of alcohol. It seems therefore fallacious to recommend the legalization model of alcohol as a solution to curtail the epidemic consumption of the illicit drugs which have much greater addictive properties.

CONCLUSION

The main argument (or rather assumption) for relegalizing illicit drugs e.g. equating their properties with those of alcohol is not supported by facts derived from the pharmacology or the epidemiology of these respective chemicals. This assumption underestimates the inherent specific neurobehavioral properties of illicit drugs that lead their users to adopt a compulsive pattern of frequent consumption that is damaging to health. Illicit drugs have a much stronger addictive potential than alcohol, because they interact directly in minute amounts with brain receptor mechanisms, and they impair much more rapidly brain neurotransmission. Even their casual use may lead, in a matter of weeks to a compulsive pattern of drug seeking drug consuming behavior. They are genotoxic and fetotoxic. Their habitual, "recreational use" may damage germ cells and reproductive function, endangering future generations.

The proponents of the relegalization of illicit drugs overestimate the ability of the human "reasonable" neocortex to override the chemical stimuli and biochemical changes induced by illicit drugs in the reward areas of the limbic system. The human brain is wired and biochemically structured in such a fashion, that it is most vulnerable to illicit drugs which have the capacity to impair at times irreversibly its normal metabolic regimen. The profound brain alterations induced by illicit drug use are difficult to treat. There is no specific cure for drug addiction, and rehabilitation of addicts is very costly and uncer-

tain. The huge medical cost of drug rehabilitation is underestimated by the proponents of relegalization of illicit drugs who would rely on some problematic treatment of addiction to contain the number of addicts.⁵² The second argument (or assumption) of the proponents of relegalization, states that social acceptance and commercial availability of illicit drugs would eliminate or decrease the social costs associated with their illegal traffic which breeds crime and corruption. This assumption ignores all historical precedents: past and present epidemiological surveys demonstrate the damaging effects of the social acceptance and widespread use of these drugs: crime increases, medical and social costs skyrocket.⁵³

The legislator has the primary task to enact laws which will protect individual rights against the infringements of society and society against individual antisocial behavior. In the case of illicit drugs, the individual, especially the young who are not able to make an informed decision, must be shielded from exposure to enticing substances which impair his brain and his genes, curtail his free will and alienate him from society.

The make-up of the human brain and body cells is such, that they must be protected from the effects of illicit drugs. Laws promulgated to interdict their usage, except for medical or scientific purposes, must be implemented: they are intended to safeguard what Teilhard du Chardin⁵⁴ called the future of man, a future which depends upon the integrity of his genes and of his brain.

52. A new government bureaucracy, the Alcohol, Drug Abuse and Mental Health Administration (ADAMHA) was created in 1973 to support a medical approach for the control of drug addiction by funding treatment and research programs. The annual budget of ADAMHA increased from \$450 million in 1975 to over \$3 billion in 1991 (more than the budget of the National Cancer Institute and the National Heart Institute combined). This budget has kept pace with the size of the epidemic but it has not been particularly cost effective. Programs aimed at defining a pharmacological cure for drug addicts have been disappointing, though some of the basic mechanisms of action of drugs on brain and body have been clarified in the course of these studies.

53. "Cost of treatment of crack babies will amount to two billion and a half dollars a year in 1989. In 1990, the state of Florida spent 700 million dollars for medical treatment of 17,000 toddlers impaired by crack and born in 1987. In 1990, the Secretary of Health and Welfare displayed a \$698,000 hospital bill, the cost of caring for a crack/cocaine baby for seven months." *N.Y. Times*, September 24, 1989, at E24, col. 1 (editorial).

54. Pierre Teilhard de Chardin (1881-1955). French Jesuit Priest, paleontologist and philosopher. His philosophy is concerned with the evolution of man in the Universe until he attains a unity with his creator.