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marijuana smoker.

What is the effect of THC stored in the brain cells? Dr. Robert C. Gilkeson has devoted considerable research to this issue. He explains that the membranes of nerve cells are fat (or "lipid") tissue, and so are sites for storage of THC molecules. The nerve cell membrane is crucially important because: (1) nutrients and waste products for the cell must pass across the cell membrane, and (2) this membrane is the primary source of neural electrical activity. When sticky THC molecules are stored in the nerve cell membrane, they degrade cell nutrition, and suppress electrical activity.

Hence, one would expect that long-term use of marijuana should cause serious brain damage. That this is so was demonstrated by experiments performed on the monkey by Dr. Robert Heath and his collegues at Tulane Medical School (Ref. [4], pp 713-730). Clear and detailed descriptions of this work have been given by Peggy Mann in Refs. [5, 6].

The following experiment was performed several times. For 6 months a monkey smoked the equivalent of 10 to 15 joints of marijuana per week, using monkey-sized joints. After recovering for 6 months, the monkey was sacrificed and its brain cells were examined under the electron microscope. Brain waves were measured from probes imbedded deep in the skull. These signals became severely distorted after 2 months of smoking, and remained distorted 6 months after smoking had stopped.

The brain cells showed severe damage, particularly those in a deep part of the brain called the limbic system, which is the center of motivation. For example, over 30% of the limbic brain cell nuclei had inclusion bodies, which are clots in the nuclei. In normal brains, less than 0.5% of brain cell nuclei have inclusion bodies. The incidence is much higher in old brains, particularly those of senile patients, but even then is much less than was observed in the brains of these young monkeys. When the researchers first observed the enormous brain-cell damage, they were shocked at what they saw.

Historical Evidence

That marijuana is stored in the body, producing continual sedation, is not a new discovery. As explained by historian Franz Lowenthall, Professor of Near Eastern Literature at Yale University (Ref. [4], pp. 739-745), marijuana is an old problem to Arab society. The Arabs have struggled for centuries against the devastating effects of marijuana (or in their words "hashish"). A thirteenth century religious leader, Sheikh Ali al-Hariri, gave the following advice:

> "He has to give it up for forty days, until his body is free from it, and forty more days until he has rested from it after becoming free."

This conclusion by Sheikh al-Hariri, made 700 years ago, is remarkably consistent with our THC model.

What was obvious to Sheikh al-Hariri should also be obvious to people today. Why have we not drawn the same conclusion? Maybe we don't want to know the truth.

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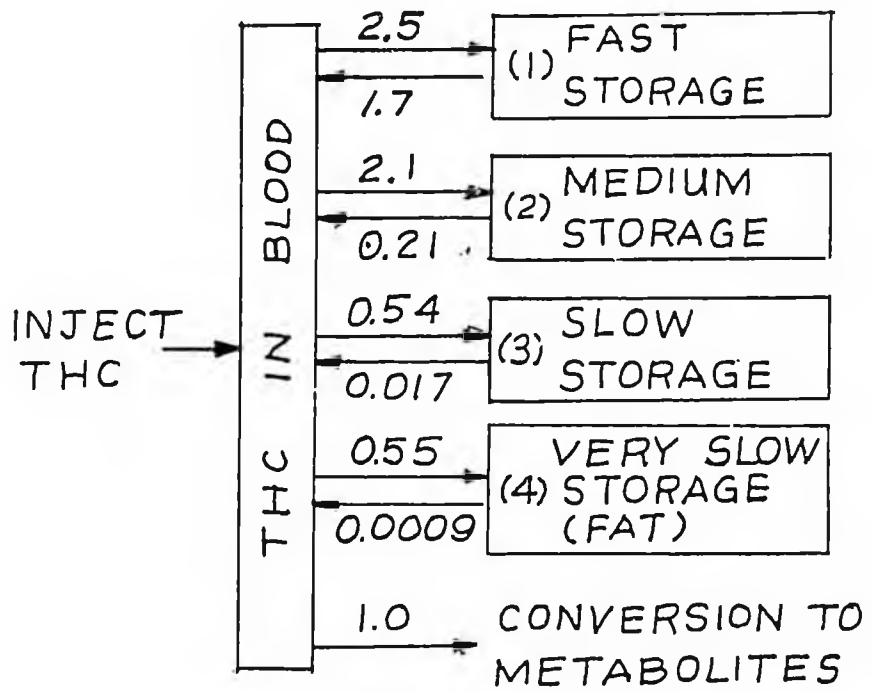

FIGURE 1: MODEL OF THC STORAGE IN THE BODY

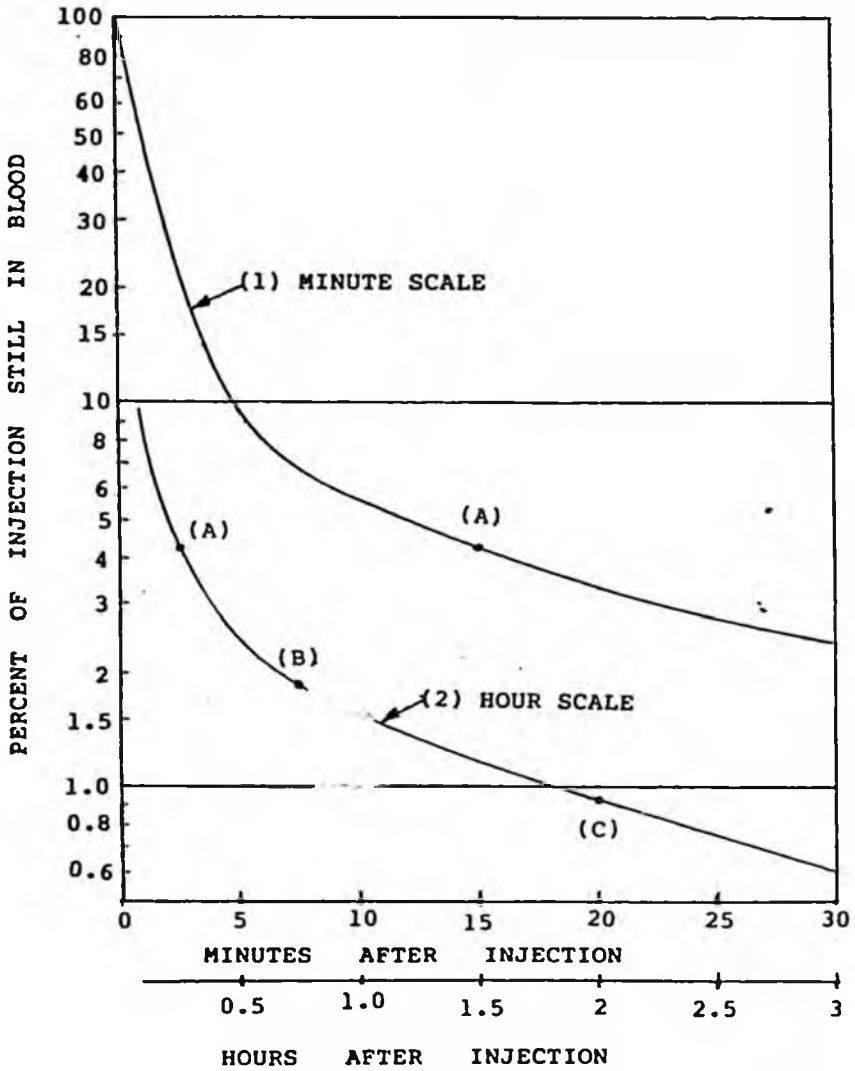

FIGURE 2: VARIATION OF THC BLOOD LEVEL WITH TIME

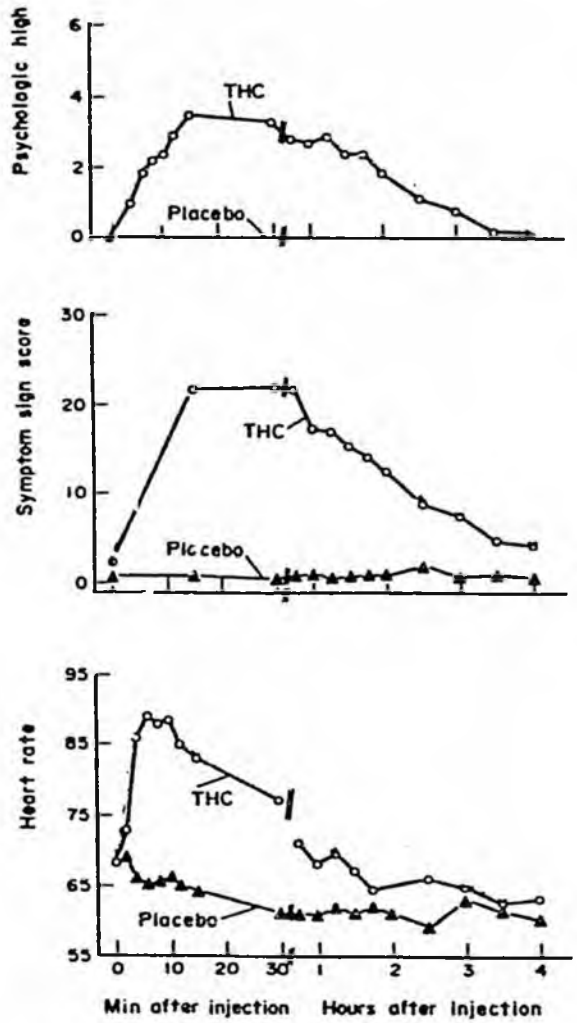

FIGURE 3: EFFECT OF THC INJECTION ON HEART RATE AND PSYCHOLOGICAL RESPONSES

COMMITTEES OF CORRESPONDENCE INC.

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Drug Awareness Information Newsletter

January 1988

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SUMMARY OF THE BIOLOGICAL EFFECTS OF MARIJUANA

by George Kornson and Otto Moulton

Marijuana, known scientifically as cannabis sativa and popularly as pot, contains 61 chemicals, called cannabinoids, which are found nowhere else. Its primary psychoactive ingredient is delta-9-tetrahydrocannabinol or delta-9-THC. Three other cannabinoids are known to be psychoactive, but occur in much lower concentration. Many of the cannabinoids probably contribute to the damage of marijuana to the body. However, the evidence against delta-9-THC is sufficient to brand it, by itself, an extremely dangerous drug. Often delta-9-THC is shortened to THC.

Storage of THC in the Body

THC is strongly fat soluble, and so is stored in the fatty tissues of the body for months. The fatty tissues act like time-release capsules, which steadily release THC into the blood, keeping the regular marijuana smoker in continual sedation. The THC molecules are very sticky, and so THC is very difficult to measure quantitatively; it sticks to the sides of test tubes and other equipment. The storage of THC in the body is discussed in detail in Ref. [1].

THC is called lipophilic, meaning "fat-loving". Its fat-storage properties are quite similar to those of the banned insecticide DDT. That lipophilic insecticide was thought to be harmless to vertebrates, until we discovered, to our dismay, that it was accumulating in the bodies of animals, and so was destroying our environment.

The brain is isolated from the main blood supply by the blood-brain barrier, which is a protective sieve of capillary walls and membranes that shields the brain against toxic substances. Lipophilic THC molecules stick to this sieve, and so the flow of THC to the brain is slow.

As THC is absorbed into the blood, most of it leaves very rapidly, to be stored in different physiological processes, which later feed THC back into the blood. As blood passes through the liver, part of the THC is metabolized to form other chemicals called metabolites, which are eventually excreted from the body. Unmetabolized THC is not excreted.

Because of these storage processes, the concentration of THC in the blood drops to a few percent of the initial level by the time the THC

molecules have worked their way through the blood-brain barrier. Hence, only a small amount of the THC entering the body contributes to the "high" sensation. In a light marijuana smoker, the concentration of THC in the brain blood that produces a strong "high" is about 10 micrograms (10 millionths of a gram) distributed throughout the total blood supply of the body.

Thus, THC is an extremely potent drug. It appears to be mild because its high fat solubility makes it slow acting. With this slow action, serious physical trauma from marijuana overdose is rare. On the other hand, being lipophilic makes marijuana very dangerous and insidious when used regularly.

There are four different types of THC storage processes in the body, which feed THC back into the blood at different rates: (1) fast storage, predominating in the first 10 minutes, (2) medium storage, predominating in the first hour, (3) slow storage, predominating in the first 12 hours, and (4) very slow storage, which controls THC blood concentration after one day. Very slow storage is caused by THC absorbed into fatty tissues. About 1/3 of the THC entering the body is absorbed into the fat tissues, which release it with a half life of approximately one week. Hence, it takes one week after marijuana smoking has ceased for THC stored in the fat to drop to 1/2, 2 weeks to drop to 1/4, 3 weeks to 1/8, etc.

All of the marijuana joints smoked over the past month contribute significantly to the THC in the fatty tissues, which is steadily released into the blood. The THC blood concentration from this steady release is low. Nevertheless, for a regular marijuana smoker, it is sufficient to cause sedation, because (1) THC is released so slowly it passes unimpeded through the blood-brain barrier, and (2) THC is extremely potent.

One third of the brain is fat tissue, and so an appreciable amount of THC is stored directly in the brain. Although the blood-brain barrier reduces THC flow to the brain, about half of the THC stored in the fat arrives so slowly it passes unimpeded through the blood-brain barrier. Hence, THC concentration in brain fat tissue should be about half of that in general body fat. (This slowly arriving THC comes partly from THC originally stored in the fat, which is recycled back into the fat, and partly from the slow storage process, described earlier.)

Effect of THC on the Brain

What is the effect of THC stored in brain cells? Dr. Robert Gilkeson [2] explains that the membranes of nerve cells are fat (or "lipid") tissue, and so are sites for storing THC molecules. The nerve cell membrane is crucially important because: (1) nutrients and waste products for the cell must pass across the cell membrane, and (2) this membrane is the primary source of neural electrical activity. When sticky THC molecules are stored in the nerve cell membrane, they degrade cell nutrition, and suppress electrical activity.

Hence, one would expect that long-term use of marijuana should cause serious brain damage. That this is so was demonstrated by experiments performed on the monkey by Dr. Robert Heath of Tulane Medical School, who is world renowned for his research on the brain [3] (pp 713-730). Clear, detailed descriptions of this work are given by Peggy Mann in [4, 5].

The following experiment was performed several times. For 6 months a monkey smoked the equivalent of 2 joints of marijuana per day, 5 days per week, using monkey-sized joints. After recovering for 6 months, the monkey was sacrificed and its brain cells examined under the electron microscope. EEG brain waves were measured from electrodes imbedded in the brain. The EEG waves became severely distorted after 2 months of smoking, and remained severely distorted 6 months after smoking had stopped.

The brain cells showed serious damage, particularly those in a deep part of the brain called the limbic system, which is the center of motivation. For example, over 30% of the limbic brain-cell nuclei had inclusion bodies, which are clots in the nuclei. In normal brains, less than 0.5% of brain-cell nuclei have inclusion bodies. The incidence is much higher in old brains, particularly those of senile patients, but even then is much less than was observed in the brains of these young monkeys. When the researchers first observed the enormous brain-cell damage, they were shocked at what they saw.

Dosage. This research by Heath is often dismissed with the argument that the monkeys were "chain-smoking" marijuana, using huge doses. This is not true. Early in this experiment the smoking apparatus was very inefficient, and little of the THC was absorbed into the monkey's body. This problem was corrected by developing a respirator that forced the monkeys to smoke in a human-like pattern.

With this respirator, a monkey weighing 11 pounds smoked a 0.25-gram joint of marijuana, containing 2.5-3% THC. (A normal marijuana joint is 1 gram, and good street pot today is usually 3.5-4% THC.) This dosage produces the same THC blood concentration, 10 minutes after smoking, as a human smoking a 1-gram joint.

If we scale the monkey's dose by weight, 0.25 gram of marijuana for an 11-pound monkey would be equivalent to 3 grams (or 3 joints) for a 132-pound teenager. However, equivalent drug dosages for different species are not scaled by weight. Extensive studies of drug equivalency have been made for cancer chemotherapy. As shown in [6], for the many drugs evaluated, the maximum tolerable dose for man, per pound of body weight, is approximately 1/3 of that for the monkey. When this factor 1/3 is included, the 0.25-gram monkey-sized joint is equivalent to a 1-gram joint for the 132 pound teenager.

To bury this dosage argument completely, let us ignore this 1/3 factor and assume, very optimistically, that dosage is scaled directly with body weight. Since the monkey smoked 10 times per week, this very optimistic assumption would yield 30 joints per week for the teenager, or 4.3 joints per day. In 1979 the National High-School Senior Survey showed that 10% of U.S. high-school seniors smoked marijuana daily, and the average consumption for the daily marijuana smokers was 3.5 joints per day. This average is very close to the very optimistic 4.3 joints per day corresponding to the monkey experiment, a smoking level that produced serious brain damage after 6 months of smoking.

Clearly, this experiment by Heath is crucially important to our youngsters. Yet, very few have received a reliable account of it in their drug education classes, even though its results were published in 1979. As Peggy Mann reported in the Nov. 1987 Reader's Digest, "We are teaching

our kids to use drugs" in drug education. The misinformation presented in most drug education programs is atrocious.

In 1981 the National Institute on Drug Abuse (NIDA) discontinued funding of this research by Dr. Heath, which is by far the most important research on marijuana ever performed anywhere in the world. This action was preceded in 1980 with the following derogatory evaluation by NIDA of Heath's work [7]:

"A researcher who used electrodes implanted deep within the brains of monkeys, instead of the more conventional scalp recording techniques, has found persistent changes related to chronic use. This same investigator has reported that rhesus monkeys administered marijuana smoke from one joint daily for five days per week for six months show persistent microscopic changes in brain cellular structure following this treatment. While these experiments demonstrate the possibility that more subtle changes in brain functioning or structure may occur as a result of marijuana smoking in animals, the implications of these changes for subsequent human or animal behavior is at present unknown. Other studies, using more conventional EEG techniques to measure brain electrical activity, have found changes temporarily associated with acute use, but no evidence of persistently abnormal EEG findings related to chronic cannabis use."

In EEG (electro-encephalogram) tests on man, the electrodes are almost always placed on the scalp, because it is dangerous to insert them into the brain. Only under extreme conditions, associated with brain surgery, has it been possible to place EEG electrodes inside the human brain. It is well known that EEG scalp records give an extremely limited measure of brain electrical activity. Doctors use the scalp EEG because it is the best that they can get, not because it is "conventional".

With NIDA's unscientific approach to research, is it any wonder that we have a drug epidemic?

The strong brain-wave distortions found by Heath on monkeys were detected only from electrodes implanted within the brain, and were not observed from those placed on the scalp. Hence one would not expect EEG scalp recordings of humans to show strong brain-wave distortion.

On the other hand, psychiatrist Dr. Robert Gilkeson has observed more subtle brain-wave changes from the scalp EEG [8] (p 20). Gilkeson has developed EEG techniques to pinpoint learning disabilities, which he applied to 50 youngsters, ages 13-18, who had used pot at least twice a week for 4 months. They abstained from pot for 2 days preceding the test.

Gilkeson found that all of these EEG records were "markedly immature for age", and had an abnormal amount of slow theta rhythms, "sufficient to be diagnostic of diffuse brain impairment. In the EEG section of academic tasks, none of these youngsters could speed up when challenged. Their brain waves failed to respond to these stimuli in the usual way." These subtle distortions of scalp EEG signals disappeared after the youngsters abstained from pot for 3 months. On the other hand, the severe distortions observed by Heath from deep-brain recordings persisted after 6 months of abstinance.

Effect on the Immune System: Relation to AIDS

In 1973, Dr. Akira Morishima of Columbia University examined, from healthy pot-smoking young men, the chromosomes of T-lymphocytes, which are important cells of the immune system. The men had smoked marijuana for an average of 4 years, and did not take other illegal drugs. For those smoking 2 joints per week, about 1/3 of the T-lymphocyte cells had about half the normal number of chromosomes (46). For the daily marijuana smokers, cell damage was greater, with some cells containing only 5 to 10 chromosomes. This study has been verified by many other researchers. [4] (p 113)

This has strong implications relative to the AIDS epidemic, because T-lymphocytes are a prime target for the AIDS virus. Many people who have been infected with AIDS do not have active symptoms. This study indicates that any use of marijuana may have a serious effect on the development of the disease. AIDS researchers should start correlating marijuana use with the progression of the AIDS symptoms.

Effect on Reproduction

The damage to chromosomes caused by marijuana can produce serious birth defects, which are transmitted through many generations. In experiments by Dr. Susan Dalterio, male mice were given a human equivalency dose of 1 to 3 joints of THC, 3 times per week, for 5 weeks. These mice were mated for a month with normal females. Twenty percent of the females either did not conceive, or had babies that were born dead or died soon after birth.

The resultant sons that matured were not exposed to any drugs and were mated with normal females. About 25% of these female mice did not achieve a normal pregnancy. The resultant grandsons of the THC-dosed mice that matured were not exposed to drugs and were mated with normal females. Many of their offspring showed severe abnormalities, including intestines outside the bodies, and exposed brains and spinal cords. Many of the sons and grandsons showed severe chromosome defects. [8] (p 12)

Effect on the Sex Drive

When mice or monkeys are exposed to marijuana, they have little sex drive: it is difficult to get them to mate. Similar results are observed in humans. A high incidence of impotence has been reported among men in Jamaica who smoked marijuana for 5 years. Dr. Ingrid Lantner, who has discussed marijuana on many radio call-in shows, reports: "Chronic pot smokers often tell me they are impotent, but this doesn't bother them --- since they no longer feel sexual desires." [8] (p 13)

Effect on the Lungs

Marijuana causes serious lung damage, particularly when cigarettes are also smoked. In 1971, studies were performed by Dr. Forrest Tennant on U.S. soldiers in Germany who smoked hashish daily, equivalent to 1-5 joints of marijuana. He found that 1/3 of the cigarette smokers had squamous metaphlasia, a dangerous precancerous condition of the lungs; while 91% of those using hashish plus cigarettes had it. [4] (p 70)

Marijuana as Medicine

Since marijuana contains many different chemicals, marijuana itself is not appropriate for medicine. The only verified medical application of a drug derived from marijuana is the use of THC to combat nausea in cancer patients undergoing chemotherapy. THC is very effective in reducing nausea.

On the other hand, as explained earlier, THC attacks the immune defenses of the body. This is very serious for patients undergoing chemotherapy, because chemotherapy also weakens the immune system, making the patient very susceptable to infectious disease. Obviously, when THC is taken to combat nausea in chemotherapy patients, it must be carefully controlled and used sparingly.

Addiction and Drug Dependence

Marijuana is often claimed to be physically non-addictive because the user does not experience strong physical withdrawal symptoms when he stops smoking it. However, the reason for this is that THC cannot be withdrawn rapidly; the body has its own supply. It takes one week for the THC stored in the fat to drop to 50%, and one month to drop to 5%.

Actually, marijuana probably produces stronger physical drug dependence than any other drug. It generates a "pot personality" and often leads to escalated use of many drugs, because:

(1) As marijuana builds up in the body, it gradually drags the smoker into continual sedation, separating him from reality and forcing him into a dream world of drugs.

(2) As demonstrated by Heath's experiments on the monkey, marijuana weakens the center of motivation of the brain, and in time permanently damages it. Clinical experience has shown that prolonged marijuana smoking destroys normal motivational reflexes, so that the smoker experiences great difficulty living a drug-free existence.

(3) Since marijuana is present in the body all the time, the body rapidly builds up tolerance to it, and the smoker must steadily escalate its use to achieve the same "high". Eventually, the kick from marijuana is not satisfying, and so he reaches for other drugs.

(4) Since marijuana inhibits nausea, people with marijuana stored in their bodies can drink alcohol very heavily without getting sick. Consequently, marijuana has caused an epidemic of alcohol abuse, drunk driving, and death from alcohol overdose. Teenage death from alcohol overdose used to be very rare; without marijuana in the system, the body protects itself by vomiting. [4] (p 51)

Marijuana is often called a "stepping stone" or "gateway drug" because it leads to drugs giving a stronger kick. However, these terms are misleading: they imply that the primary damage of marijuana comes from drugs evolving from its use. Marijuana's dangers are deceptive because its main action is slow and delayed, and so it is difficult for the user to relate cause and effect.

Remember that THC is extremely potent and is stored for months in the body, causing serious damage to the brain, to chromosomes, and to the immune system. THC appears to be mild because it acts slowly. Hence, marijuana is at least as harmful as cocaine and heroin, but is really more dangerous because it is so insidious. In societies where marijuana is readily available, and heroin and cocaine are not, the smoker usually sticks to marijuana, until it destroys him. For example, in Morocco and Jamaica, marijuana-induced insanity is common. [9] (p. 76)

Survey after survey have shown that essentially all users of other illegal drugs started with marijuana, and most continue to use marijuana along with the other drugs. The great reluctance of a heroin addict to stop may be due more to the marijuana he has taken than the heroin.

Many surveys of this sort were available in the early 1970's, when the myth of marijuana's harmlessness was spread across the U.S. For example, the U.S. Commission on Marijuana and Drug Abuse stated in its 1972 report to Congress that "80% of the [San Diego High School] students who had used marijuana weekly or more often had used other illegal drugs, and 50% of this group had used LSD" [10] (p 56). Similarly, Psychology Today (April 1970) found from a survey of its readers that 58% of those who smoked marijuana weekly had taken LSD, while at least 99% of those who drank alcohol but did not use marijuana had not taken LSD. Yet LSD is probably the most harmful psychoactive drug used by man, and its dangers had been well publicized at that time. It produces an hallucinogenic state akin to schizophrenia, and is a common cause of insanity. (Use of LSD and similar hallucinogenic drugs is widespread today: a 1983 survey shows that 21% of young adults have taken them.) [11] (p 364)

These studies were glibly dismissed as being irrelevant. They were buried by using the fallacious argument: "Since marijuana is not addictive, it cannot by itself lead to other drugs; hence these correlations cannot be the result of cause-and-effect relationships."

We hear of statistical studies everywhere we turn. Elections are predicted with remarkable accuracy from them. Our knowledge of the dangers of tobacco is largely the result of statistical evidence. Most of the decisions in modern medicine concerning medical procedures are based strongly on statistical data. Yet, strangely, statistical studies relating marijuana to other drugs, or to crime, suicide, and insanity, are considered to be irrelevant.

Note that the violent crime rate has increased tremendously since the early 1960's, directly paralleling the use of marijuana. It rose from 1.62 per 1000 of population in 1962 to 5.81 in 1980, which is a factor of 3.6. [11] (p 370)

Conclusion

The scientific evidence is more than sufficient to brand marijuana an extremely dangerous drug, yet few youngsters are aware of this. They smoke marijuana because it is there, and they believe it is no more harmful than alcohol. The only way they learn otherwise is to see their classmates being destroyed by it. However, for this mechanism to operate, many young lives must be sacrificed. It is about time that science provided a better learning mechanism.

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NOTES:

References [7] and [10] contain serious misinformation.

References [1] and [2] are available from Committees of Correspondence for $1.00 each prepaid.

References [4], [5], and [9] are available from PRIDE, 100 Edgewood Ave. NE, Suite 1002, Atlanta, GA 30303.

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Marijuana and the Brain

By Robert G. Heath, M.D., D.M. Sci.

Marijuana is used extensively because people like the way it makes them feel. It alters feelings by influencing the brain, perhaps the most fascinating organ of the body. It is the brain that controls or coordinates muscle activity and perception, as well as the vital functions of breathing and circulation. But most unique, the brain is the organ of the mind, integrating behavior through thoughts, emotions, and feelings. While marijuana has been shown to affect all these systems, its mind-altering proclivity is its principal appeal.

BEHAVIORAL EFFECTS OF MARIJUANA SMOKING

Acute Effects

The most consistent and immediate effect of smoking a "good" marijuana joint is a pleasant, relaxed feeling, usually induced after a few puffs. Gradually heightened relaxation is often associated with giddiness and self-preoccupation. The smoker's attentions to his environment diminishes. Indeed, it is the anticipation of these feelings that is the principal motivation for smoking marijuana. While feelings of apprehension and suspiciousness may occur, as well as preoccupation with such sensory stimuli as loud music and flashing lights, these are less consistent symptoms. Typically, the smoker's thinking becomes less precise and more self-centered. The ability to perform tasks is impaired, and inertia proportionate to the strength of the psychoactive ingredients develops. Further, memory mechanisms become altered. These acute effects of smoking usually intensify for 30 minutes to an hour and then gradually subside.

If a person smokes marijuana infrequently - a joint once every ten days or two weeks, - these transient acute effects may be the only changes he experiences although some persons suffer ill effects from only brief exposure. Moreover, an axiom long acknowledged by behaviorists is that pleasure once sampled stimulates repetition. The users of pleasure-inducing drugs corroborate this axiom. According to government surveys, 15 million people in the United States now use marijuana regularly. Moreover, as the pursuit of pleasure has intensified, most smokers have sought increasingly stronger marijuana. And some smokers, still not satisfied, are using other pleasure-inducing drugs as well. In addition to the psychological factors, the drive for stronger pleasure-inducing drugs results from the fact that stimulation of the brain mechanisms for pleasure is, in time, depleting. A cycle is established. Even with frantically increased usage, the desired pleasure continues to be attenuated. Eventually, lasting (chronic) behavioral changes appear.

Chronic Effects

Chronic behavioral changes are those that persist during the intervals between acute effects and, to some extent, even after a person stops smoking marijuana. The intensity of chronic effects and the time it takes them to develop vary considerably, depending on the smoker's constitutional makeup, life stresses, the frequency of smoking, content of the marijuana, and the concomitant use of other psychoactive agents. Intelligent, introspective persons, most of whom were highly aware of their higher intellect, have described the chronic effects of their marijuana smoking thus: First they noticed decreased motivation and enthusiasm in association with reduced ability to absorb, integrate, and effectively use new information. Their anticipation of doing things is less pleasurable. It becomes more of an effort to socialize. And there is a perceptible increase in irritability. Because of marijuana's intoxicating effects, the scholastic performance of the regular user is profoundly impaired. Former marijuana users who are students, teachers, and others engaged in intellectual activities report they are not able to perform at pre-exposure levels months or even years after having stopped smoking. Lasting impairment is more pronounced in those who smoked heavily and for long periods before stopping.

During the 1960's, there were virtually no well documented reports of chronic behavioral impairment as a result of marijuana use in this country. The marijuana of that decade, however, was low in content of delta-9-THC, assays showing the psychoactive ingredient to be in the range of 0.5 to 1.0 percent.

Delta-9-tetrahydrocannabinol (delta-9-THC) is the principal psychoactive ingredient in marijuana. To date, however, 421 separate chemicals have been identified in the cannabis plant. Sixty-one (61) of these substances, the cannabinoids, are unique to Cannabis sativa (Turner et al, 1980).

It was in the early 1970's that reports of profound behavioral changes, seemingly related to heavy marijuana use, particularly in young adults, began to appear in the medical literature. There was abundant evidence of diminished academic performance among users. Further, acute psychotic behavior resembling schizophrenic psychosis was being reported, in addition to disturbances in motivation and impairment of memory. Finally, there were reports of gross brain aberrations. By that time, the delta-9-THC content of marijuana available on the streets had risen to 2.0 to 3.0 percent, and it is still rising. Recently, delta-9-THC content of sinsemilla marijuana grown in California was assayed at 11 to 14 percent.

The past twenty years has seen an increase in behavioral disorders related to chronic use of marijuana that has paralleled the increase in its strength. Although statistics are available, they are not precise, largely because the chronic smoker has often added other drugs to his regimen. Some reports indicate that body fluids of as many as one third of the patients admitted to wards of city mental hospitals show the presence of metabolic breakdown products of marijuana (often combined with other drugs) when toxicological studies are performed. Toxicological studies of persons involved in violent deaths, ranging from accidents to suicides and homicides, are also revealing marijuana use, often associated with use of other drugs. In 1979 in a limited study, we analyzed the body fluids of 55 coroners cases involving violent death (homicide, suicide, traffic fatality) and in 15 of 55 cases, significant levels of marijuana components and/or PCP were demonstrated. In a study done in England toxicology studies were performed on 65 fatal vehicular accidents

randomly selected and in six of the cases (just under 10%), high levels of delta-9-THC were detected (Teale et al, 1977). Only one of the six showed some alcohol in the blood, but it was below the level for intoxication. Regretfully, studies of this type are restricted by lack of instrumentation for detection of the drugs and by legislation prompted by advocates of "human rights."

EFFECTS OF MARIJUANA SMOKING ON BRAIN FUNCTION AND ULTRASTRUCTURE

Ultrastructure refers to cellular anatomy as seen with extremely high magnification of the electron microscope. Despite the increasing number of scientific reports of the deleterious effects of marijuana use, its advocates remain skeptical. They argue that the behavioral changes and associated brain disturbances would have occurred spontaneously in the cases cited, even without marijuana use. Or, they insist, it is other agents (alcohol or other drugs) that are responsible. The rigid controls required to test these arguments cannot be imposed when human subjects are studied. It would be virtually impossible to carry out a study in human subjects in which one could be sure that marijuana (or any other agent one might wish to test) was the only drug the participants would use during the study. Even if an investigator sought volunteer subjects in a controlled environment such as a prison, he could not be certain of a rigid regimen. And, of course, deep brain electrode procedure for obtaining important brain recording could not be used in volunteer-subjects. Finally, informative brain post-mortem studies could not be conducted. Because of legal steps involved in acquiring human post-mortem brains, it would be rare for an investigator to obtain the brain of a marijuana smoker in a sufficiently short time after death to permit its use for ultrastructural studies. Even if one were obtained, findings would be influenced not only by cause of death, but would be questionable due to numerous contributing variables (the subject's general condition before death, history of drug abuse and so forth).

For these reasons, we chose to study marijuana's effects on brain function and ultrastructure in the rhesus monkey, a subhuman primate close to man. Using the monkey, it was possible to impose the rigid scientific controls required to provide answers concerning the drug's effects on the brain. Because of the rhesus monkey's physiological similarities to man, it has been used extensively as the experimental animal of choice to obtain medical information pertinent to human illnesses. It has been used in studies of the RH factor, in the development of polio vaccine, and it has been used widely in studies directed toward understanding vascular and endocrinological disorders in man.

For more than three decades, research in our neuro-science laboratories at Tulane University has been directed toward identification of the brain's neural network for pleasurable and painful emotions as a basis for understanding human behavior and for developing more specific treatments for disordered behavior. Other investigators have likewise conducted studies to demarcate the brain's neural network for pleasure-reward and for pain-punishment. In man, electrical stimulation of certain interconnected deep brain sites has been shown to induce profoundly pleasurable feelings, whereas stimulation to certain other well-demarcated sites has induced profoundly adversive feelings (anger, anxiety, violence); (Heath, and the Tulane University Department of Psychiatry and Neurology, 1954; Heath, 1964; Heath, 1974; Heath, 1975). When given an opportunity a laboratory animal will push a button to stimulate its brain's pleasure system (Olds, 1958; Olds and Milner, 1965) and man will do the same (Heath, 1963). In patients we have shown that the brain's

pleasure system is activated when he is experiencing pleasure or even when he is having pleasurable thought (Heath, Cox, and Lustick, 1974). Similarly, electrical activity in the brain's adversive system is activated during unpleasant situations or in association with anxiety, anger, or fear. In both animals and human subjects, these brain systems have also been localized by administration of drugs which induce profound emotions of pleasure or pain. When marijuana is administered, the acute response is usually a very pleasant feeling. We have therefore used marijuana, as well as other mood-altering drugs, in our comprehensive program to demarcate the brain's neural network for emotion.

It was against this background that we initiated our studies of marijuana in rhesus monkeys - studies that involve sophisticated techniques for monitoring brain function and examining brain ultrastructure. Space limitations permit only a summary description of the studies we have carried out thus far.

Some rhesus monkeys were prepared with electrodes implanted into numerous brain sites identified as a part of the brain's neural network for specific emotions. The electrical recordings obtained from these monkeys, by use of electro-encephalographic machines, would reveal activity deep in the brain, as well as over the surface. Other monkeys were not equipped with electrodes since their brains were destined for electron microscopic studies. A smoking apparatus, fabricated in our laboratories, permitted delivery of smoke to the monkeys in such a way as to simulate man's smoking pattern. The standardized monkey joint we used produced a blood level of delta-9-THC in the animals that approached the level of a person who smoked one marijuana joint.

The significant factor in establishing dosage in the monkey was to determine how much of the agent it actually received. The monkey does not inhale and hold smoke as a man does. In our early studies, before the efficient smoking apparatus was built, we necessarily used large amounts of starting material after discovering that much of the smoke was dissipated in the air when the marijuana was lit. This point was seized upon and exaggerated by marijuana advocates who incorrectly stated that our dosages were much greater than those used by human marijuana smokers (Brecher, 1975). When we obtained blood levels of delta-9-THC in our monkeys, they were no higher per exposure than the blood levels of human smokers. Moreover, the critics chose to ignore the fact that some monkeys in our studies received delta-9-THC intravenously at dose levels that could be carefully controlled.

Active marijuana used in the smoking studies contained 2.5 to 3.0 percent delta-9-THC. To control for nonspecific effects of smoking, we used inactive marijuana, from which all cannabinols (delta-9-THC and delta-8-THC) had been removed, for some of the monkeys. Finally, some monkeys were given delta-9-THC intravenously to control the variables of smoking effects, such as anoxia (lack of oxygen). The monkey smokers of active marijuana were divided into three groups: heavy smokers (three exposures each day, five days per week); moderate smokers (one exposure on each of two days per week); and light smokers (exposed to one-tenth the dose of the heavy smoker). Monkeys exposed to smoke of inactive marijuana were on the same smoking schedule as the heavy smokers of active marijuana (three exposures per day, five days per week).

Acute Recording Effects

Profound changes in brain recordings occurred in those monkeys that smoked active marijuana on the heavy and moderate schedules and those that received delta-9-THC intravenously. Associated with development of a semi-stuporous,

catatonic appearance, recording changes were predominantly at sites identified as being involved in the pleasure circuitry of the brain. They usually persisted for about an hour and a half, subsiding as the monkey's appearance returned to normal. In contrast, monkeys exposed to smoke of inactive marijuana showed no recording or behavioral changes. When the dosage schedule had been in effect for two to three months, persistent recording changes were also noted at brain sites in circuits involved in adversive emotion (irritability, anger, fear) of the heavy and moderate smokers of active marijuana and the monkeys receiving delta-9-THC intravenously. The dose to which the light smokers were exposed was below threshold and had no effect on the monkeys.

Chronic Recording Effects

The monkeys continued on the same exposure schedule for six months (and a few, for eight months). During that period the abnormalities in recordings failed to subside between exposures. We then stopped the smoking schedules and administration of delta-9-THC intravenously enabling the monkeys to "rest" and to be observed for an additional eight months. The recording changes persisted despite withdrawal of the drug. On the other hand, those monkeys that received smoke of inactive marijuana, never developed behavioral or recording changes.

At the end of the eight months' rest period, the monkeys were killed and their brains studied under the electron microscope.

Ultrastructural Changes

For ultrastructural studies, brains of monkeys not prepared with electrodes were also used. The brains of the monkeys exposed to delta-9-THC, whether in the form of heavy or moderate smoking or administered intravenously, showed striking changes at the synapse (the site where one brain cell makes contact with another). It is at the synapse that transmission of a message from one nerve cell to another occurs by release of chemicals at the nerve ending. This is the basis of brain activity. There was widening of the synaptic junction, deposition of a dense material in the cleft, and clumping of the vesicles that contain the chemical transmitters released to carry the impulse across the cleft. Changes were also evident in the rough endoplasmic reticulum, a constituent of the cytoplasm in nerve cells thought to be associated with protein synthesis and possibly the memory process. And finally, there was deposition of proteinaceous substances (called inclusion bodies) in the nuclei of brain cells. These changes, all significant, have been associated with brain damage from other causes. Brains of other monkeys in the study (those exposed to smoke of inactive marijuana and those not exposed - serving as further control of the study) showed no ultrastructural changes.

Comment

The findings reported here indicate that exposure to delta-9-THC, the psychoactive ingredient of marijuana, at doses commensurate with those used by human marijuana smokers, produces permanent changes in brain function and structure of monkeys, a subhuman primate close to man (Heath, et al, 1980).

Some aspects of these studies have been conducted at other research centers. At the University of Toronto, where brain studies have been carried out in rats exposed to active marijuana similar recording changes have been reported (Fehr, Kalant, and LeBlanc, 1976). Data from the University of British Columbia, where investigators have conducted ultrastructural studies on brains of rats exposed to marijuana, likewise support our findings in monkeys (McGeer and Jakubovic, 1979).

Granted, there is some risk in extrapolating data from one species to another. But the consistencies between our monkey findings and the clinical observations and subjective reports of human marijuana smokers cannot be denied. The functional and ultrastructural changes in the monkeys were at brain sites where neural activity has been shown to correlate with emotional behavior. Changes seen in heavy users of marijuana, ranging from mild apathy to the "burned out" syndrome, suggest the same brain sites of human smokers are being affected similarly.

This subject cannot be dismissed without brief consideration of broader complications that can occur when a person seeks to alter his neural network for pleasure-pain by use of drugs. The drug-user is a component of our society.

The fate of cultures in which drug use has been extensive substantiates the consequences of inducing pleasure dissociated from utility and survival. In our own culture, in which use of drugs is ever-increasing, the pattern is rapidly emerging. When the pleasure a person gains from taking a drug replaces reward for a job well done, we have shoddy workmanship. When puffs from a joint replace the pleasure of a swim on a warm afternoon or a good tennis game, we have apathy and physical deterioration. When the anxiety before an examination is eliminated by the instant pleasure of a drug, the student does not prepare and fails the examination. When ingestion of a chemical substitute replaces the satisfaction of solving a problem, being creative, or helping another person, what are the implications for the future of our society--or even our survival as a nation?

* * *

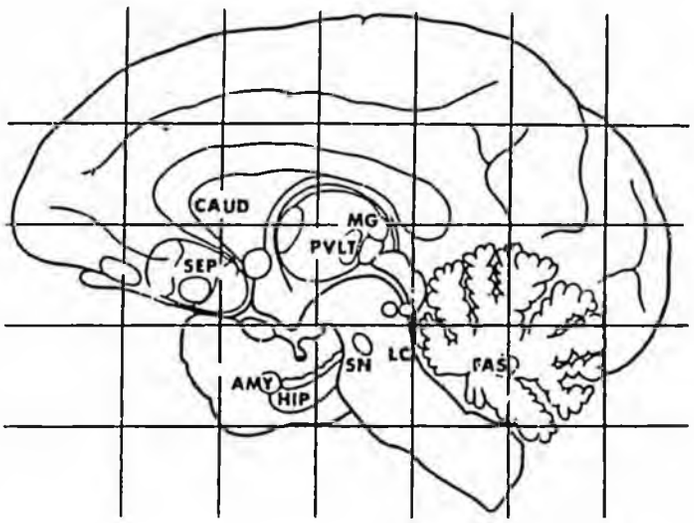

Figure 1. Cross-section of rhesus monkey brain showing cell populations involved in emotion and behavior. HIP-hippocampus; AMY-medial amygdala; SEP-septal region (A-anterior, P-posterior); CAU-caudate nucleus; PVLT-posterior ventrolateral thalamus; LC-locus ceruleus; SN-substantia nigra; FAS-fastigial nucleus of cerebellum.

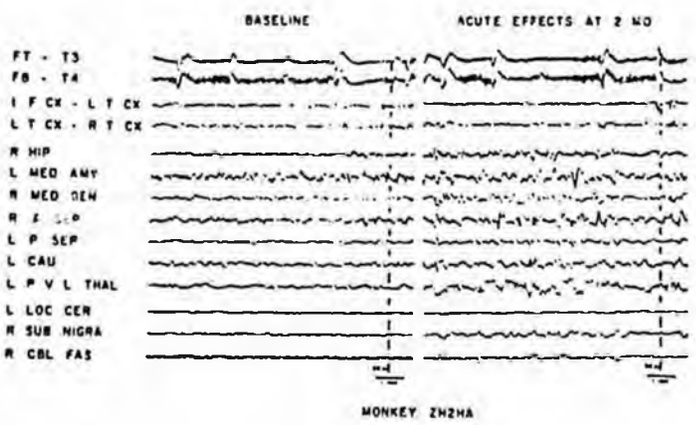

Figure 2. Bipolar electrodes implanted at the brain sites shown in Figure 1 record the electrical activity of these nerve cell groups before any smoking (baseline) and with exposure to smoke of active marihuana (acute effects). Letters and numbers refer to various regions of the brain.

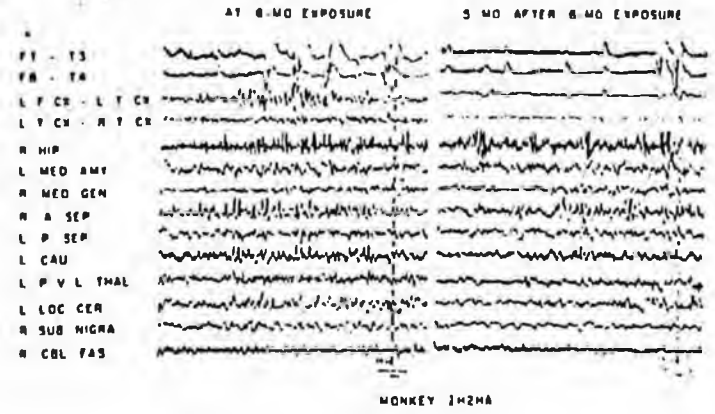

Figure 3. Electrical activity of nerve cell groups after six months of exposure and in the post-smoking follow-up period.

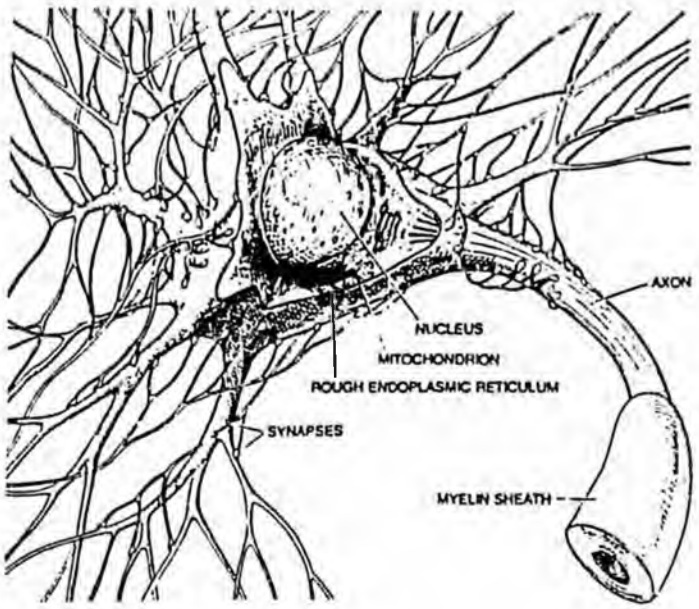

Figure 4. Typical brain nerve cell receiving input from neighboring cells (via synaptic connections) and sending output through axon which synapses onto other cells. (Drawing with permission from *Scientific American*, September, 1979.)

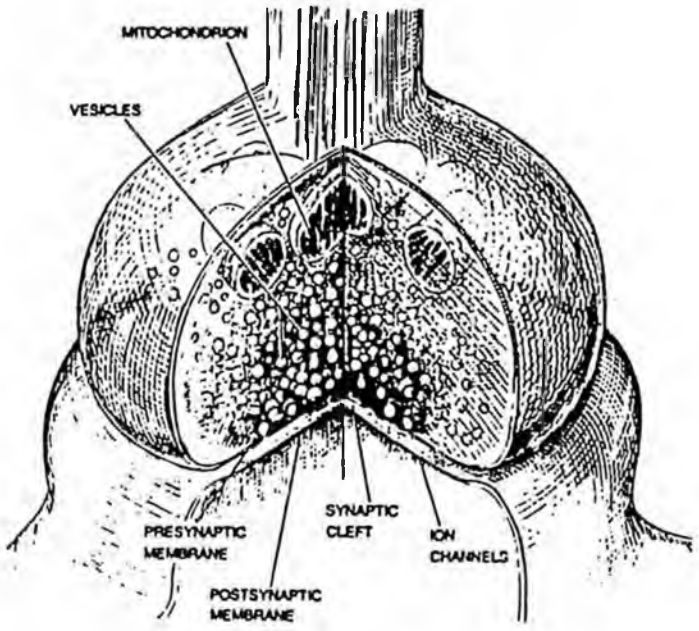

Figure 5. Detailed view of synapse which passes information from one nerve to another. An electrical signal in upper cell causes chemical (neurotransmitter) to be released by vesicles into cleft. This chemical is recognized on postsynaptic membrane of lower cell, resulting in new electrical signal in that cell. (Drawing with permission from *Scientific American*, September, 1979.)

Figure 6. Electron microscopic pictures of synaptic tissue in monkey. *Left:* Normal synaptic junction. *Right:* similar tissue in heavy-smoking monkey (x 20,000). Magnified inset views (x 60,000) show changed structure of synaptic cleft more clearly. (With permission from Biological Psychiatry.)

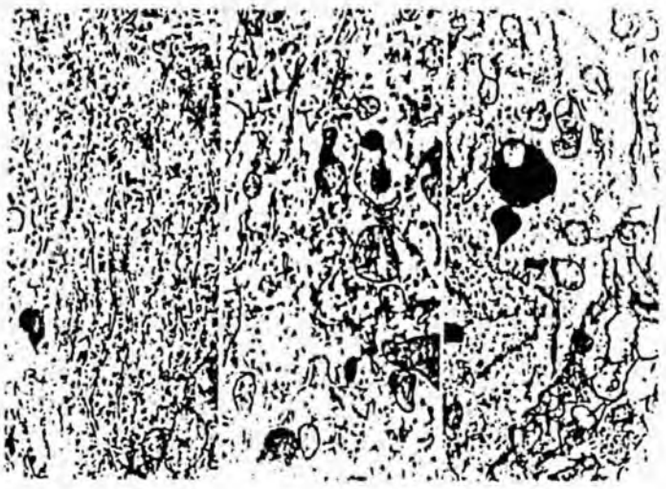

Figure 7. Electron microscopic pictures of rough endoplasmic reticulum (involved in protein synthesis) within cell body of monkey brain. *Left:* Normal. *Center:* from monkey that received delta-9-THC intravenously. *Right:* From heavy smoking monkey (x 6,000). (With permission from Biological Psychiatry.)

Figure 8. Electron microscopic pictures of inclusions within cell nuclei of heavy smoking and intravenously injected monkeys (x 15,000). (With permission from Biological Psychiatry.)

* * *

ABOUT THE AUTHOR

A native of Pittsburgh, Robert G. Heath, M.D., D.M. Sci., is a graduate of the University of Pittsburgh School of Medicine. He trained in psychiatry at the Pennsylvania Hospital in Philadelphia and in neurology at the Neurological Institute in New York City. Dr. Heath is also a graduate of The Psychoanalytic Clinic of the Columbia University College of Physicians and Surgeons and he is a recipient of Columbia University's Doctor of Medical Science degree. He is Board-certified in both psychiatry and neurology.

In 1949, Dr. Heath became the first Chairman of the Tulane University Department of Psychiatry and Neurology in New Orleans, a post he filled until his retirement in June 1980. Nearly 400 psychiatrists and neurologists were trained in the Department under Dr. Heath's leadership, including many prominent medical educators.

Dr. Heath is acknowledged as a pioneer in the study of schizophrenia as a biologically-caused disorder. In 1949 he and his research team began charting the pathways of emotional expression in the brain, work that led to the therapeutic use of a brain pacemaker in patients with severe chronic behavioral disorders that failed to respond to conventional treatments. Of major concern to Dr. Heath since the early 1970's has been his research on the detrimental effects of marijuana on the brain.

Dr. Heath is the author of 360 scientific papers and the principal author and editor of three books. He has been elected to a number of honorary societies and is the recipient of numerous international, national, and regional awards. A Professor of Psychiatry and Neurology on the Tulane faculty, he is continuing his research concerned with the brain and behavior.

Dr. Heath serves as Chairman of the Scientific Advisory Board of the American Council on Marijuana.

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MARIJUANA: TOXIC TO CELLS

Synopsis of the Videotape *Marijuana: Myths and Misconceptions*

ROBERT C. GILKESON, M.D.

Until Americans change their wholly erroneous perception that marijuana is the "least harmful" of all "illicit drugs" it will continue as the drug with the gravest national consequences.

ALL DRUGS ALTER BRAIN CELL FUNCTION

Every drug that alters your mood, your feelings, your coordination, your thinking, or your behavior has altered the cells in your brain and disrupted their normal chemical function. Before using a drug of any kind, one should know what chemicals it contains, which cells in your brain and body they most affect, and exactly how these cells are altered.

CELL MEMBRANES

Each cell in your body is surrounded by a delicate membrane which allows the cell to perform its specific work and protects it from the toxic waste products floating by in the circulation. Cell life depends on the unobstructed passage of nutrient and waste chemicals in and out of this membrane. This membrane is composed of an intricate pattern of lipid (fat) and protein molecules. The pattern is determined by the cell type, the function it performs, and its specific needs.

MEMBRANE TRANSPORT

Nothing is more essential to the healthy cell than the proper function of its membrane. Each of the chemicals which provide the ENERGY to keep the cell alive must be selected from the circulation and brought through the membrane. All of the special products which the cell produces and the waste products from that work must pass out of the cell through the membrane. This constant movement of chemicals in and out of the membrane occurs through submicroscopic channels between the lipids or the complex actions of the protein molecules specifically assigned to them.

MARIJUANA: AND ITS TOXIC CHEMICALS

Marijuana contains 421 bioactive chemical molecules; 61 of these are called cannabinoids. The cannabinoid which causes the acute marijuana high is delta-9 THC, but all of the cannabinoid molecules in street pot are extremely soluble in lipid molecules, and disrupt cell function. Every cell membrane in the body is composed of an intricate arrangement of lipid and protein molecules essential to cell function.

The purpose of all of these messages is to keep track of all of the other cells in the body, to keep them functioning properly, and to keep them alive. "Internal" messages deeper in the brain relate the needs of the cells within the body. "External" messages from the eyes, ears, nose and skin provide information about the environment outside and the problems that must be solved to satisfy those needs.

Neurons from all the areas of the brain must accurately pass their information from one to another until they reach the frontal lobes of the brain where they must be kept going over time so they can be correctly analyzed and the most intelligent plan can be formulated to initiate and direct the complex sequential actions necessary to meet the needs of all of the cells in your body and for your optimal survival.

NEURON "FIRING"
Each time a message is passed from one neuron to another, precise amounts of sodium, calcium, chlorides, and complex messenger chemicals (neurotransmitters) must enter or leave through the proper membrane channels in 0.4 to 1.0 milliseconds. To be accurate each message must be transmitted in exactly the right amplitude and frequency. Because of their chemical complexity, their constant activity, and the speed at which they operate, neurons are affected more than any other cells in the body by substances which alter or block cell membranes or change the speed or amplitude of their firing.

THE BRAIN'S ENERGY CENTER: (The RAS)
That area of the brain which controls and directs the amount of energy going to and coming from each of the other brain centers is called the Reticular Activating System - The RAS. Because it alters the energy going to and coming from each area, the RAS coordinates the interaction of all the other brain centers. The RAS must make more connections (synapses) than any other center and must be constantly in operation. It controls our waking, sleeping, and alertness - our very level or consciousness. Because it turns on (increases) or it turns off (decreases) the chemical messages between areas of the brain, it regulates the intensity of messages between the centers for memory, the center for feelings, and the centers for analyzing all the messages from inside and outside of the body. Most importantly, it determines the level of the activity and the number of connections that can be made in our frontal lobes which analyze all incoming messages from our environment and formulate the most intelligent plans in the right sequence of movements and behaviors necessary for our optimal survival over time. Since this determines the level of complexity of our thought and behavior, it determines our intelligence.

Whenever the energy of the RAS is decreased or depleted by depressant drugs such as marijuana, the energy of the entire brain is decreased. But that area most affected by this loss in energy is the rich and multisynaptic frontal lobe where we analyze the significance of all sensory images, and plan and program our most intelligent responses.

The most complex thoughts and the most sensitive feelings, demand the most complex circuitry and depend on the number of synapses which can be activated. Decreasing the energy flowing in the neuronal circuits reduces the number of those circuits which can be activated, and reduces the degree, the intensity, and the alacrity of those that are left.

Cannabinoids are not interested in the IQ of the user, only the lipids in his cell membranes. No matter who - or how intelligent before he began - even the occasional smoker has less energy to activate the cells and circuits of his brain.

CANNABINOIDS BLOCK MEMBRANE TRANSPORT

The cannabinoids are found in an oily resin which coats the ouds and youngest leaves of the marijuana plant nearest the sun. This oily coating blocks water and water-soluble substances from escaping (evaporating) from inside the leaves, helping to conserve water through periods of drought. But if this same resin were scraped from the leaves and applied to the roots, it would prevent their absorption of water from the ground and then be TOXIC to the plant itself.

Unfortunately, when the cannabinoids are inhaled in smoke or eaten, they are immediately attracted to and become embedded in the lipids in every cell membrane in the body, and increasingly interfere with membrane transport very much as they did in nature.

MARIJUANA ACCUMULATES IN CELL MEMBRANES

Since these cannabinoids are of no chemical use to the cell and are hidden from the circulation, they are not easily broken down or eliminated, and they remain embedded in the lipids of every cell membrane of the body for months at a time.

After smoking only one 3% THC marijuana joint, 40-50% of the THC remains in your cell membranes for four to eight days; 10-20% is still there at thirty days; and 1% to traces can be found from forty-eight days to 4.6 months.

"OCCASIONAL" MARIJUANA USE CAUSES CHRONIC CELLULAR IMPAIRMENT AND CRIPPLES RATHER THAN KILLS

Smoking marijuana more than once every four months (faster than your cells can eliminate the cannabinoids from the last ingestion) leads to the accumulation and eventual saturation of the cell membranes.

Since saturation limits further acute toxicity, cannabinoids chronically CRIPPLE rather than KILL.

As they increase, however, they progressively interfere with membrane transport, and increasingly rob it of nutrients. This leads to an obligatory loss of cell ENERGY and insidiously retards the growth and maturation of every cellular system. Cells with less energy can do less work.

Saturated membranes may not lose their cannabinoid molecules for many months after stopping smoking.

CANNABINOIDS CONCENTRATED IN MOST VITAL ORGANS

Cannabinoids become concentrated in the lungs, liver, kidneys, adrenal glands, ovaries, testicles, bone marrow, and the center of brain activation. Studies of all the systems these organs maintain have repeatedly shown their disruption by marijuana.

BRAIN CELLS FAR THE MOST VULNERABLE

The brain cannot feel pain. The brain is the only organ or body part not equipped with pain fibers or sensation. While it hurts to pull a single hair from the scalp, massive areas of brain tissue can be slowly or rapidly injured or destroyed without any warning or awareness. You "feel no pain" from the drugs that damage the brain.

The most important, the most specialized, the most complex and the most fragile cells of the body are the 100 billion cells of the brain. These cells, called neurons, make 100 trillion connections or synapses where chemical messages are passed from one neuron to another.

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SUMMARY

In summary, the cannabinoid molecules in marijuana become embedded in cell membranes throughout the body, blocking the channels through which critical chemicals must pass, particularly calcium, in order to keep each cell functioning properly. As more and more cannabinoids saturate the membrane, the cell is progressively robbed of important nutrients and slowly loses its ENERGY. When this interruption of membrane transport occurs in brain cells, the loss of energy affects the centers of the brain that regulate our highest levels of thought, feeling, memory, behavior, and our ability to envision and make the most appropriate plans to meet the future.

Most simply: every marijuana smoker is dumber than before he began, and he remains that way not only for the months it takes until all of the cannabinoids are gone, but however long it takes after th t for his injured cells to recover if they still have the capacity to do so, and the longer impaired the greater the residual loss.

INVALID RESEARCH

Any sincere research investigation that does not reflect the obligatory loss of cell ENERGY from the presence of cannabinoids embedded in cell membranes must be simply and immediately rejected as scientifically invalid. While often intentional, any study not reflecting this loss, is by very definition inadequate in its understanding of basic concepts, or inaccurate and inadequate in design, instrumentation, or scientific methodology.

Immediate review of each of the poorly controlled and frighteningly subjective behavioral studies which fail to demonstrate marijuana's insidious toxicity reveals that in every case the primary investigators must be embarrassed that they ignored the most basic chemical property of the cannabinoids: their lipid solubility and their months'-long membrane storage.

HUMAN BEHAVIORAL STUDIES THE LEAST SCIENTIFICALLY ACCURATE

Unable to introduce toxic substances to naive research subjects (non-marijuana users), investigators were forced to use chronic marijuana smokers whose membranes were saturated before their "studies" began, and remained so throughout the entire study.

Since they then failed to allow sufficient time (months) for subjects to eliminate embedded cannabinoids before their studies began, and repeated the same error in measurements taken only days or weeks after ingestion was concluded, observations or conclusions comparing the acute and the chronic effects of marijuana, in these studies are wholly inaccurate, scientifically naive, and invariably invalid. Particularly invalid are observations about withdrawal, addictive properties, and observations of baseline behavior, since they have been made with the presence of cannabinoids still saturating the membranes.

CORRECTION

THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY

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Marijuana not only reduces the richness and sensitivity of our feelings, it not only impairs our ability to analyze the world around us, but it diminishes in sequence our most complex and highest order brain functions which are all related to our ability to generate and activate the neuronal circuits which allow us to foresee or preview future, we are less able to plan and carry out the most intelligent actions and behaviors necessary to achieve and assure our most optimal future survival.

The first, the most common, and certainly the most discouraging symptom of the chronic marijuana smoker, is his apparent and increasing disinterest in the necessary behaviors he must pursue now, to assure his most optimal gratification for his future life. Without the energy to direct his own future, he is forced to go with the flow, and hope he has the energy left to take care of whatever lies ahead after it has happened to him.

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HUMAN BEHAVIORAL STUDIES THE LEAST SCIENTIFICALLY ACCURATE

Unable to introduce toxic substances to naive research subjects (non-marijuana users), investigators were forced to use chronic marijuana smokers whose membranes were saturated before their "studies" began, and remained so throughout the entire study.

Since they then failed to allow sufficient time (months) for subjects to eliminate embedded cannabinoids before their studies began, and repeated the same error in measurements taken only days or weeks after ingestion was concluded, observations or conclusions comparing the acute and the chronic effects of marijuana, in these studies are wholly inaccurate, scientifically naive, and invariably invalid. Particularly invalid are observations about withdrawal, addictive properties, and observations of baseline behavior, since they have been made with the presence of cannabinoids still saturating the membranes.

INVALID BEHAVIORAL STUDIES THE MOST WIDELY PUBLICIZED

It has become a national tragedy for a scientifically ignorant public - particularly its developing adolescents - that such simplistic and basic errors in scientific methodology were not only unrecognized but incredibly repeatedly published by such influential bodies as the National Institute for Drug Abuse. That they were not immediately rejected only reveals and substantiates this body's disturbing but repeated scientific naivete in a matter so vital to public trust and public health.

THE NATIONAL INSTITUTE OF DRUG ABUSE CONTRIBUTES TO CONFUSION

Even more upsetting, is to realize that despite their immediately invalid design such research studies were not only published, but repeatedly funded by NIDA at enormous expense to its victims.

PUBLIC TRAGICALLY MISLED BY THE MEDIA

Ironically "adopting" a century old intoxicant as their symbol, marijuana was transformed and promoted as a fervently partisan political rather than scientific issue. As a result, the more invalid the study, the more avidly it was selected and the more widely it was publicized by a scientifically ignorant and adolescently biased public media.

THE MEDIA ALARMINGLY NAIVE

With inexcusable professional negligence, this same media has persisted in dubbing as "expert" any they interview and have pursued and quoted more vested lawyers, drug "industry" lobbyists, and "users", than qualified scientific investigators.

SCIENTIFIC FACT SACRIFICED FOR ENTERTAINMENT

Choosing to stage controversial "debate" with wholly unqualified "witnesses", rather than investigating readily-available facts, the media has intentionally ignored, purposely distorted, and naively contested, the over 8,500 published scientific papers which have overwhelmingly condemned marijuana for its insidious, long-lasting, often subtle but obligatory cell energy depletion.

ABOUT THE AUTHOR

Robert C. Gilkeson, M.D., teacher, pediatrician, adolescent neuropsychiatrist, and brain researcher, has the unique ability to make clear to non-scientists and scientists alike how the chemicals in drugs disrupt the normal functions of human cells. Dr. Gilkeson has lectured extensively throughout the United States on drugs, the neurophysiology of learning, and normal adolescent development. His audiences have included the National Association of Independent Schools, The Independent School Association of Central States, The Headmasters' Association, The United States Senate and State Senate Hearings, The Department of Justice, national parent organizations, and countless schools and medical groups.

FOR MORE DETAILED INFORMATION ON THIS SUBJECT, WE RECOMMEND PURCHASE OF THE VIDEOTAPE - MARIJUANA: MYTHS AND MISCONCEPTIONS which is a 90-minute VHS presentation which reviews the latest findings in drug and brain research, taking the viewer step-by-step from the chemicals in drugs - alcohol, cocaine, amphetamines, LSD, and heroin - to their alteration of brain cells to the result of those brain-cell changes on personality, learning and performance.

This videotape is not just a drug program - it provides the basis for an extended drug curriculum. The price is $400.00 which includes a 24-page teaching guide. Discounts are available for three or more tapes. Demonstration tapes are available. For more information write or call: Committees of Correspondence, 57 Conant St., Room 113, Danvers, MA 01923, 617/774-2641. Checks may be made out to The Center for Drug Education and Brain Research and mailed to Committees of Correspondence.

Alaskans for Drug-Free Youth has this video. Call Sandy Spargo at 586-6122 (evenings).

GLOSSARY OF SPECIALIZED TERMS

MARIJUANA CHEMICAL COMPONENTS AND THEIR PROPERTIES

CANNABIS - Cannabis, or more technically Cannabis Sativa, is a leafy plant whose leaves, flowers, stems, and seeds are dried and crushed to form the street drug, marijuana.

CANNABINOIDS - Chemical components found exclusively in marijuana.

DELTA-9-THC (TETRAHYDROCANNABINOL) - A fat-soluble cannabinoid most responsible for the nervous system changes associated with being "high."

SINSEMILLA - Seedless variety of high-potency marijuana.

FAT-SOLUBLE - Capable of being stored in the lipid (or fatty) cell tissue.

SATURATION - The point at which cells' storage capacity for a substance (such as THC) has been reached.

BRAIN AREAS

HIPPOCAMPUS - An area of the midbrain beneath the cortex, essential to memory formation. It is part of the limbic system closely intertwined with the feeling center.

FEELING CENTERS - Part of the limbic system in the midbrain area giving sensations of pleasure, pain, fear, surprise, sexual arousal, depression, anger.

RETICULAR ACTIVATING SYSTEM (RAS) - the energy controller of the cortex. Consciousness cannot be maintained without its activity. It is the major target of drugs. This center controls facilitation and inhibition. It activates or suppresses the feeling and memory centers.

SENSORY CORTEX - It contains the receptors for vision, hearing, touch, and the ability to localize oneself and other objects in depth and space.

FRONTAL LOBE - Contains the motor area, a premotor (programing) area, and the prefrontal lobe (analysis).

PREFRONTAL AREA - The very forwardmost part of the brain and the last to mature. Richest associative area with all parts of the cortex and the midbrain. It contains the reverberating circuits which hold images in place over time so they can be analyzed. It is your analyzer and programmer.

MOTOR AREA - Stimulates muscles of limbs and body.

CELL COMPONENTS AND CELL PROCESSES

CELL MEMBRANE - The coating or protective covering surrounding every cell, composed of tightly packed fat (lipid) molecules, interspersed with special proteins. This membrane controls all the chemicals which enter and leave the cell.

MEMBRANE CHANNELS - Passageways or tunnels through the protein molecules in the cell membrane, which can be opened and closed by the cell to let the chemicals in or out of the membrane.

NEURONS - The cells in the brain and spinal cord capable of passing messages to each other in milliseconds.

DENDRITES - The receiving end of a neuron, resembling branches of a tree.

CELL BODY - The metabolic center of a neuron, where the nucleus resides.

AXON - The sending trunk of a neuron that releases the chemical messenger at its end.

SENSORY NEURONS - Neurons equipped with special receptors which respond to light, sound, touch, pressure, heat, chemicals, pain, taste.

MOTOR NEURONS - Contract muscles, move body parts constrict blood vessels and excite glandular secretions.

MESSENGER NEURONS - Relay messages between sensory and motor neurons.

NEUROTRANSMITTER - The messenger chemical made by neurons and released by their axons to stimulate other neurons, muscles, glands.

RESTING MEMBRANE POTENTIAL - The difference in "charge" between the positive outside surface of the neuron membrane and the inside surface.

DEPOLARIZATION - The rapid flow of positive sodium ions into the cell when the sodium channels are opened.

REPOLARIZATION - Restoring the membrane "charge" by pumping all sodium ions out of the cell.

MITOCHONDRIA - Submicroscopic membrane-coated sacs containing chemicals which burn fat, carbohydrates and proteins to produce cell's energy.

Your brain is a precious resource; it is your computer!
The brain generates all human behavior, both peaceful and violent.
It stores all human experience - social, cultural and educational.
It is the source of energy, motivation, organization and pleasure.
All drugs taken into the body go to the brain in the blood and cause a chemical imbalance.
DO NOT TAMPER WITH YOUR BRAIN!

COMMITTEES OF CORRESPONDENCE. INC.
57 Conant Street, Room 113, Danvers, MA 01923

MATERIAL LIST

THE COMMITTEES OF CORRESPONDENCE is a non-profit agency which publishes a quarterly Drug Abuse Newsletter, written on a specific subject relating to drug-abuse issues. Extra mailings are sent when urgent issues need letter-writing attention. We are affiliated with the National Federation of Parents for Drug-Free Youth and PRIDE. An important part of our work has been the detection and exposure of drug-culture proponents who have undeservedly been "legitimized" in various sectors of our society. Our information is carefully researched and documented. A "New Membership Package" (included in our $15 subscription fee) contains the following:

NEWSLETTERS

School Policy Guidelines - Discipline for Drug Offences
*Biological Effects of Marijuana
Courtwatch - Citizen's Guide to Judicial Accountability
*Cocaine - The Great Addicter
Sky High - Who's in Control?
Drug Abuse in Industry - What Does It Cost & What Can Be Done
*Beware ---- Incorrect Information
*Evaluating Resource Material on Mind-Altering Drugs with Reading List
How To Mobilize Your Community for JUST SAY NO MARCHES
Dealing With Smoking Areas in School - How to Eliminate Them
The Experimental Use of Cocaine in Man: Is It Acceptable?
Drug Testing in the Workplace by Dan Haigh
Addiction as a Primary Disease by Eric A. Voth, MD
Marijuana: Toxic to Cells by Robert C. Gilkeson, MD
The Magistrate/Adolescent Intervention Program

ARTICLES

Drug Prevention Curriculum and Resource Review Guidelines (NFP)
Marijuana: The Myth of Harmlessness Goes Up In Smoke by Peggy Mann
Marijuana: The Effects on the Unborn by Dr. Susan Dalterio
Marijuana: The Effects on the Brain by Dr. Robert Heath
Speeches on Drug Abuse by Otto Moulton
Some Unsettling Thoughts About Settling In With Pot by Richard Hawley
*Drug Prevention - The Role of the Schools by Malcolm Lawrence
A Parents Guide to Teenage Parties
Drug-Free Community Plan by Deerfield Citizens for Drug Awareness
A Man of Our Time: Dr. Gabriel Nahas
PRIDE Position Paper: A Drug Policy of Our Times
The Media as Drug Promoters by David Martin
*Making Sure Kids Get the Right Message by Atty. Gen. Roy Zimmerman, PA
Drugs, Drinking and Adolescents by Dr. Ian Macdonald
Don't Drink Before You're 21 by William N. Plymat, Sr.
Alcohol --- is a Drug, Too! by Straight, Inc.

PAMPHLETS

*Cocaine - The Great Addicter
*What Parents Must Learn About Marijuana
*Marijuana: More Harmful Than You Think
*A Straight Pitch About Marijuana
*Helping Young People Kick the Sniffing Habit
*How to Form a Just Say No Club
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*Peer Pressure - It's OK to Say NO
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Drug Abuse Newsletter

March 1984
Issue #16

BIOLOGICAL EFFECTS OF MARIJUANA

WHAT IS MARIJUANA

Marijuana is neither a plant nor a single substance. It is a crude drug obtained from the dried leaves and flowering tops of the plant species Cannabis sativa.

There are three types of Cannabis plants:

the drug type
the fiber type
the intermediate type

Marijuana is most often smoked in cigarette form, but may also be ingested in cookies, tea, etc. Marijuana smoke is composed of several hundred chemicals, many of them toxic. Its potency varies from weak to extremely powerful.

To understand marijuana, you need to know two things about it:

1. Its chemical components.
2. The solubility of these chemicals.

CHEMICAL COMPONENTS

There are over 421 chemicals in marijuana. This number increases to over 2,000 when it is smoked.

More than 61 of these 421 chemicals are called cannabinoids and are found in no other plant.

All cannabinoids tested to date are biologically active. This means that each cannabinoid will alter some normal function of a living organism. These alterations may not be visible since they occur at the cellular level, but they can be documented in research laboratories.

One of these cannabinoids is delta-9-tetra-hydrocannabinol. This is the psychoactive cannabinoid that causes the familiar marijuana "high" or state of intoxication. "THC" stands for the several chemicals in the tetrahydrocannabinol class. It is the chemical that has been researched the most.

The potency of marijuana is determined by the amount of THC it contains. The higher the THC content, the more intoxicating and **harmful** it becomes. The marijuana grown today is up to 10 times more potent than that used prior to 1970.

All cannabinoids have one important factor in common: They react on all types of living cells by interfering with the cells' ability to manufacture pivotal molecules.

Pivotal molecules contain substances required for the proper division of cells, which is necessary for the continuation of our body functions. These substances you have heard of many times - DNA, RNA and proteins. DNA is the basic chemical contained in the core of all cells and it carries the genetic code for heredity.

SOLUBILITY

The major chemical components (all cannabinoids) of marijuana are fat soluble. This means that they do not mix with water, but they do mix with fat.

The body is rich in fat and fat-like material (collectively called lipids). The brain, lungs, and sex organs are especially loaded with lipids.

Every cell in the body is covered by a fatty membrane, which makes the fat volume of these membranes alone very huge. In essence, the body can figuratively hold a keg-full of THC or fat-soluble chemicals.

Once the THC from marijuana is in the storage sites, it is released ever so slowly into the blood stream. THC is similar to DDT in the way that it accumulates in fat tissue.

THC possesses a high order of reactivity. THC molecules are very busy, and they are up to no good seeping through the fatty membrane wall of the cell and into its core; creating havoc with the chemical process of cell division.

Creating a slowdown or interference of production of DNA, RNA and protein replacement within the cell causes the following to happen:

1. Cellular activity decreases.
2. This decrease in activity can eventually become a stoppage.
3. This stoppage can result in cell death.

When this happens, every function in the body is depressed:

- Energy level
- Thinking
- Sperm count
- Testosterone production
- Ovulation
- Even the sense of time

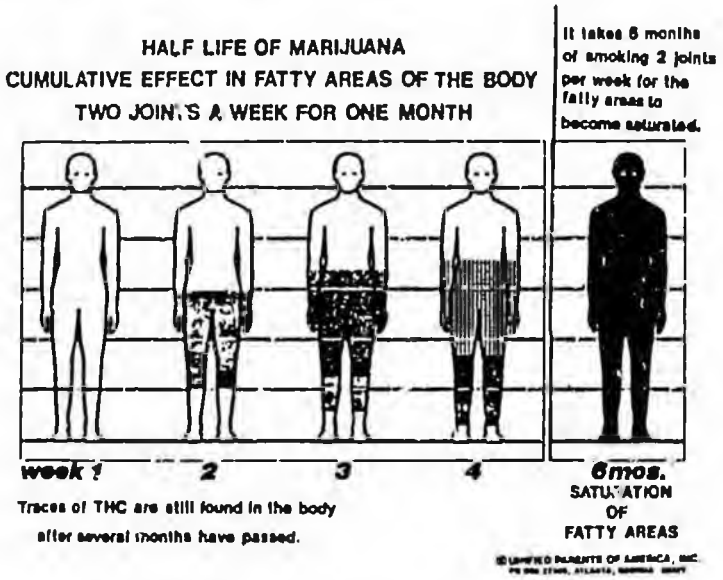
How much damage can THC do to the various systems of the body? That depends on how long and how much of the THC is present within the cells. The body can not get rid of marijuana's chief chemicals easily - trapped as they are in the lipid stores of the body - so the damage continues, slowly but surely!

RETENTION OF CHEMICALS

The marijuana "high" is rather short-lived, and the detectable effects during this time are significant, but there is more to it than that. When a single marijuana cigarette is smoked, THC and other cannabinoids have an average half-life of about 72 hours in the human body. Half-life is the time it takes the body to break down and/or get rid of one half of the drug taken into the body.

It takes 21 days to excrete THC and fat-soluble chemicals from a single marijuana cigarette. Stored in the cells of the liver, lungs, brain, spleen, lymphoid tissues and sex organs, half of the THC leaves these cells in the first three days. The remaining half is released into the bloodstream ever so slowly over the next 18 days. At the end of this time less than 1% remains in the body. This is as a result of smoking only one marijuana cigarette.

However, if one is a regular marijuana smoker (i.e. smoking 2 joints per week for six months), the fatty areas of the body become completely saturated with fat-soluble chemicals. Traces of THC are still found in the body after several months have passed.



CELLULAR DAMAGE - - THE EFFECTS ON THE IMMUNE SYSTEM

Cellular damage from marijuana use is a proven fact, and long-term users of this crude drug display an impairment of their cellular control immunity.

The immune system is a complex system of defense involving the white blood cells which specialize in fighting infections and destroying substances foreign to the body such as cancer cells and tissue transplants.

The immune system can be weakened by drugs, nutritional deficiencies, and by intense emotional stress.

In studies done at Columbia University, scientists studied the immunity response of 51 marijuana smokers, 16 to 35 years of age, who had smoked an average of three marijuana cigarettes a week for four years and who had used no other drugs except tobacco and alcoholic beverages. They compared these studies to a group of control subjects who did not use marijuana but did use tobacco and alcoholic beverages. (Science, Vol. 183, 419-420, 1974). The results of the immunity response of the marijuana smokers was 40% less than that of the non-marijuana smokers.

Something to think about.... Could there be any connection with the lowered immune system of marijuana smokers to the new disease of Acquired Immune Deficieny Syndrome (AIDS)?

How is it that the weekly consumption of only three to four marijuana cigarettes containing 15 to 20 mg. of THC may induce such cellular damage? It is because THC hangs around in the fat tissues for long periods of time. Most other drugs are water soluble and are flushed out of the body in a short period of time. This is not the case with marijuana.

CELLULAR DAMAGE - - THC EFFECTS ON REPRODUCTIVE CELLS

Available evidence indicates that cannabinoids exert significant negative effects on all phases of reproduction in males and females because they are stored in the sex organs and in the brain.

EFFECTS ON MALE REPRODUCTION.

Researchers at Columbia University have proven that moderate to heavy marijuana smokers have a decrease in sperm count and mobility and produce an abundance of abnormally formed sperm.

Cannabinoids disrupt the development of germ cells in the testes and disrupts the hypothalamus gland in the brain which controls this production.

Since men constantly produce millions of sperm, conditions will probably return to normal when pot smoking is stopped.

EFFECTS ON FEMALE REPRODUCTION:

This information is from studies done by Ethel Sassenrath, Ph. D., UC at Davis.

However, the effect marijuana smoking has on women may be lasting. An infant girl is born with her lifetime supply of eggs. If these are damaged, there is NO replacement!

A female using marijuana will notice a change in the menstrual cycle due to the effect of THC on the hypothalamus gland in the brain which programs the release of hormones from the pituitary gland.

The use of marijuana before conception and during pregnancy has been associated with a high incidence of fetal

oxic effect and neonatal deaths.

Infants born to marijuana-smoking mothers had a reduced birth weight (by one pound) and a smaller head circumference.

There is a subtle difference in their behavior - they seem less attentive in playing and less loving and caring to people.

Dr. Gabriel Nahas states: "These findings indicate that the pot smoker may not only be damaging his own mind and body, but may be playing genetic roulette with his or her unborn children. It is most urgent that we learn to what extent frequent use of marijuana will impair the genetic equilibrium of a person's sex cells. The hereditary fate of future generations may rest upon this research."

Dr. Carlton Turner states: "There is no other drug like marijuana, used or abused by man, that has the staying power and broad cellular actions on the body."

What can be more harmful than interference with the life processes?

What are we doing to future generations?

Is self-pleasure worth the possible harm that can be done to our children yet to be born?

CANNABINOIDS AS POSSIBLE THERAPEUTIC AGENTS

Research areas where individual cannabinoids are being studied are:

a) Reduction of nausea associated with chemotherapy treatments. (There are other medications that do the same thing with no harmful side effects and do not lower the immune system.)

b) Reduction of intraocular pressure associated with glaucoma. (There are at least five other medications that work well without harmful side effects. Refer to Committees of Correspondence Newsletter #6.)

REPORTING RESEARCH FINDINGS

Drug educators, practicing physicians and the media have a major obligation to translate the marijuana research literature into a form readily understandable and correct to the general public.

ONE THING MUST BE UNDERSTOOD —

Marijuana is **NOT** THC . . . and THC is **NOT** marijuana

The media often uses the word marijuana when they should use the word THC and vice versa. This is not correct and is misleading.

Incorrect wording gives people the impression that marijuana smoking is a cure for cancer and glaucoma.

CONCLUSION

There are over 8,500 scientific research papers on the health hazards associated with marijuana use. None give it a clean bill of health. (MARIJUANA: AN ANNOTATED BIBLIOGRAPHY), Vol. I, II and 1980 supplement; MacMillan Publishing Company.

It has been proven beyond a shadow of a doubt that marijuana effects **EVERY CELL IN THE BODY.** (MARIJUANA: BIOLOGICAL EFFECTS), Dr. Gabriel Nahas; Pergamon Press

With the information that we have now, why is anyone looking for something good about marijuana? The detrimental effects far outweigh any possible good that might be found.

The usual order of testing products is that they have to be proven safe **before** they are prescribed for use.

Once these basic concepts are understood about marijuana, it should be easy to conclude that there are no redeeming factors in using marijuana.

A MOST SERIOUS PROBLEM - YOU CAN CHANGE IT.

The information on marijuana in all the new family medical guides is outdated and not correct. Write to the authors, point out this fact and ask them to correct the situation.

* * *

A few expressions that are disturbing:

"Recreational use of drugs"...

The word "recreation" means to do something healthy for one's mind and body. -- What is healthy about marijuana?

The terms "soft" or "hard" used to describe a drug. Very often the term "soft" is used to describe marijuana. Anything that is so harmful to the body can not possibly be considered gentle and soft.

* * *

BOOKS TO READ FOR MORE INFORMATION:

Available from Committees of Correspondence prepaid.

BITTER GRASS & POT IN A NUTSHELL
by Dr. Roy Hart ($4.50)

POT SAFARI & MARIJUANA: THE MYTH OF HARMLESSNESS GOES UP IN SMOKE
by Peggy Mann ($6.95 & $1)

THE MARIJUANA CONTROVERSY
by Dr. Carlton Turner ($3)

SENSUAL DRUGS
by Dr. Harden & Helen Jones ($10.95)

KEEP OFF THE GRASS
by Dr. Gabriel Nahas ($4.25)

Mary Jane and the Sex Cells

by Gabriel G. Nahas, M.D., Ph.D.

Seldom in the course of centuries has a plant ever created a controversy as great as has **Cannabis sativa**, better known under the name of marihuana, Indian hemp, or hashish.

Eight centuries ago Moslem scholars from Cairo and Bagdad debated the pros and cons of this magic herb which allows man to dream while still awake. Their discussions had the same alacrity as those of today's American intellectuals. It appears now that this controversy, at least from a medical standpoint, has been partially answered.

One of the greatest uncertainties concerning marihuana, was the lack of evidence of cellular damage related to its use. It was known long ago that marihuana produced marked changes in thinking and behavior. This was brilliantly described by the French physician Moreau, 130 years ago, in his book "Hashish and Mental Illness." He observed that heavy long-term users of marihuana displayed a slowly progressive mental and physical deterioration, but these symptoms were non-specific, vague and had never been directly associated with cellular damage.

Cellular damage from marihuana has now been observed. Long-term marihuana users display an impairment of their cellular controlled immunity. This immunity is a function of T-lymphocytes (white blood cells) which specialize in fighting virus infections and destroying substances foreign to the body, such as cancer cells or tissue transplants.

My colleagues, Dr. J. P. Armand, Dr. N. Suciu-Foca and Dr. A Morishima, of the College of Physicians and Surgeons of Columbia University, and I studied 51 marihuana smokers, 16 to 35 years of age who had smoked an average of 3 joints of marihuana a week for 4 years. (Science Vol. 183, 419-420, 1974) These subjects had used no other drugs, except tobacco and alcoholic beverages.

We sampled blood from the veins of these volunteers and isolated their lymphocytes. The cells were tested with special substances which normally cause them to divide and grow.

The fact that marihuana products are stored in the sex organs, raises the possibility that marihuana might adversely affect the sex cells of men and women.

Such a test, the blast transformation test, measures the strength, or response, of the immunity system of the body.

We compared the immunity response of marihuana smokers with that of control subjects who did not use the weed, but smoked tobacco and drank alcoholic beverages. The immunity response of the marihuana smokers was 40% less than that of the nonsmokers. Furthermore, their immunological response was similar to that of patients with cancer, or kidney transplants (treated with immunosuppressant medicines).

The mechanism of this decrease in the division of lymphocytes was determined in another series of experiments. We were able to show that these lymphocytes from marihuana smokers could not increase the DNA production required for their proper division. DNA (desoxyribonucleic acid) is the basic chemical contained in the core of all cells. It carries the genetic code for heredity.

Similar observations were made on lymphocytes taken from subjects who did not smoke marihuana, but which were exposed in the laboratory to the drug. These cells were incubated in a test tube with very minute amounts of THC (THC is the active ingredient responsible for the effects of marihuana). They presented the same impairment in division and DNA production as those taken from marihuana smokers.

Our results confirmed those of Dr. Stehchver, from the University of Utah Medical School, who observed an increase in chromosome breakage in the lymphocytes of marihuana smokers.

Other scientists have made similar observations on other cells. Dr. Leuchtenberger, from the University of Lausanne, showed that lung cell cultures exposed to marihuana smoke did not grow properly and presented an abnormal DNA production. Dr. Zimmerman, at the University of Toronto, reported that the growth of tetrahymena, a microorganism, was diminished by miniscule amounts of THC which interfered with DNA synthesis.

How is it that the weekly consumption of only 3 to 4 marihuana cigarettes containing 15 to 20 mg. of THC may induce such celluar damage? The answer may lie in the fact that the active ingredients of marihuana, THC, are insoluble in water and are stored in fat tissue. The excretion from the human body of a single dose of marihuana requires more than one week's time. People who smoke marihuana more than once a week will store its by-products in the liver, lungs, brain, spleen, lymphoid tissues and sex organs (testes and ovaries).

The fact that marihuana products are stored in the sex organs, together with the known cellular alterations related to marihuana, raises the possibility that marihuana might adversely affect the sex cells of men and women.

It is most urgent that we learn to what extent frequent use of marihuana will impair the genetic equilibrium of a person's sex cells. The hereditary fate of future generations may rest upon this research.

DID YOU KNOW? Since men constantly produce millions of sperm, the formation of sperm probably returns to normal when pot smoking is stopped, but the effect on women could be lasting. A female is born with about 400,000 eggs. If they are injured, there is no way to repair the damage. It has been proven that THC accumulates in the ovaries as well as other organs.

Gabriel G. Nahas, M.D., Ph.D., who was decorated by the French and British governments for his work in the French underground during World War II, is now Professor of Anesthesiology at Columbia University College of Physicians and Surgeons in New York City.

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Cannabis 1988
Old Drug, New Dangers
The Potency Question

TOD H. MIKURIYA, M.D.* & MICHAEL R. ALDRICH, PH.D.**

The story of the new, allegedly stronger and more dangerous marijuana was rebirthed in January 1986 by the late Sidney Cohen, M.D., Professor of Psychiatry at UCLA: ''. . . material ten or more times potent than the product smoked ten years ago is being used, and the intoxicated state is more intense and lasts longer." In addition, Cohen (1986) asserted that ''the amount of THC [tetrahydrocannabinol] in confiscated street samples averaged 4.1 percent THC during 1984. The sinsemilla varieties were about 7 percent with some samples reaching 14 percent. . . . all marijuana research to date has been done on 1 or 2 percent THC material and we may be underestimating present day smoking practices."

The average potency of marijuana samples seized by the Drug Enforcement Administration (DEA) increased from 0.5 percent THC in 1974 to 3.5 percent in 1985-1986, with sinsemilla (seedless marijuana) at 6.5 to 12 percent, announced Dr. Richard Hawks of NIDA later that year (Kerr 1986: 1). ''Parents who experimented in their youth are not aware that the potency is much higher," added Donald M. Delzer, Chairman of the National Federation of Parents for Drug Free Youth (Kerr 1986: 18).

''Now perceived as a hard drug, marijuana has increased 1,400 percent in potency since 1970," proclaimed the flyer of a national conference on marijuana (Henry Ohlhoff Outpatient Programs 1986). Drug abuse treatment professionals soon elaborated on the outcry. Tennant (1986) asserted that the drug of the 1970's contained one to three percent THC, while that of the 1980's contained five to 15 percent. Furthermore, the brain registers the difference exponentially, so the difference between one percent and 10 percent THC was not nine percent, but more like 900 percent (Garcia 1986: 3). Smith (1987) stated that Cohen ''taught us that marijuana was a lot more dangerous than we originally thought, particularly with the use of more potent preparations by young people." Inaba (1987) added that ''this new, stronger marijuana has a more disruptive effect on brain chemistry and body physiology than we had imagined previously," and mentioned heretofore undescribed side effects among athletes: ''Baseball players who get beaned a lot admit to smoking marijuana. It impairs their ability to follow the ball."

In a column for drug abuse counselors, Meyers (1987) advised ''supportive therapy" for the effects of the ''new" marijuana, which were described as ''depersonalization, disorientation, derealization, changes in perception, and alterations in body image . . . acute brain syndromes with temporary clouding of mental processes . . . a change of time sense---where minutes seem like hours---slowed thinking, and feared perception of brain damage." Schick Shadel Health Services drug abuse treatment clinics (Unsigned 1987) now advertise that ''marijuana has increased THC content from one percent THC in 1975 to six to fourteen percent THC in 1985 due to hybridization techniques. . . .

For those who have become addicted to marijuana, whether it was years ago, or recently, treatment is necessary---even more critical today."

Despite the respectability of these authorities, none of these alarming claims are new, and neither is the potency issue. There are several claims intertwined: (1) that the marijuana available today is much stronger than that available previously, particularly since the early 1970's; (2) that the effects of this so-called new marijuana are different from effects known earlier; and (3) that all previous marijuana research has been done with weak material and is therefore irrelevant. Before leaping on the bandwagon, one should examine the validity of these assertions.

HISTORICAL PERSPECTIVE

Extremely potent marijuana has been described for 150 years by Western scientists and (with the possible exception of the bean-ball syndrome) so have the effects of the new marijuana. There has been a great deal of research on high-potency cannabis in many countries.

In the paper that introduced cannabis to Western medicine, O'Shaughnessy (1839) discussed the widespread social and medical uses of ganja (sinsemilla) in India and noted symptoms of ''delirium which the incautious use of the Hemp preparations often occasions, especially among young men first commencing the practice." Cannabis tinctures soon appeared in Europe and America (Robertson 1847; Savory 1843) and Fitz Hugh Ludlow (1857) described florid psychedelic trips after their oral ingestion, including all the symptoms mentioned by Meyers (1987). The Ohio State Medical Society (McMeens 1860) reviewed some 15 years of clinical experience with the drug and acknowledged

the intense but physiologically benign mental effects caused by high doses or idiosyncratic sensitivity.

Wood (1869) reported the subjective effects of a tincture made from North American marijuana, experiencing a distortion in time sense, convulsions and memory loss, but no adverse aftereffects. He reported considerable success with it in the treatment of severe neuralgia. However, 15 years later Wood and Smith (1884) commented on the variable potency of cannabis and outlined appropriate treatment for overdoses in medical practice.

Early investigators (McMeens 1860; Bell 1857) attributed this variability to ''defective pharmaceutic processes" employed in foreign countries, and recommended that extracts prepared at home would be preferable. However, extreme variations in locally manufactured preparations were soon recognized in the Dispensatory of the United States (Wood & Bache 1868: 379-382). A practical bioassay technique was gradually perfected starting from the systematic observations of Hare (1887), followed by Evans (1894) and Marshall (1898), to compensate for batch-to-batch potency variations.

Pragmatically, the solution to the overdose/potency problem in both the United States (Wood & Bache 1868: 382) and England was to titrate the dose. In London, a patient who signed a letter to the editors of Lancet, W.W. (1890) reported a typical case: W.W. had inadvertently been given an overdose of cannabis for treatment of neuralgia by his doctor and had suffered perceptual distortion, agitation, mood swings, and fear of death. Sir J. Russell Reynolds, M.D., F.R.S., physician to Queen Victoria's household, responded with a recommendation based on 30 years of experience with the drug (Reynolds 1890), stating ''that Indian hemp, when pure and

administered carefully, is one of the most valuable medicines we possess. . . . a minimum dose should be given to begin with, and . . . the dose should be very gradually and cautiously increased."

During the nineteenth century, social and scientific research on marijuana, as well as tinctures, were conducted with much stronger material than is available on the illicit market today. For example, the Indian Hemp Drugs Commission of 1893-1894 investigated the social, religious and medical uses of bhang (marijuana), ganja (sinsemilla) and charas (hashish). The potencies of varieties from different parts of the subcontinent were evaluated by government chemists and botanists (Evans 1894; Hooper 1894), using the ''acknowledged superiority" of Bengal ganja as the standard. The Commission found that the moderate use of even highly potent marijuana caused no significant physical, mental or moral damage (Kaplan 1969; Mikuriya 1968).

In the 1890's, at the peak of medical interest in the drug, British chemists (Wood, Spivey & Easterfield 1899) isolated an impure active principle, cannabinol, using a ''red oil" distilled from Indian cannabis as a starting point, which was considered to be the active ingredient until the 1930's (Work, Bergel & Todd 1939; Cahn 1931). In 1909, Marshall demonstrated that oxidation during storage was the primary cause of the drug's variable potency. With this advance the pharmaceutical industry shifted its attention to the production of standard extracts that could be used to assay medicinal compounds (Colson 1920). Because it had long been known that ganja and charas produced the most reliable extracts (Wallich 1883; Robertson 1847), in practical terms this meant the European and American producers had to learn how to grow ganja.

Sinsemilla cultivation by the Indian technique of culling male plants from the fields before female plants could set seeds---the very process to which recent researchers attribute the potency of the new marijuana---was exhaustively described by the British government in India (Kaplan 1969: 59-84; Prain 1893; Kerr 1877). In an effort to promote Bengali ganja, the British Raj imposed an export duty on inferior Bombay ganja at the turn of the century, and pharmacognosists in Europe and the U.S. began learning sinsemilla cultivation (Mair 1900).

Holmes (1900) discussed the potencies of Calcutta and Bombay ganja and recommended that the former be used for pharmaceutical preparations, either by home cultivation of ganja according to the Bengal methods he outlined (Holmes 1902a) or by extracting it immediately in Bengal and shipping it in tightly closed containers (Holmes 1902b). Comparing the potency of cannabis from Uganda, France and India, Holmes (1905) urged that only Indian sinsemilla preparations be admitted to the British Pharmacopoeia.

Likewise, Whinery (1909) and Hooper (1908) described ganja cultivation and manufacture, pointing out that cannabis grown in North America by the Indian methods could be as fully potent as Indian hemp. The National Standard Dispensatory of 1909, which included medicines from the pharmacopoeias of the U.S., Britain and Germany, gave the details of sinsemilla cultivation and featured a drawing of a perfect Calcutta ganja flower top (see Figure 1) as an example to be emulated by Western cultivators (Hare, Caspari & Rusby 1909: 374).

In the U.S., Hamilton and his colleagues (Hamilton 1918; Hamilton 1915; Hamilton, Lescohier & Perkins 1913; Houghton & Hamilton 1908) demonstrated that if care was exercised in cultivating and processing

the plant for extraction, American-grown ganja and its extracts were as reliable as those from India and would not deteriorate significantly if stored properly. Information on cultivation of extremely potent seedless marijuana was thus widely disseminated to Western pharmaceutical producers during the first two decades of the twentieth century.

The U.S. government ignored these sensimilla cultivation techniques at the first federal marijuana farm established in 1904 on the Potomac Flats (where the Pentagon now sits) in Washington, D.C. (Silver 1979: 262-263), and as a result the 10-foot marijuana plants grown there and elsewhere in America proved to be much less potent than good samples of Indian hemp (Eckler & Miller 1912). However, private pharmaceutical firms were more successful. The Eli Lilly and Parke-Davis companies ran a cooperative venture at Parkedale (Parke-Davis's farm near Rochester, Michigan) from 1913 until 1938 to develop cannabis extracts for medical use, at first from Cannabis indica, but later standardized on a highly potent strain they developed that they called Cannabis Americana (Wheeler 1968). Pharmaceutical companies were marketing cannabis extracts that were uniformly effective at 10 mg dose levels (Parke-Davis & Company 1930: 82) 11 years before its official removal from medicinal availability.

In 1941, cannabis was removed from the United States Pharmacopoeia (USP) at the behest of the Federal Bureau of Narcotics, which suddenly claimed that marijuana had no medical uses (Mikuriya 1973: xx). Yet even the removal of cannabis from the USP did not end scientific and social research on highly potent forms of cannabis, ranging from the red-dirt marijuana of the Midwest to the red oil of the laboratories. Adams, Pease and Clark (1940) described improved procedures for preparing purified red oil from Minnesota wild hemp,

and comparison of the potencies of Minnesota marijuana and red oil was of significant interest to Loewe, pharmacological director of the LaGuardia Committee (Mayor's Committee on Marihuana 1944: 186ff). Red oil concentrates were used along with marijuana in the LaGuardia Committee's experiments on prisoners, under Loewe's personal direction (Mayor's Committee on Marihuana 1944: 32); for a subjective account see Mezzrow and Wolfe (1946: 317ff). In the 1940's, Adams and Loewe in the U.S. and Todd in England isolated other cannabinoids, including THC, which Adams (1940) postulated as the active principle.

Such isolates were the mainstay of marijuana research during the 1940's and 1950's. A potent marijuana oil created as a truth drug for interrogation purposes by the Office of Strategic Services during World War II (Lee & Shlain 1985: 3-5) was the forerunner of later clandestine experiments conducted by the CIA and the Department of Defense at the Edgewood Arsenal in Maryland from the 1950's to the 1970's (Mikuriya 1973: xxii). Experiments with the designer drug synhexyl, a potent analog of delta3-THC, were conducted from the 1940's (Adams et al. 1941) until the mid-1970's (Lemberger 1976; Pars & Razdan 1976), but were abandoned before its potential was fully explored.

In the 1960's, the identification of pure delta9-THC as the active principle in cannabis (Gaoni & Mechoulam 1964) made it possible to assay the relative potencies of cannabinoids directly in human subjects (Isbell et al. 1967). Although Weil, Zinberg and Nelsen (1968) demonstrated the safety of human marijuana research, much of the U.S. research of the 1970's was conducted with low-potency marijuana because the government would not approve human research with

high-potency strains. Indeed, in one early study (Jones & Stone 1970), a THC concentrate was removed from Mexican marijuana and then redistributed back into the bulk marijuana to return its potency to 0.9 percent THC. Outside the U.S., these strictures did not apply: The fact that cannabidiol interferes with the effects of delta9-THC was discovered in Brazil, using both purified cannabinoids on humans (Karniol et al. 1974).

The 1960's and 1970's saw a worldwide flowering of cannabis research, including its social, psychological, chemical, botanical and legal aspects as well as covering an enormous range of potencies and dosages. Major botanical work involved potency questions: observing phenotypes at the University of Mississippi (Fetterman et al. 1971) and in Canada (Small 1979); establishing a lectotype for Cannabis sativa L. (Stearn 1974); distinguishing C. sativa from C. indica and C. ruderalis (Schultes et al. 1974); and cultivation techniques for increased THC production (Clarke 1981; Frank & Rosenthal 1978).

Thus the claim by Cohen (1986) that "all marijuana research to date has been done on 1 or 2 percent THC material" is not accurate for the 1970's or for any other decade going back to 1839. It ignores much of the laboratory research in the U.S. that was summarized by Cohen himself (Cohen & Stillman 1976), Hollister (1986) and the National Academy of Sciences (1982), and all of the social research on high-potency marijuana in Jamaica (Rubin & Comitas 1975; Bowman & Pihl 1973), Costa Rica (Carter & Doughty 1976), Greece (Fink et al. 1976) and Africa (DuToit 1980). It is difficult to think of any country in which the claim is true.

RECENT ESTIMATES OF POTENCY

Since the advent of quantitative analysis technology, there has been sporadic reportage of the percentage of delta9-THC and other cannabinoids in natural and semisynthetic cannabis products. Notwithstanding the psychophysical effects of other cannabinoids, the amount of THC present in a marijuana sample is believed to determine the drug's potency (National Commission on Marihuana and Drug Abuse 1972: 50), and potency is usually expressed in percent THC by weight. The results of quantitative analyses performed on street samples of marijuana have been published since the late 1960's. These results are generally higher than the alleged 0.5 percent THC content of marijuana cited for the early 1970's.

Lerner and Zeffert (1968) described the development of quantitative analysis for the determination of THC content, and noted much variation among samples of marijuana, hashish, and red oil (still being used experimentally in the 1960's). The THC content of confiscated Mexican marijuana was 0.8 to 1.4 percent, hashish averaged eight percent and red oil 31 percent in 1968.

Quantitative analyses of street samples of marijuana and hashish conducted by Canadian laboratories in 1971 for the Commission of Inquiry into the Non-Medical Use of Drugs (1972: 28-29) showed a range of 0.02 to 3.46 percent THC (median=0.93%) for marijuana, with hashish ranging from 1.0 to 14.3 percent THC (median=4.82%). Samples seized in police raids were less potent: marijuana was 0.05 to 1.65 percent THC (median=0.21%), while hashish was 0.0 to 8.6 percent THC (median=1.3%). The reported difference between confiscated police seizures and street samples submitted to laboratories for analysis may be due to the voluntary samples being submitted precisely because of their extraordinary potency, or that storage conditions in police evidence lockers are hardly optimal for potency stability.

This has a bearing on the potency question because the low potency cited by both Cohen (1986) and Hawks (see Kerr 1986) referred to samples confiscated by the DEA. It has been known since the early days of its isolation (Wollner et al. 1942) that THC oxidizes to cannabinol rapidly in samples stored at room temperature (24oC). Lerner (1963) reported that the concentration of THC in marijuana decreased at a rate of three to five percent under normal room conditions, and Razdan (1970) reported a rate of 10 percent per month. The influence of temperature, light and age on potency was addressed by Starks (1977: 13-15). The low-baseline percentage of THC reported for the early 1970's may be due to this deterioration in confiscated, stored samples. In any case, the low baseline makes the difference in the THC content of later-reported samples appear much greater than it may have been in actuality, assuming that the marijuana smoked by consumers was fresher than stored police seizures.

For a short while in the early 1970's, PharmChem Laboratories in Palo Alto, California, tested and reported the percent of the THC content in anonymously submitted marijuana samples. For 1973, PharmChem reported an average THC content of 1.62 percent in marijuana, compared with hashish at 4.6 percent and hash oil (a refined extract of hashish) at 13.5 percent (Ratcliffe 1974).

In 1974, the DEA published guidelines that no longer allowed laboratories to provide quantitative results directly to the sample donors. This, in effect, restricted public access to analysis information to whatever government officials wished to reveal. However, nonspecific summaries of THC percentage ranges were allowed to be published (Unsigned 1974).

The results of an independent examination of gas-liquid chromatographs of street samples of marijuana from California that

were submitted to PharmChem during 1973 and 1974 are shown in Table I.
Seeded varieties ranged in THC from an average of 2.2 percent (Mexican) to 4.9 percent (Panama Red), while sinsemilla averaged 2.8
percent for Big Sur ''Holy Weed" to above six percent for Thai Sticks
and Hawaiian ''Maui Wowie." This would appear to be a much more
representative sample of the types of marijuana available in California in 1973-1974 than the half-percent grade cited by Cohen
(1986) and Hawks (see Kerr 1986), or the one to three percent grade
cited by Tennant (1986).

A retrospective summary of street-drug analysis trends from 1969
through 1975 published by PharmChem (Perry 1977) confirms the fact
that quite potent forms of cannabis were available on the illicit U.S.
market by 1975: ''Early quantitative work showed a range of 1.0-2.5
percent THC for average marijuana. In 1975, the range was 1.0-2.5
percent; samples in the range of 5.0-10.0 percent were not uncommon,
and some contained as much as 14.0 percent THC. . . . Hash oil
(concentrated from hash, usually amber or red in color) and grass oil
(from marijuana, dark green or black in color) . . . vary greatly in
potency, some samples [containing] up to 40 percent THC." Abundant
information on the comparative potencies of cannabis grown in the U.S.
and other countries in the mid-1970's was summarized by Starks (1977:
41-87).

In the spring of another election year, 1980, Cohen and DuPont
launched a similar campaign, stating that confiscated marijuana in
1975 contained only 0.4 percent THC, while in 1979 the average was
four percent, a 10-fold increase (Brody 1980: C1). This data conflicts
directly with that published by PharmChem for 1975 street samples
(Perry 1977) and that shown in Table I. Perhaps one should be thankful

that, according to these estimates, marijuana potency dropped from four percent THC in 1979 to 3.5 percent THC in 1986 (Kerr 1986).

The most recent comparison of cannabis potencies was compiled from published sources from 1972 through 1981 by the National Academy of Sciences (1982: 16), and is summarized in Table II. It again demonstrates the great range of products available legally (i.e., NIDA samples) and illegally during that decade, and may in fact underestimate some potencies. For example, the 2.8 percent THC content cited for Jamaican ganja (Marshman, Popham & Yawney 1976) is slightly lower than the mean 2.96 percent THC material studied by Rubin and Comitas in 1970 through 1972 (Unsigned 1973), and significantly lower than the four to eight percent THC Jamaican ganja cited by the National Commission on Marihuana and Drug Abuse (1972: 50).

The government ''research harvests" in Table II (Rosenkrantz 1981) are considerably less potent than the sinsemilla samples that averaged three to 11 percent THC (Turner 1981, 1980). Perhaps this is because cultivators at the government marijuana farm at the University of Mississippi, like their predecessors in 1904, never learned proper sinsemilla cultivation (Turner et al. 1979), while illicit cultivators in California and Hawaii were making it standard for the industry (Frank & Rosenthal 1978: 258-259). If so, this alone could explain the wide discrepancies between the potency of marijuana reported by government sources and that actually being grown in the U.S. during the 1970's and 1980's.

SELF-ADJUSTMENT OF DOSE

An important consideration in regard to the potency issue is autotitration, the adjustment of dose by the individual user to obtain

optimal effects and avoid unpleasant ones. As noted above, cautious titration of dose was standard practice when cannabis preparations were used in medicine. Smoking marijuana, customary in present social use of the drug, requires knowledge of when to stop in order to avoid symptoms of overdose. The smoked route gives rapid feedback to the user with regard to levels of effect because the drug goes directly to the brain from the lungs, unimpeded by the gut or the liver.

Researchers for the Mayor's Committee on Marihuana (1944: 13) were among the first to notice that experienced marijuana smokers in the ''tea-pads" of Harlem routinely practiced autotitration. The confirmed user, they noted, ''appears to be quite conscious of the quantity he requires to reach the effect called 'high.' Once the desired effect is obtained he cannot be persuaded to consume more. He knows when he has had enough . . . and is ever-conscious of preventing himself from becoming 'too high.'" Similarly the Commission of Inquiry into the Non-Medical Use of Drugs (1972: 48) observed that ''great variations in potency are usually accommodated by the experienced user through a 'titration' of dose (intake is reduced or stopped when the smoker reaches the preferred level of intoxication)." For U.S. users, the National Commission on Marihuana and Drug Abuse (1972: 166) commented: ''. . . whatever the potency of the drug used, individuals tend to smoke only the amount necessary to achieve the desired effect."

SUMMARY AND CONCLUSIONS

Observation of the real world of social marijuana use, where autotitration is the norm, renders the scare tactics of the new marijuana proponents not only inaccurate but irrelevant. There is much

published evidence about the availability of highly potent varieties of cannabis from the nineteenth century through the present day. The effects attributed to the new marijuana are the same ones debated for centuries in many different cultures. The assertion that ''all marijuana research to date has been done on 1 or 2 percent THC material" (Cohen 1968) ignores several thousand years of human experience with the drug. The old medical cannabis extracts were stronger than most of the forms now available, though the potency of illicit hash oils by the mid-1970's was approaching the level of medicinal preparations available before their removal from the USP.

While it may be true that sinsemilla is more widely available than 10 or 15 years ago, its potency has not changed significantly from the 2.4 to 9.5 percent THC materials available in 1973-1974 (see Table I), or the five to 14 percent sinsemilla of 1975 (Perry 1977). The range of potencies available then (marijuana at 0.1% to 7.8% THC, averaging 2.0% to 5.0% THC by 1975) was approximately the same as that reported now. With such a range, the evidence simply cannot support the argument by Cohen (1986) that marijuana is ''ten or more times more potent than the product smoked ten years ago." And to say that marijuana potency has increased 1,400 percent since any date in history is patent nonsense.

It is not legitimate to imply that average low potencies represent the full range of potencies available in reality. Neither is it valid to cite the low end of the range then as a baseline to compare with the high end of the range now. The claimed baseline for THC content in the early 1970's would appear to be too low, probably because confiscated, stored police samples were utilized; and this low

baseline makes the claimed difference in potency appear to be greater
than it has been in reality.

In sum, the new marijuana is not new and neither is the hyperbole
surrounding this issue. The implications of the new disinformation
campaign are serious. Many people, particularly the experienced users
of the 1960's and their children, will once again shrug off the
warnings of drug experts and not heed more reasonable admonishments
about more dangerous drugs. This is not only abusive to those who look
to science, the medical profession, and government for intelligent
leadership, but will sully the reputations of drug educators who
wittingly cry wolf, and will inevitably diminish the credibility of
drug abuse treatment professionals who pass on such flawed reports.

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\F0\cCOMPREHENSIVE RATIONAL
\cDRUG ABUSE CONTROL
\c- A PROPOSAL\f1

Tod Mikuriya, M.D.
Berkeley, California

\f0Summary\f1

A compelling need exists for a COMPREHENSIVE, rational, realistic, and equitable change in laws pertaining to psychoactive substances in order to achieve any substantive control. The current crazy-quilt of traditions and selective contradictory application of laws are based upon denial, hypocrisy, and competing special interest groups' priorities and needs, which harm society in general. The specific proposals for reform are:

1. Remove exemptions from product liability laws for alcohol and tobacco products.

2. Share liability for medical and casualty losses from alcohol and tobacco products.

3. Repeal all "sin" or excise taxes that cause inherent conflicts of interest within the government.

4. End price supports for tobacco and deregulate tobacco farming.

5. Set up drug users cooperatives run by consumers, medical societies, and pharmacies.

6. Legalize marijuana with free cultivation for personal use by adults.

7. No testing of body fluids, brain waves or muscle movement patterns without probable cause or due process guarantees. Those ordering the test subject to drug testing themselves.

\f0Introduction

\f1Despite continuing valiant efforts by enforcement and corrections sectors, a growing awareness exists that the government's war on drugs is being lost. Control by criminalization as a social policy has failed, and casualties of secondary crime only evidence surface manifestations of the harm to society. A massive and uncontrolled underground economy is fueled by a market of eager consumers in whom a powerful pharmacologic reflex has been carefully cultivated by advertising from an early age.

Outspent and outmaneuvered by organized and entrepreneurial criminal elements, the least competent overpopulate jails, prisons, court dockets, and probation case loads. Resources are diverted from protecting the public from other serious crime.

Alcohol and Tobacco

\f0Tobacco\f1

The Southeastern colonies' economy was founded upon and still depends greatly upon tobacco. Principal American founders ran large plantations that cultivated the drug. North America was (and still is) the largest grower and producer of smoked addictive psychoactive substances for ourselves and the world. Well-financed, powerful political forces effectively represent the tobacco industry and successfully resist efforts to curb print advertising and other marketing efforts inducing people to take on a tobacco habit.

Local, state, and federal governments are hopelessly addicted to revenues from tobacco excise or sin taxes that, in addition to supporting the revenue collectors, contribute to general fund revenues.

\f0Alcohol\f1

The famed repressiveness of the puritans did not extend to the alcohol use. The colonial days were awash with fermented and distilled spirits. (Beer,

ale, stout, and naturally fermented wine with less than 12 percent alcohol vs. rum, whiskey, brandy, vodka or gin with over 40 percent.) Rum punches, toddies, and ciders were consumed starting in the morning as "eye openers" for men, women, and children. That good old time religion meant getting together with your neighbors to share rum punch and enthusiastic exhortations against Satan.

The Temperance movement grew from reactions to the excesses in 19th century England, where ubiquitous London gin shops guaranteed "Drunk for one pence, dead drunk for two with straw to sleep on." Both were imported into Colonial America. Temperance discouraged intemperate use of distilled spirits and favored the moderate use of fermented spirits.

With the industrial revolution in the first half of the 1800's, the incompatibility of widespread daily intoxication and drunkenness with efficient factory operations was recognized.

\f0America Polarizes;
A War Against Alcohol is Won and Lost\f0
The Temperance Movement Becomes the Prohibitionist Party

\f1In 1869 the Temperance movement hardened into the Prohibitionist movement, which demanded total alcoholic abstinence. Zealotry flourished. The Drys overcame the Wets state by state over the next fifty years. In 1919 the Prohibitionist party and their sympathizers finally realized their divinely inspired moralistic goal of the national prohibition of alcohol.

Even the most virulent anti-drug extremist admits that prohibition failed disastrously. It established and capitalized organized antiestablishment crime, whose ranks were filled by recently immigrated minorities. Public confidence in law enforcement was shaken by widespread graft and corruption. The grand American social experiment of legislated morality ended after 14

years in the depths of the great Depression as part of a general repudiation of the previous administration's policies.

The pendulum has swung the other way. Emboldened by a privileged freedom, the alcohol industry aggressively hawks its wares, appealing to insecurity and needs for social acceptance. Enmeshed in a symbiotic relationship with government hopelessly dependent upon excise revenues and political contributions, the alcoholic beverage industry controls the government rather than vice-versa. A form of attitudinal blackmail still remains from the colonial days: Men who cannot handle their liquor are still regarded as weak or suspect as to their manliness. Legislatures and other representative bodies are still governed by this pathologic pharmacologic machismo. Alcohol excise or sin taxes are regarded as the least unacceptable to levies of guilt tithes for the users and producers.

\f0Fiscal Institutionalized Denial:
\f0Alcoholism Treatment Programs: Last to be Funded and First to be Cut.

\f1While billions of excise and sales taxes collected from users invariably find their way into the general fund, monies for the treatment of alcoholism and related illnesses remain the lowest priority at all levels of government. In times of financial crisis, these services are the first to go. The compartmentalization and disjointedness of public opinion and the resultant public policy is nowhere more evident.

It would be appropriate to study the comparative public revenues from sales with expenditures for treatment of alcohol and tobacco related diseases, trauma, and property costs. My global impression is that the costs far outstrip the revenues. It would be useful to develop a social policy that

minimizes overall costs to society. The earmarking of excise and sales revenues to pay these costs would improve levels of awareness of the connection of these drugs' use with the adverse consequences of abuse. Sadly, institutions continue to reflect a fragmented, flawed, and fictionalized perception of reality preventing meaningful solutions to substantial self-imposed biosocial problems.

\f0Shared Liability:
Partial Remedy for Alcohol and Tobacco Abuse
\f1

A precedent for drug liability was set by the 1964 settlement of the thalidomide case. The manufacturer of this minor tranquilizer paid huge sums of money for birth defects caused by mothers taking the drug in the first pregnancy trimester. But how is it that the manufacturers of alcohol and tobacco, whose effects are far more toxic and much more widely used, have been able to evade responsibility for the well-known adverse effects? The endemic and blatant denial that alcohol and tobacco are indeed drugs. While medicine and science regard these psychoactive substances as drugs, the body of common usage expressed in the laws defines alcohol and tobacco as things other than drugs. The same patterns of denial seen in individual abusers of these substances is recapitulated collectively in public opinion and articulated through institutions, customs, and laws.

This flawed collective perception distorts resulting public policy, causing it to resemble "Through the Looking Glass" rather than a logical, thoughtful product of an enlightened society dedicated to decency and reason. How else can one rationalize attempting to discourage smoking while subsidizing the growth of tobacco?

The proposed salient change is based on the premise that alcohol and tobacco are dangerous drugs. Groups profiting from producing, processing, and

trafficking should bear partial responsibility for adverse reactions through failure to adequately inform the user. Users, however, bear ultimate responsibility for the invocation of adverse or untoward reactions from alcohol and tobacco. Government programs are largely ineffectual or often worsen drug problems.

\f0I. Repeal Product Liability Exemptions for Alcohol and Tobacco\f0 With Temporary Shared Liability for Restitution
\f1

In order to end generations of victimization by these industries that continue to evade their share of social responsibility and prey on human frailty, fairness calls for a period of restitution to equalize liability. Because of a history of deceptive advertising that has systematically omitted cautionaries or warnings about adverse effects, it would not be unfair for them to bear the responsibilities for a share of the medical and casualty losses caused by their products...say 49 percent through an industry assigned risk pool. The individual should still be liable for the majority of the responsibility for his or her conduct and pay 51 percent of the medical and casualty costs.

\f0"Sunset" Period of Industry Restitution\f1

The restitution period should continue for a length of time required to attain a public truly informed of the use of these drugs - perhaps for an equal number of years from the implementation of this policy going back to date of prohibition's repeal.

\f0Self-restraint in Advertising.\f1

Resulting advertising practices would become appropriately cautious and prudent since corporate counsel would carefully screen advertising campaigns to minimize liability exposure.

\f0II. Abolish Excise or "Sin" Taxes\f1

Sumptuary or excise taxes constitute a breach of the separation between church and state. Separation is violated by the extraction of a payment for using a disapproved substance. Detoxification from dependence on revenues derived from excise taxes would remedy an inherent governmental conflict of interests.

\f0III. Illicit Drug Control

Historical\f1

The passage of the Harrison Narcotics act of 1914 nationally defined drug dependence problems as MORAL DEFECT that call for retribution or deterrence; not mental or physical diseases that require medical intervention. Since then, police, courts, and prisons have been utilized in attempts to prevent nonmedical drug use with retributive methods. Despite vigorous and continuing efforts at great expense over the years to enforce these laws, there has been minimal impact on illicit drug trafficking. Noxious side-effects of this criminalization include increased primary and secondary crime motivated by high illicit profit margins, diversion of police services corruption, crowded prisons, and more red tape for the health professions. Ineffectual, self-serving, expensive government agencies rationalize their continuing existence as they claim to protect us from the drug abuse menace.

Most recently, the dramatic escalation of the use of urine drug screens to ever widening populations in the workplace and on the highway afford the use of police and administrative penalties. WRONGDRUG has become the moral jihad of the decade. Despite protestations of medical interventions, and lip service to the disease of drug abuse, the overbearing presence and use of the enforcement/corrections resources prevails. Fueled by martial rhetoric the War Against Drugs inflames the passions of middle America to ferret out the sources of "trouble in River City".

Assisted by the defacto assumption that this is proper behavior for public and workplace authority, growing numbers of citizens face random urine testing by reason of circumstance, not probable cause. Vulnerability to this intrusion is not equal, but a function of status.

\f0Semantic Abuse\f1

The term "controlled substances" is a euphemism like "intelligence" as in CIA or "security" as in weapons for a foreign country. Illicit drug traffickers continue to operate beyond society's control. These drugs should more properly be called \f2uncontrolled substances. \f1Unconstrained by budget, protocol, or interagency bickering only the least competent or unlucky illicit traffickers get caught, leaving the rest to enjoy untaxed profit margins at least ten times that of the same drugs sold through legitimate channels.

The following scheme would effectively eviscerate the illicit market by making the drugs available to the public on a non-prescriptive, medically controlled basis. By definition, a smaller population of drug criminals thus created would be much more effectively and economically targeted by enforcement agencies. Drugs would come in off the streets back into the pharmacies where they belong.

More importantly, currently illicit drugs would cease to have the appeal of "forbidden fruit", losing the allure of life in the fast lane and an oppositional way of defining adolescent independence. The demographic alteration would revert to an older population like those in the pre-criminalization before 1914, with the motive of palliating disease and discomfort rather than anger and thrills.

\f0 Voluntary Drug Users Cooperative\f1

The demonstration project proposes a voluntary, non-prescription controlled substances dispensing program supported by its consumers and supervised by the local medical society, pharmacy society, users, and the public.

All revenues derived from transactions are earmarked for support of program which include:

1. Dispensing
2. Administration
3. User Education
4. Treatment of Adverse Reactions
5. User Health Survey
6. Research

\f0Method\f1

Users would be eligible to enter the program at the age of majority and would be required to:

1. Undergo screening medical tests.
2. Demonstrate informed consent by passing written tests on:
   a. Mental and physical effects of specific drugs.
   b. Program rules and procedure.
   c. Personal responsibilities and liability.
3. Sign an agreement to abide by the program terms.

\f0Administrative\f1

To avoid user exploitation and provide competent guidance, the county medical society, county pharmacy society, and consumers would constitute the board of directors for this non-profit organization. It supervises a credit card type invoicing system to dispense drugs through co-operating pharmacies. This "Drug Control Agency" responds to cases of misuse (e.g. admission to hospital or emergency room visit for overdose, public intoxication, complaint of spouse, etc.) by referral to public and private community health resources or enforcement/corrections agencies, as warranted by the nature of the infraction. DCA also provides user health advisories

and updates new user test questions and education manuals. DCA coordinates
voluntary periodic health surveys and participates in research.

\f0Dispensing\f1

Controlled substances will be dispensed utilizing an embossed identification
card presented to the participating pharmacy. The pharmacy imprints a
special multi-part form sent to the bank as with ordinary VISA or MasterCard
transactions. The participating banks submit monthly drug statements
dispensed to the DCA office with accounts flagged that show unusual activity
(significant increase in number of transactions or size of order).

The DCA office first contacts the user by mail and requests him/her to
contact a designated drug abuse specialist to attempt to resolve exceptional
drug use patterns or drug related problem. If the incident is either
unresolvable or of a serious nature, such as driving under the influence or
furnishing drugs to anyone else, the case is turned over to the Department
of Motor Vehicles or the District Attorney's office.

If the user fails to respond to the mailed notice, his or her identification
card number is placed on a list of suspended users. The pharmacy informs the
user at the next transaction that dispensing the requested drugs must be in
exchange for surrendering and destroying the identification card or the
drugs are denied and the user is told to contact the drug abuse specialist.

Users may be put on probationary status or temporarily or permanently
suspended from the program. Entry dose level would be determined at final
intake interview by a drug abuse specialist and depend upon the
participant's drug history. If no data is available then a therapeutic dose
is given based upon weight or body surface area. This entry dose level then

becomes the standard against which exceptional or unusual drug use activity is defined.

\f0Financing\f1

The program would be self-supporting through fees collected from the users' transactions at a rate agreed upon by the board of directors, meeting the costs of the program providers at a reasonable consumer price. Costs would be contained by utilizing existing community facilities and proven bank and pharmaceutical transaction recordskeeping methods.

\f0. Marijuana - Legalize Growth and Use by Adults for Personal Use. Commercially Produced and Subject to Drug Product Liability Laws \f1

Current efforts to suppress cannabis cultivation or trafficking have not only failed but adversely affect enforcement, court, and corrections resources by adding to their overload. Still, marijuana crime provides a source of temptation for selective enforcement and corruption. Cannabis prohibition has created a giant underground economy with grossly inflated user costs not subject to taxation or regulation for consumer protection. Cannabis sold in crude or purified form should conform to standards and definitions in pharmaceutical preparation methods used prior to the removal of cannabis from the U.S. Pharmacopeia in 1941.

Recent efforts by the Drug Enforcement Agency to use Paraquat and other toxic herbicides to eradicate cannabis show gross irrational recklessness. Poisoning users in order to protect them from using the weed is a most dangerous and unconscionable intervention by government.

Attempting to utilize the deterrent value of having the word sent out that the cannabis crops are being poisoned, espoused by proponents within the enforcement community, harms the public since they rely on the cooperation

of the public for their effectiveness. A policy of disinformation would diminish trust for these public institutions through damaged credibility with consequent adverse effects on the delivery of enforcement services.

\f0No testing of body fluids, brain waves or muscle electrical activity without probable cause and due process.\f1

Recent technological advances have made it possible to detect the presence of most psychoactive substances with varying degrees of reliability. While it is undoubtably desirable to protect the public safety and health from impaired intoxicated behavior, safeguards must be guaranteed lest the abuses resulting from misapplication outweigh the benefits.

The drug testing industry has been notably seclusive about sources of error and observed error rates. Monitoring of laboratories by state and federal health agencies reveal significant levels of inaccuracy over the years. The recent increased levels of testing not only increase the actual numbers of false readings but the rate as well. All specimens must not only be confirmed and verified by other tests, but the sample itself retained indefinitely for possible retrospective analysis.

Recently a device was patented that alleges to identify specific drug intoxication states by monitoring brain waves and eye muscle movements. The Veritas 100 is touted to be a fairer estimate of current mental state rather than measuring drug breakdown products for what was happening hours before. Analytic methods of these complex waveforms have yet to be confirmed and margins of error and artefact remain to be defined.

The requiring of a citizen to undergo drug testing without the showing of compelling need, probable cause, and due process safeguards is far more

insidious and toxic a doctrine than any drug side effect. It poisons the very assumptions of the framers of the constitution of the sanctity and worth of the individual.

The suspension of the fourth amendment of freedom from illegal search and seizure and the fifth amendment protecting against self-incrimination are hardly trivial social costs. The attempts to implement programs that harm the individual will not only fail to deter the undesired behavior but will diminish the mutual respect and trust required for government to govern and degrade the quality of life in general.

THM Berkeley, California 8-7-86

15-year study links marijuana use to schizophrenia

NEW YORK (AP) — A 15-year study of more than 45,000 Swedish soldiers suggests that heavy marijuana users are six times more likely than non-users to develop schizophrenia.

The authors of the study said the statistical association between schizophrenia and marijuana, or cannabis, does not necessarily mean that the drug causes schizophrenia.

"Cannabis consumption might, on the contrary, be caused by an emerging schizophrenia," the researchers said in their report, to be published Thursday in The Lancet, a British medical journal.

American researchers asked about the report were not familiar with it, but Dr. Charles Schulz, chief of pharmacology research for the schizophrenia branch at the National Institute of Mental Health, said the findings did not surprise him.

"Many psychiatric clinicians have noted over the years that a patient's illness starts with marijuana use or overuse," Schulz said.

Marijuana might cause latent schizophrenia to become apparent, he said. Researchers have also noted that the hallucinogenic drug LSD can trigger persistent mental illness, Schulz said.

Furthermore, there is a chemical link that might explain why marijuana and schizophrenia would be related, Schulz said.

Schizophrenia is thought by some to be related to a disorder in the brain's production or use of dopamine, one of the many so-called neurotransmitters that brain cells use to communicate with one another.

In schizophrenics, there is evidence that the dopamine system is hyperactive, Schulz said. And, he said, "there have been basic studies demonstrating that marijuana stimulates the neurotransmitter dopamine."

The Swedish study — conducted by Sven Andreasson of the Karolinska Institute and Ulf Rydberg of Karolinska Hospital in Stockholm and their colleagues — cites numerous previous studies that have found that marijuana aggravates schizophrenia or triggers psychotic episodes.

In the Swedish study, 45,570 soldiers were given questionnaires at the time of their induction into the country's compulsory military service. They were asked about drug use, among other things. They were also given psychiatric evaluations.

Sweden maintains a national registry of psychiatric care provided to its citizens, and that was used to follow the conditions of the soldiers for 15 years.

The researchers found 197 cases of schizophrenia among 41,280 members of the group who reported no marijuana use. In contrast, 21 cases of schizophrenia were found in the 752 soldiers who reported heavy marijuana use.

From those figures, the researchers calculated that the heavy marijuana users had six times as great a risk of schizophrenia as the non-users.

Marijuana robs your body cells of energy

By ROBERT GILKESON, M.D.

No chemical can alter your mood, your feelings, your coordination or your behavior unless it has altered the cells in your brain and disrupted their normal chemical function.

Before using a drug of any kind, one should know what chemicals it contains, which cells in your brain it most affects, and what brain cell chemistry it changes.

The wall -- or the membrane -- that surrounds every cell is composed of fat (lipid) molecules and complex protein molecules. These molecules form an intricate membrane around each cell arranged in patterns specific to each cell type, according to its functions and its specific needs.

All the chemicals providing the ENERGY necessary to keep each cell alive must somehow pass through this membrane into the cell, and the waste products from its metabolism must exit through these membrane molecules back into the circulation.

This constant movement of chemicals in and out of the membrane occurs through submicroscopic channels between the lipid or the protein molecules specifically assigned for them.

MARIJUANA contains 421 bioactive chemical molecules. Sixty-one are called cannabinoids, which are extremely soluble in fat, or lipid, molecules. When inhaled or ingested, these cannabinoids become absorbed by, and remain imbedded in, the lips in the membrane of every cell in the body. Since they are of no chemical use to the cell and are hidden from the water-soluble enzymes outside the cell membrane, the cannabinoids are not broken down, but remain imbedded there for months at a time.

Whenever you smoke marijuana at a rate faster than the cannbinoid molecules can be eliminated, they ACCUMULATE in the membrane, leaving it in a chronic state of saturation. As they accumulate one after the other in the membrane, they increasingly prevent the passage of those chemicals which must enter and leave the cell. Progressively robbed of such nutrients, cells become starved and slowly lose their energy.

AFTER ONE JOINT: 40-50% of the THC remains in the membranes for four to eight days; 10-20% remains for 30-48%; 1% to traces remain in the membranes for 4-6 months.

Saturated membranes may not lose the cannabinoids for nine months or more. Smoking marijuana faster than your cells can eliminate the cannabinoids leads to their saturation of the cell membrane. As they accumulate, cannabinoids interfere more and more with cell's metabolism, decrease its energy and growth, and retard the development of every cellular system. Marijuana is concentrated in lungs, liver, kidneys, adrenal glands, ovaries, testicles, bone marrow and the brain.

The most important, the most specialized, the most complex, and the most fragile cells in the body are the 100 billion cells of the human brain, called NEURONS. These cells make 100 trillion connections or synapses along which chemical messages are passed.

The purpose of these messages is to keep track of all the other cells in the body, to keep them functioning properly, and to keep them alive. Internal messages relate the needs of the cells in the body. External messages tell us everything going on in the "outside world." The brain "reads" these messages, analyzes them, then plans and initiates the correct movements, the glandular secretions, and the other functions to meet those needs.

To pass accurate messages, sodium, potassium, calcium, chlorides and the complex messenger chemcals called neurotransmitters must all go in and out through their membrane channels in the correct amounts, in 0.4-1.0 thousandth of a second.

Because of their chemical complexity, their constant activity, and the speed at which they must operate, substances which block membranes affect neurons more than any other cells in the body.

The center of the brain coordinating the interaction of all the other brain centers and controlling the amount of brain energy is called the Reticular Activating System or the RAS. Since it makes the most connections and is always in operation, it is the most saturated and affected of all the centers. This center controls how alert we are and the level of our "consciousness." When the energy of the RAS is decreased, the energy of the entire cortex is lowered.

This activating system turns ON and increases, or turns OFF and decreases, the chemical messages between areas of the brain that regulate the very level and complexity of human thought and behavior. It regulates the intensity of messages between the centers for memory, the center for feelings, and the center for analyzing all the messages from inside and outside the body. This information in turn triggers necessary motor behavior or glandular activity.

The less energy flowing in the neuronal circuits, the less rich and sensitive our feelings will become and the less clear our imagination, plans and ideas will be.

More simply, the less energy available to run our brains, the more stupid we become.

DR. ROBERT GILKESON is a former teacher and pediatrician and now has a national reputation as a child and adolexcent neuropsychiatrist.

abuse much more often in

MARIJUANA: IT'S A SERIOUS HEALTH PROBLEM.

Marijuana contains over 400 known chemicals, and 61 of those are known as cannabinoids which affect the central nervous system. The primary psychoactive or mind-altering ingredient is called delta-9-tetrahydrocannabinol, or THC. Researchers have clearly shown that marijuana interferes with immediate memory and intellectual performance. And it can impair concentration and reading comprehension. Preliminary research has shown that the extended use of marijuana can produce severe anxiety, apprehension and fear of others.

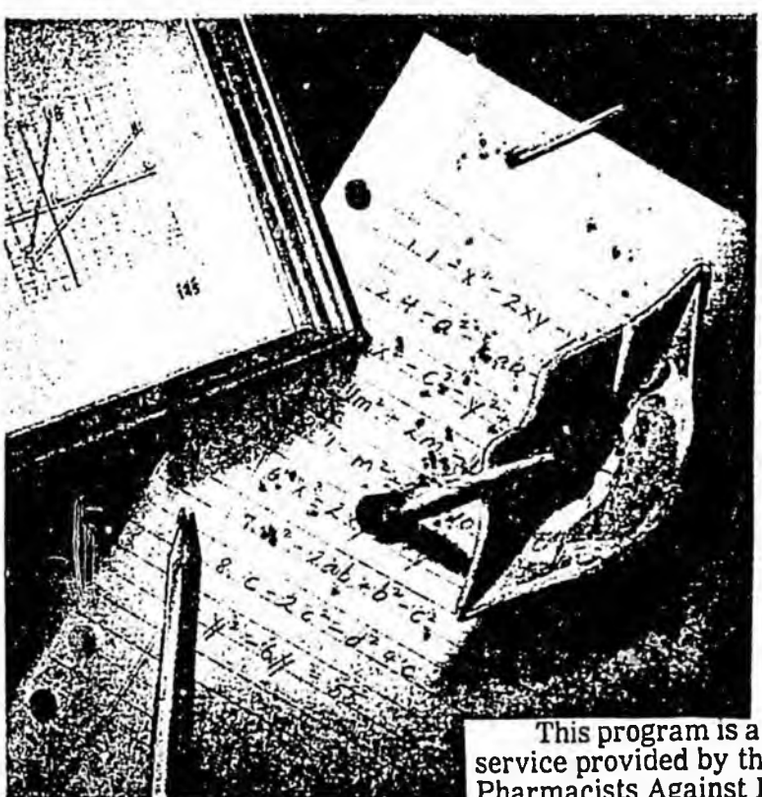
And marijuana not only has an adverse effect on the brain, it also affects the heart and lungs. Further, marijuana has a higher concentration of known cancer-causing agents than tobacco.

Studies have shown that males who use marijuana daily have a lower sperm count than those who don't. And it can reduce the body's production of testosterone – the hormone that makes men, men.

Finally, pregnant women who use marijuana are exposing their unborn children to unnecessary risks.

The source of marijuana ("grass," "pot," "weed") is cannabis sativa, a plant grown all over the world. The crumbled leaves and flowering tops of the plant are usually smoked in hand-rolled cigarettes (called "joints") or in pipes. It can also be eaten (although it takes more to produce the same effect).

Did you know that the National Institute on Drug Abuse has reported that in 1975 the average confiscated sample of marijuana contained 0.4 percent THC; in 1979, the average THC content was about 4 percent – that's 10 times stronger. Thereby increasing the physical and mental effects and the possibility of health problems for the user.



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Research Institute of Pharmaceutical Sciences
Physical Sciences Research Division
School of Pharmacy
University, MS 38677
(601) 232-5324

September 14, 1987

Det. John McIntosh
Ketchikan Police Dept.
361 Main St.
Ketchikan, Alaska 99901

Dear Det. McIntosh:

Attached is an analysis report of the marijuana sample #87-3673 you sent to our laboratory on June 19, 1987.

The material has a profile typical of drug-type Cannabis - high Δ^9-THC (4.38) coupled with little or no CBD content. The average Δ^9-THC for whole plant material is approximately 2.5%, well below the THC percentage of this plant.

If you have any questions or if we can be of service to you again, please let me know.

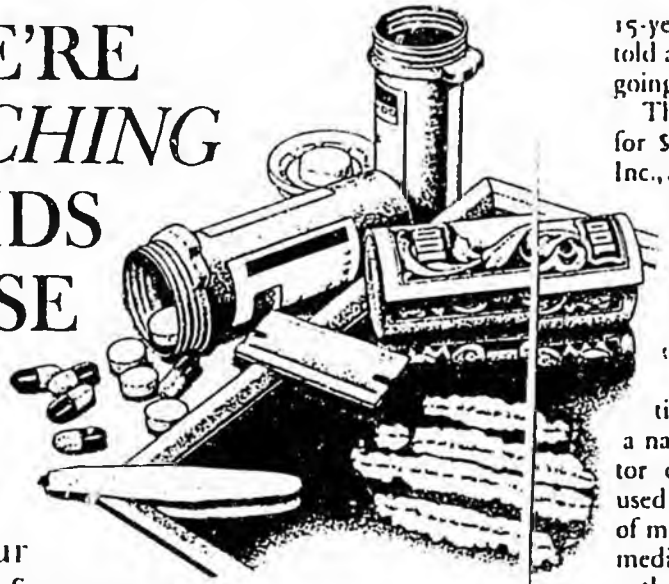
Sincerely

Carol T. Abel
Laboratory Supervisor
NIDA Marijuana Project

CTA/kkl

Enclosure

"WE'RE *TEACHING* OUR KIDS TO USE DRUGS"



The drug-education courses offered in our nation's schools too often carry this incredible message: If you do drugs "responsibly," it's okay. It's *not* okay. And it's time we told our kids the truth

By Peggy Mann

Sophomores in the health class of a Lancaster, Pa., high school were totally absorbed as a smooth-voiced narrator for the filmstrip *Marijuana Update: Its Use and Abuse* extolled the medicinal qualities of the plant, tracing its use back to the Late Stone Age. "Throughout history," he stressed, "man has been a drug user. For at least 5000 years cannabis has supplied one of his favorite intoxicants." Then he described pot's pleasurable effects: "the euphoric feeling of relaxation, contentment, inner satisfaction; the sensations of floating beyond reality."

The 55-minute cassette contained only 105 seconds on pot's possible ill effects, and it claimed that "the role of cannabis in causing them has not yet been confirmed." The final 19 minutes of the film were devoted to promoting legalization of marijuana, echoing the platform of the "pro-pot" National Organization for the Reform of Marijuana Laws (NORML).

"Obviously," said one indignant 15-year-old, "everything I've been told about pot is wrong. Now I *am* going to try it."

This filmstrip currently is sold for $179 by Guidance Associates, Inc., a large and respected producer of audio-visual materials for schools. *Marijuana Update*, released in 1975, has *never* been updated to reflect current knowledge about the dangers of pot.

During a recent presentation to a group of sixth graders, a nationally known health educator declared, "Any drug can be used in a positive manner." Typical of many mis-educators, he lumped medications and illegal drugs together; for example, he listed aspirin on the blackboard as "might be a narcotic or a barbiturate," followed by "angel dust (PCP) is an analgesic" (a pain reliever). Not surprisingly, when he asked "How many of you are drug users?" all the sixth graders raised their hands.

His further instruction included these phrases: "Heroin can be used in a bad way or a good way. It is the person who is misusing the drug—the drug itself is not bad."

National Tragedy. These are not isolated cases. Far *more* isolated are reports of schools that are doing an effective job in the drug-education area. Says Congressman Charles Rangel (D., N.Y.), chairman of the House Select Committee on Narcotics Abuse and Control, "We have a national tragedy on our hands in drug education."

In August 1986, Sen. Paula Hawkins (R., Fla.), then chairman of the Senate Subcommittee on Children, Family, Drugs and Alcoholism, held hearings on the impact of drug education. Hawkins cited the book *Chocolate to Morphine*, published by Houghton Mifflin in 1983 and co-written by Andrew Weil, longtime advisory-board member of NORML. The book's first sentence indicates it is written for teen-agers. But, Hawkins noted, "The publisher says it is also quite popular with school counselors and professionals." She then read from several paragraphs:

"Question your parents about the drugs they use. If you can convince them that your drug use is responsible, you may be able to allay their anxiety. Drugs are fascinating because they can change our awareness. Occasional snorting of cocaine in social situations is probably not harmful."

"With drug use running rampant," Hawkins asked, "why are our children being exposed to such garbage?"

Why, indeed, since the kids themselves are demanding facts. In 1977 and every two years since, the National Gallup Youth Survey has asked youngsters ages 13 through 17 to name "the biggest problem facing people your age." Each year drug abuse has been No. 1. Another eye-opening survey, this one of 500,000 children in grades 4 through 12, was published by *Weekly Reader* last spring. When

asked to circle "the *one* thing you think is most important for schools to do to fight drugs," the top answer was: "Teach us the facts."

Instead, what *are* we teaching kids? Most programs focus on three main messages:

1. "Responsible use." Children are taught they should use drugs "responsibly," the implication being that experimental or occasional use is not harmful. Yet the annual National High School Senior Survey has shown since 1975 that one-third of occasional pot smokers become daily users at some point in their lives, and, of seniors who currently smoke pot at all, about half use one or more additional illegal drugs. (Virtually no non-pot smokers are regular users of any other illegal drug.)

2. "It's your decision." Two decades of societal permissiveness toward drug use are reflected in the conclusion that you must decide for yourself whether or not to use drugs. In what other area do we tell kids that it's *their* decision whether or not to break the law?

3. "Do drugs." Some books and other materials used in schools contain virtual commercials for illegal drugs. For example, the three books on drug abuse most commonly found in school libraries today are *Chocolate to Morphine* and *The Natural Mind,* both by Andrew Weil, and *Licit & Illicit Drugs* by Edward M. Brecher and the editors of Consumer Reports, published by Little, Brown in 1972.

What adventurous youngster would *not* want to try mescaline or LSD, for example, after reading in *Licit & Illicit Drugs* (page 337) that mescaline users have found its "most spectacular phase comprises the kaleidoscopic play of visual hallucinations in indescribably rich colors . . . the 'seeing' of music in colors or the 'hearing' of a painting in music." Page 364 describes a 1960s study finding LSD valuable as "a therapeutic tool, a road to love and better relationships . . . a door to religious experience . . . a release from anxiety or troubles."

"Little Change." Otto Moulton is considered by most leaders of the national parent movement for drug-free youth to be the nation's foremost expert on information generated by the drug culture. He has visited hundreds of schools in over 40 states. In each town or city, he checks school and public libraries, as well as bookstores. "In 1979," he says, "the drug information was almost invariably incorrect, outdated and/or actually promoting drug use. Today little has changed. Some of the bad material has been updated. But most schools are not about to throw out materials they have already paid for, especially when they don't know where reliable material can be found, or, in many cases, *even what it is.*"

In 1987 Beverly Kinard, founder and president of HOPE (Helping Other People Educate), surveyed 100 chain bookstores in cities and towns from San Francisco to Boston. She found only one store with one book containing up-to-date information on drugs. She found *Chocolate to Morphine* in all the bookstores. Several teachers told her that they used the "suggestions" at the end of the marijuana section for class instruction. These include: "Define what benefits you want from pot" and "set limits on usage."

Why Wait? In America today the "Just Say No" message is being heard loud and clear from the White House on down. Even rock groups, those former promoters of the do-drug message, are beginning to clean up their act, as are movies, television and radio.

In October 1986 the President signed into law the Omnibus Anti-Drug Abuse Act, which among other things provided $200 million for fiscal 1987 and $250 million each for fiscal 1988 and '89—all so the Department of Education could help the states rid their schools of drugs. Most of the fiscal year '87 money has been distributed, and much of it is already available at the school-district level.

But what is actually being done? Says William Lennox, director of the Department of Education's Drug Abuse Policy Oversight Staff: "In November 1987 we will set up a committee to make on-site visits to schools in order to develop criteria for

Some Recommended Anti-Drug Materials

- A booklet listing drug prevention resources is available from Committees of Correspondence, Dept. RD, 57 Conant St., Danvers, Mass. 01923. (617) 774-2641. Cost, including postage and handling, is $5.
- Boy Scouts of America offers a four-color, 24-by-36-inch body chart showing how illegal drugs affect body organs. Drug Abuse Task Force, S200, Dept. RD, 1325 Walnut Hill Lane, Irving, Texas 75038-3096. Cost: $5.
- *What Works: Schools Without Drugs* is a 77-page booklet produced by the Department of Education and available free from Schools Without Drugs, Dept. RD, Pueblo, Colo. 81009.
- Just Say No Foundation provides free information on setting up a program in your area: Just Say No Foundation, Dept. RD, 1777 N. California Blvd., Walnut Creek, Calif. 94596. 1-800-258-2766; in Calif., 415-939-6666.
- Medical Education Research Foundation publishes *Marijuana: The Myth of Harmlessness Goes Up in Smoke,* an 8½-by-11-inch illustrated booklet plus teacher's guide. Address: 1100 Waterway Blvd., Dept. RD, Indianapolis, Ind. 46202. Cost: $2.50.
- PRIDE (Parents' Resource Institute on Drug Education) offers an anonymous student survey (already taken by over 850,000 students) on drug-use prevalence. PRIDE's computer compiles the data for school administrators. An excellent tool to galvanize schools and communities. Cost: 56¢ per student. Write for free information: PRIDE, 100 Edgewood Ave., Suite 1002, Dept. RD, Atlanta, Ga. 30303. 1-800-241-7946.

good curricula. We expect to have this guide ready by September 1988."

Why must we wait until September 1988 for new guidelines, which may or may not then be acted upon? Especially since, while we wait, an already appalling situation is growing worse. With millions of dollars available to schools through Department of Education grants, "curricula" entrepreneurs have been flooding the marketplace with bad advice. Notes Carla Lowe, co-founder of Californians For Drug-Free Youth, and a consultant on drug abuse to the State Department: "Many school districts are buying new materials without knowing whether they're good or bad. Accurate information about the harm drugs do is the best weapon we have. But we're shooting ourselves in the foot."

What to Do? Along with the $200 million allocated this year to the Department of Education, the 1986 Omnibus Anti-Drug Abuse Act established the Office of Substance Abuse Prevention (OSAP), with a $41.5-million budget. Part of OSAP is the National Clearinghouse for Alcohol and Drug Information, with its own hefty budget and a mandate to disseminate to schools information on drug-abuse education provided by the Department of Education. Says Section 4144 of the act: "Any materials produced or distributed with funds made available under this subtitle shall reflect the message that illicit drug use is wrong and harmful."

Over a year has passed since the law was enacted. Yet, as Congressman Rangel points out, "the act has received no priority. A list of recommended resources could be compiled in a few weeks by the National Clearinghouse and distributed free of charge to all schools, school departments and boards of education. This would be the simplest, most useful and cost-effective step we could take at once to better the drastic situation of drug education in our schools."

Secretary of Education William J. Bennett has announced a public-service campaign to help "slam the door" on drug use in our schools. To learn more about the campaign, and to ask about the availability of effective anti-drug materials, call the Department of Education's toll-free number, 1-800-541-8787.

Meanwhile, it is urgent that the National Clearinghouse take immediate steps to distribute a comprehensive list of accurate, up-to-date books, films and other materials with a *no-use* message. Such resources exist, and many schools are eager to learn about them. A law mandating that the government disseminate information about these materials has been in place for over a year. Let's not waste any more time in getting this list to schools, teachers and educators all across the nation.

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PSYCHIATRIC ANNALS

The Clinical Syndrome of Marijuana Dependence

By [illegible]

There is little question that the need for clinical treatment of marijuana dependence will escalate. Many persons who have used marijuana for several years are now beginning to realize that they are dependent and will not be able to cease use without medical intervention.

Dependence upon cannabis sativa was initially described in the United States about 40 years ago.[1] In 1944, 35 "confirmed marijuana addicts" were admitted to a military hospital and developed withdrawal symptoms. In the same decade, Fraser in India reported on soldiers who had been ganja smokers for some years and, after joining the army, exhibited severe withdrawal symptoms due to difficulty in obtaining cannabis products.[2] Since these initial reports, a number of studies clearly document that tolerance, dependence, and withdrawal symptoms may occur after chronic administration of cannabis.[1-7] Supporting data comes from clinical observations, animal studies, and a carefully controlled trial where humans were given known quantities of tetrahydrocannabinol (THC) and then observed for tolerance and withdrawal symptoms.[3-7]

Until very recently, cannabis dependence had not been a significant clinical concern in the United States. This is accounted for by two factors. First of all, the form of cannabis usually consumed in America is marijuana, and its THC content throughout the 1970s generally ranged from about 1% to 3%. This contrasts with other countries where the more potent forms of cannabis, including hashish, ganja, and dagga have been traditionally used, and where observation on cannabis withdrawal symptoms have frequently been made.[1] In the decade of the 1980s, however, potent forms of marijuana with a THC content of 5% to 15%, as well as hashish, have emerged as the usual forms for self-administration. This high THC content makes it relatively easy to consume over 180 mg per day, whic. was the daily dose given to human volunteers for 11 to 21 days by Jones and co-workers, and which showed an opioid-like withdrawal syndrome when it was abruptly discontinued under controlled conditions.[7] A second factor that has helped make cannabis dependence an increasingly common clinical entity in the United States is the recent development of low-cost, urine screening technology that can detect marijuana metabolites.[8] Wide-spread urine screening in the workplace, criminal justice system, and clinical settings are now identifying persons dependent upon marijuana. This practice has resulted in routine referrals for treatment in my ambulatory clinics located in West Covina, California (East Los Angeles County). This article reviews pertinent literature and summarizes some of my clinical experiences.

EVIDENCE OF DEPENDENCE

In 1971, Deneau and Kaymakcalan succeeded in producing self-administration of THC in monkeys.[5] When THC was abruptly discontinued,

TABLE 1
Commonly Observed Cannabis Withdrawal Symptoms*

Insomnia	Anorexia
Nausea	Photophobia
Myalgia	Cannabis craving
Anxiety	Depression
Restlessness	Mental confusion
Irritability	Yawning
Chills	Anergy

* These symptoms have been observed in animal and human studies

the monkeys exhibited a withdrawal syndrome that was not dissimilar to the opioid abstinence syndrome. Other investigators were able to repeat these experiments and make similar observations.[1] Self-administration has also been induced in rats following a forced injection period.[1] In early studies, rats given THC chronically also appeared to develop an opioid-type withdrawal syndrome when THC was abruptly discontinued.[1] These observations were confirmed when, in 1974, Hirschhorn and Roseerans gave naloxone to rats treated with THC for five weeks and precipitated an opioid-like withdrawal syndrome.[3] Kaymakcalan duplicated this study and also found that naloxone produced withdrawal symptoms in THC-treated rats.[4] The most common withdrawal signs observed in both studies were diarrhea, teeth chattering, wet-dog shakes, salivation, ptosis, piloerection, yawning, and increased activity.[1]

After the human observations of withdrawal in the 1940s, there were no reports of cannabis dependence and withdrawal symptoms in humans until the 1970s.[1] In a research project sponsored by the World Health Organization (WHO) in 1976, 50 long term cannabis users in India were compared with 25 non-user controls.[1] It was found that the majority of users (98%) felt uncomfortable if they were unable to obtain their daily supply or dose of cannabis, and in addition to a strong craving for the drugs (86%), the majority also showed mental irritability and feelings of anxiety (74%) as well as profound lethargy and physical weakness (60%). About 70% of the users reported some kind of physical discomfort in the absence of the drug. There are reports from other countries, including Greece and Egypt, where there is a relatively high hashish consumption. Tennant and Grossbeck observed dependence in American soldiers in West Germany who were able to obtain large amounts of hashish.[9] Bensusan described five young South Africans who had marijuana withdrawal symptoms for one to three days and who were able to relieve them by re-administering marijuana.[10] Teitel reported three cases of manic-depressive illness that followed withdrawal after prolonged use.[11] Other clinicians have reported that heavy marijuana users may develop tolerance rapidly, become dependent, and experience flu-like withdrawal symptoms following cessation of use.[1]

To substantiate whether withdrawal symptoms exist with chronic marijuana use in humans, controlled human studies have been done. Volunteers have been given bedtime dosages of THC and monitored in sleep laboratories. When THC is administered nightly for only four to 15 nights and then abruptly discontinued, there is insomnia and increase in REM sleep and eye movements that last for up to 12 days.[12] In addition to controlled sleep studies, Jones and co-workers gave oral THC to volunteers for 11 to 21 days and then substituted placebo. They observed a variety of withdrawal symptoms similar to those described in clinical reports and animal studies.[7]

Based on numerous reports and studies, it is clear that there is a cannabis withdrawal syndrome. I have frequently observed marijuana-dependent patients in withdrawal, and my observations support previous reports. In particular, my patients have reported insomnia, nausea, myalgia, restlessness, and irritability. Table 1 summarizes the common withdrawal symptoms that have been reported in human and animal studies. A major question is whether this syndrome is identical to the opioid withdrawal syndrome. To date there are no reports of naloxone challenges in cannabis-dependent humans. A recent animal study, however, shows that THC will deplete endogenous opioid peptides, so marijuana dependence and withdrawal may be at least partially mediated through the endogenous opioid system.[13] THC administration also has effects on the catecholamine system.[14] Another study suggests that marijuana withdrawal may be mediated through the serotonergic system.[15] Rats made dependent on THC were given chlorimipramine, which is a potent inhibitor of serotonin re-uptake. Following this challenge, they developed a clear and quantifiable withdrawal syndrome similar to that observed when naloxone was given.[3,6]

CLINICAL TYPES OF DEPENDENCE

Two types of marijuana dependence will con-

TABLE 2
Two Clinical Forms of Marijuana Dependence

	Frequency of Self-Administration	Likely Dependence Metabolite(s)	Usual Referral Route	Patient's Perceived Dependence	Usual Severity of Withdrawal Symptoms	Relapse Rate
Type One	Multiple times each day	THC 11-OH-THC	Voluntary self-referred	Significant	Moderate	High
Type Two	Every 24 to 48 hours	THC-C	Involuntary. Detected by mandatory screening	Minor to moderate	Mild	High

front today's clinician (Table 2). Type One is an individual who will self-administer marijuana several times per day, usually at an interval of about two to four hours unless asleep. This individual may voluntarily present to the clinician with the complaint that their daily dosage has escalated and that they are unable to cease use without medical assistance. The patient may or may not relate mental impairment primarily related to memory, motivation, time-keeping, abnormal thoughts, and work or school performance. In addition, they may relate a number of withdrawal symptoms that occur when they attempt abrupt cessation. The variety of symptoms generally resemble those described in the controlled animal and human studies (Table 1), although they may report others. The precise relapse rate following withdrawal is unknown, but it occurs.

CASE REPORTS

Case 1: Marijuana Dependence: Voluntary Admission to Treatment

MV was a 25-year-old male who presented with the complaint that he could not "stop marijuana by myself." He was a 12-year user having begun marijuana smoking at 13 years of age. He had used marijuana daily for about five years and was using two to three joints per day at the time of admission to outpatient treatment. The patient was married and held a regular job as a warehouse superintendent. He claimed he was having considerable conflicts with his wife and employer. In addition, he had noticed in the two months just prior to admission that he occasionally heard voices that were not real, did not always have total "control over his mind," and had some thoughts of suicide. He denied use of any other drug or excessive alcohol intake. His treatment admission breath alcohol was negative, and his urine contained marijuana metabolite, but no other abusable drug. The patient was administered desipramine, 25 mg, three times per day and was given weekly psychotherapy for approximately six months. During the first ten days of treatment, he reported insomnia, abdominal cramps, diaphoresis, tachycardia, and anxiety. These symptoms subsided, and he submitted a urine void of marijuana approximately 30 days after admission. Most of the thought disturbances noted above disappeared after about two to six weeks of treatment. He denied any marijuana use during the six months after entering treatment, and he submitted monthly urine tests that showed no marijuana.

Case 2: Volunteer with Unsuccessful Treatment

JS was an 18-year-old male who voluntarily presented because he "wanted to stop." Consumption of drugs consisted of about 3.5 grams of marijuana and hashish per day for one year prior to seeking treatment. He self-administered every one to four hours while awake and complained of chronic cough, anorexia, depression, and weight loss. When he had tried abruptly to cease marijuana by himself, he had hallucinations, depression, and anergy. Urinalysis testing revealed the presence of marijuana, but no other drugs. The patient entered a counseling program, but received no medications. Only one return appointment was kept, and he was lost to followup.

Type Two form of marijuana dependence is primarily being identified as a result of mandatory urine screening and treatment referral in the workplace. Seldom does a Type Two voluntarily present for treatment, although it may occur. In this form, the patient is usually self-administering marijuana every 24 to 36 hours and may give a history of carrying on this habit for several years. As in Type One, reported impairment relative to memory, motivation, time-keeping, and job performance is

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variable. In contrast to Type One, however, the patient may report few if any symptoms of withdrawal upon abrupt cessation. Relapse, however, is common.

Case 3: Mandatory Work-Site Detection and Referral

HS was a 37-year-old male salesperson. He was reported to the management of his company to be a marijuana user who also sold it to other employees while on company premises. A mandatory urine test revealed the presence of marijuana metabolite, and in order to retain employment he was required to undergo withdrawal and enter a periodic urine-testing program. Upon interview, he stated that he had used marijuana every evening for approximately 22 years. He believed this habit had not been injurious to himself until approximately three months prior to treatment when he began to notice some defects in his short term memory. Physical examination was normal. Plasma analysis showed there to be 148 ng/ml of 11-OH THC and 80 ng/ml of THC-C. He was administered desipramine, 25 mg. three times per day and tyrosine. During the first three weeks following cessation of marijuana, he reported mild insomnia, depression, anergy, and craving. Urine analysis showed no marijuana metabolite after about 30 days. After six weeks of abstinence, he reported improvement of short term memory and improved job performance.

METABOLIC BASIS FOR TWO FORMS OF DEPENDENCE

New data on the metabolism and pharmacokinetics of marijuana provide a sound rationale as to why two basic clinical forms of dependence appear to exist. When a marijuana cigarette is smoked, THC is converted to two major metabolites, 11-Hydroxy-THC (11-OH-THC) and 11-Nor-THC-9-Carboxylic Acid (THC-C). THC and 11-OH-THC both have psychoactive effects, and they remain in the plasma at concentrations above about 5 ng/ml to 10 ng/ml for only about two to six hours.[16-18] During this period they appear to produce a short-term characteristic "high" or euphoria. This time period correlates well with the self-administration frequency of Type One marijuana dependence. The THC-C metabolite remains in plasma at concentrations above 5 ng/ml to 10 ng/ml for at least 48 to 72 hours. Although this metabolite may produce little or no euphoria, it is likely the compound that sustains Type Two dependence. A similar phenomenon also exists with some benzodiazepines, such as diazepam, and with the opioid methadone. For example, methadone will provide analgesia and euphoria for about four to six hours, but it and its metabolites will remain in plasma for 24 hours and sustain dependence. A similar time course may be observed with

A number of studies clearly document that tolerance, dependence, and withdrawal symptoms may occur after chronic administration of cannabis.

diazepam, which also has long-lasting metabolites. For example, some withdrawal symptoms and even seizures may not appear for several days following cessation of diazepam dependence.[19] I have recently observed that withdrawal symptoms following abrupt cessation of marijuana dependence may not appear for several days.

The following is an illustrative case in which plasma concentration of THC-C was assessed at three intervals during the first week following abrupt cessation of Type Two marijuana dependence. Withdrawal symptoms did not occur until the eighth post-drug day at which time plasma concentration of THC-C was undetectable. The delay in withdrawal symptoms is undoubtedly related to slow clearance of plasma and tissues of marijuana metabolites, particularly THC-C.

Case 4: Delayed Withdrawal Symptoms

A 27-year old male was admitted to a day-treatment program for marijuana dependence. He had been identified at work for being "under the influence" on more than one occasion and was, therefore, referred for treatment. Drug consumption consisted of intermittent cocaine use and daily use of about one marijuana joint. He perceived that he had been "addicted" to marijuana for about 15 years, and that he had skipped marijuana use on very few days during this time. A physical examination was normal except for mild nasal-septum inflammation and a swollen uvula. Urine analysis showed the presence of marijuana metabolite and marijuana plasma analysis by high performance liquid chromatography (HPLC) showed no 11-OH-THC and THC-C to be 8 ng/ml. A 24-hour urine specimen showed secretion of 2-methoxy-4-hydroxy-phenyglycol (MHPG) to be 143.0 MCG/24 hours (normal is 1164 to 2216). Since his continued employment was dependent upon attending the day-care program until his urine was void of all drugs, compliance with treatment and testing procedures was good. Withdrawal medication consisted of desipramine, 25 mg, administered three times per day, and the amino acid, tyrosine. On the third treatment day, his urine still contained metabolite, and his plasma contained 3 ng/ml of THC-C. On the eighth day of attendance, he complained of a flu-like illness consisting of nausea, vomiting, diaphoresis, chills, myalgia,

TABLE 3
Clinical Patients to Screen for Covert Marijuana Dependence

Psychiatric patients under age 35
Adolescents and young adults with recurrent respiratory ailments
Adolescents and young adults with recurrent accidents and unexplained somatic complaints
Patients under age 35 who abuse alcohol, cocaine, phencyclidine, hallucinogens, and amphetamines

anorexia, and insomnia. The patient did not relate these symptoms temporally to his marijuana use, since he had ceased use eight days previous. Plasma analysis showed no detectable presence of 11-OH-THC or THC-C, but marijuana metabolite was still present in urine at this time. The apparent withdrawal symptoms resolved within 48 hours. Marijuana metabolite remained in his urine until the 34th day of treatment.

SCREENING

There are some clear clinical indications to screen for marijuana dependence. Proper screening requires urine testing, physical examination, and history-taking relative to frequency of use (Table 3). Once detected, a treatment program can be developed. Patients who should particularly be screened by urine test are those who are under age 35 and who exhibit psychiatric symptoms, deviant behaviors, use cocaine, phencyclidine, or amphetamines, abuse alcohol, or have recurrent respiratory ailments. The association of various psychiatric symptoms and chronic cannabis use has often been described.[9] Although it is difficult, if not impossible, to always determine whether psychiatric symptoms pre-date or post-date the cannabis dependence, the association is so high that it is prudent to screen for it. In particular, chronic cannabis use has been associated with chronic thought disorders that are characterized by delusions, hallucinations, depersonalization, poor ability to perform at work or school, and inappropriate interpersonal relationships. Physical examination can often give clues to marijuana dependence. In particular, chronic marijuana smoking produces a swollen uvula and signs of chronic bronchitis. A generally unappreciated clinical candidate to screen for marijuana dependence is the adolescent or young adult who presents with apparent abuse of another drug or alcohol. For example, the underlying marijuana dependence may pharmacologically potentiate another drug, but remain unrecognized if a urine screen is not done.

Case 5: Marijuana Dependence Underlying Alcohol Abuse

A 17-year-old girl was arrested for being "drunk in public" on more than one occasion, and was referred for treatment. As part of a routine urine drug screen done for all persons under age 35 with substance abuse or psychiatric problems, she was found to have marijuana metabolite in her urine. Upon questioning, she stated that she drank alcohol only once or twice per week, but smoked marijuana daily. In addition, she questioned whether she could cease all marijuana use. Physical examination on admission to treatment revealed strabismus on the right and non-reactive pupils. She was administered desipramine, 25 mg, three times per day and tyrosine. She participated in outpatient counseling weekly. After approximately one week, the strabismus disappeared and pupils began to react. Marijuana metabolite could not be detected in urine after approximately two weeks of treatment. After three months of treatment, no known episodes of drunkenness occurred.

TREATMENT

At present there is no recognized medical withdrawal regimen for marijuana dependence. Outside of this review, the author cannot identify any reported use of a medical regimen for this purpose. Additionally, the use of the tricyclic antidepressant, desipramine, and tyrosine, a precursor of norepinephrine, as reported here, is not necessarily the optimal treatment. Recent studies of cannabis administration given to animals and humans indicate that it reduces noradrenergic activity and endogenous opioids.[13,14] For this reason desipramine, which is a potent blocker of the reuptake of norepinephrine, may be an effective withdrawal agent. For example, a case described here showed extremely low urinary excretion of MHPG, which is a metabolite of norepinephrine. Although this regimen appeared clinically effective in the cases reported here, plus others treated by me, only a double-blind, placebo-controlled study can prove true effectiveness. Regardless of pharmacologic effectiveness, I have observed that patients who present for treatment and who do not receive withdrawal medication for at least a few days tend to drop out of treatment just as did one of the illustrative cases described above. This appears to apply to both Type One and Type Two dependency.

Although there has been a scarcity of attempts at medical withdrawal, there are recent reports of hospitalization and withdrawal attempts.[20,21] Swatek found that many patients would drop out or fail to reduce marijuana use enough to ever clear

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their urine of marijuana metabolite.[20] This study points out the necessity to regularly monitor urine for marijuana metabolite as an indicator of successful treatment. I have found that assessment of the plasma concentration of 11-OH-THC and THC-C to be useful in determining whether the patient is ceasing self-administration of marijuana.

Regular psychotherapy to accompany urine monitoring and possible medication appears essential in most cases. Patients dependent upon marijuana tend to have a plethora of psychiatric symptoms and considerable problems with interpersonal relationships, motivation, and reality functioning.[9,11]

TRENDS AND RESEARCH NEEDS

There is little question that the need for clinical treatment of marijuana dependence will escalate. Many persons who have used marijuana for several years are now beginning to realize that they are dependent and will not be able to cease use without medical intervention. This realization is enhanced by the availability of more potent forms of cannabis that were not available just a few years ago. Some persons are probably becoming dependent as a result of these potent forms, where they might not have done so if their only consumption was the low potency forms that were formerly available. Perhaps the biggest impetus for dependency treatment will be the identification of dependent persons in mandatory urine screening programs operated by industry.

Research is needed to develop a medical withdrawal treatment for marijuana dependence. From a prevention perspective, we need information as to how frequently and for what length marijuana must be used to develop dependence. For example, I have clinically observed that withdrawal symptoms will occur in persons who use marijuana on a daily basis, but I am not clear as to whether they will occur in persons who use marijuana every second or third day. Since THC has long-acting metabolites whose pharmacologic activity is uncertain, our concepts of dependence must be refined. Lastly, there is almost no available data on relapse rates with marijuana dependence.

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Anchorage Chamber of Commerce

Crime Commission

November 15, 1985

Dear Reader:

The material contained herein was compiled from various sources by the Anchorage Chamber of Commerce Crime Commission in support of our recommendation to recriminalize marijuana in the state of Alaska.

Because of a State Supreme Court Decision on this subject, it will be necessary for the Legislature to hold extensive hearings to determine if, in fact, marijuana is harmful to one's health.

It is the Crime Commission's contention that since the decriminalization of small amounts of marijuana in Alaska approximately ten years ago, much new information has been developed concerning this issue.

We feel that this scientific evidence substantitates the Commission's position that marijuana is a harmful substance. We further believe that if the Legislature were to hold the same type of hearings that were held ten years ago, the preponderance of evidence would result in outlawing the possession of marijuana for health reasons, an act which should then stand up to any further Supreme Court reviews.

We ask the reader to review the material carefully and draw his own conclusions as the Crime Commission has.

Sincerely yours,

Pat Wellington
Vice Chairman

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MARIJUANA STUDY
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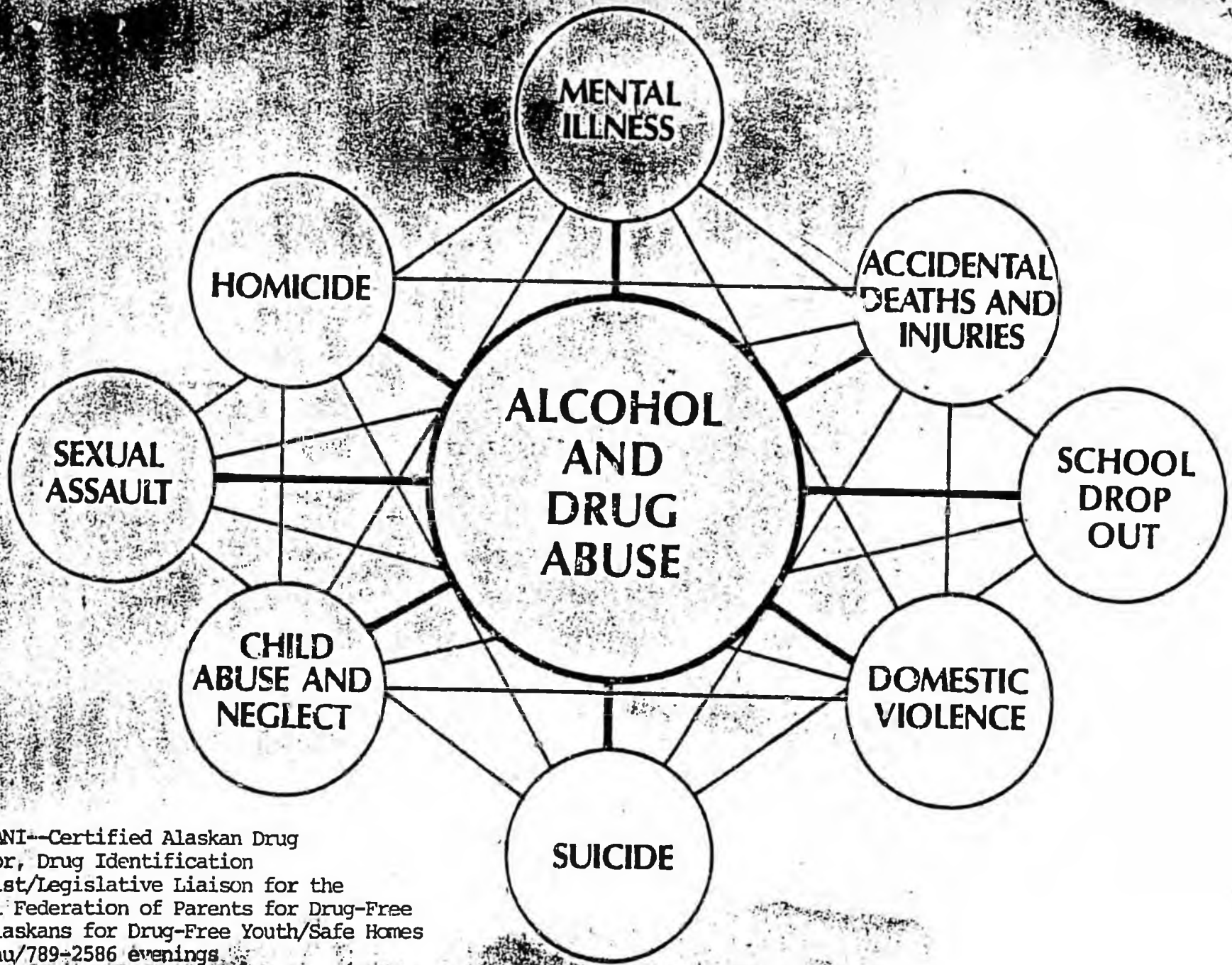

BOBI TRANI--Certified Alaskan Drug Counselor, Drug Identification Specialist/Legislative Liaison for the National Federation of Parents for Drug-Free Youth/Alaskans for Drug-Free Youth/Safe Homes of Juneau/789-2586 evenings

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PANDAA

PARENTS' ASSOCIATION TO NEUTRALIZE DRUG & ALCOHOL ABUSE

ADOLESCENT CHEMICAL USE

This is a special edition of the PANDAA newsletter. It is a guide for parents and professionals to identify adolescent chemical abuse problems. It is for sale in bulk or on a single copy basis. To purchase, use the form on page 11. This guide has been written by parents who have learned about the subject through experience, extensive research, and from their own recovering children and their friends.

WHY DO KIDS DO DRUGS?

Parents must realize that whatever type of home they have, the kids also live in another world - different than what our adolescent world was like. At present, the only way to keep your child from being exposed to the drug culture is to lock him up, without exposure to newspaper, TV, radio, movies, and magazines. Outside influences begin to affect our children at a very young age. TV and movies depict alcohol use as an ingredient for a good time. Drug usage is also portrayed as "cool" and expected behavior. Our kids' role models - TV, movie, and rock stars are open about their drug use, and receive no legal consequences. Rock music lyrics often promote alcohol and drug use. Many professional athletes have been suspended for drug use. The children see widespread alcohol and drug abuse at concerts, outdoor sports events, in school, and in shopping centers. Not only is it socially acceptable in these public places, but there seems to be no consequences from law enforcement personnel. By the time a child is 10 years old he is very saturated with "drink alcohol and do drugs" messages, and the philosophy, "If it feels good do it." It is very easy for a child to rationalize going against values that "old fashioned parents" may have taught.

Alcohol and drugs are easily available to our young people. Many homes have well stocked liquor supplies. Some young adults make extra money by stationing themselves at convenience stores to buy alcohol for underage kids. Some restaurants buy mailing lists of student groups, and mail notices of a special happy hour for students from a specific group or college campus. The breweries have sales representatives on college campuses. On at least the first few encounters, the marijuana is usually given to them free. Marijuana is easier for our kids to buy than it was for our generation to buy cigarettes. They can buy any drug they want at school, shopping centers, convenience store parking lots, etc.

When asked why they started doing alcohol and/or drugs the most frequent answer of the kids was peer pressure. They had ususally refused participation several times before they gave in to peer pressure. Curiosity, love of thrills and danger, desire for acceptance by a group, were other influencing factors. Experimentation continued because it was fun.

> "I started getting high off pot when I was 11, with my best friend. He was 2 years older and I really wanted to be like him. My friend's 16 year old brother did drugs and we would steal his drugs and get high. I did it at first to keep from being called "chicken" or being left out. For almost two years my parents were not fully aware I used drugs. I was sneaky and a good "con" which kept me from getting caught."

Alcohol and drugs were not used to alleviate parental conflicts, low self esteem, etc. until usage was well established. None of them intended to become dependent on alcohol or drugs. If they read literature on drugs they carefully chose reading that favored drug use, and when they observed their drug using friends and role models there were no apparent bad effects from the alcohol or drugs. Indeed, it seemed like these were the people who really knew how to live and had their act together! Some reported that drug education delayed their first encounters and they were very cautious in the beginning. As time went on the horror stories did not materialize or they did not recognize what was happening to themselves.

WHAT DOES "DO DRUGS" MEAN?

When we speak of kids "doing drugs" we are speaking mainly of alcohol and marijuana. As usage continues and tolerance is built up, alcohol and pot often become boring, and they may progress to using uppers, downers, and hallucinogens. Heroin is rarely part of the adolescent scene. Another frequently used term is "partying" or "to party", which means to drink and/or do drugs. For many kids their weekend social life is "partying". Keg parties are held at homes where the parents may or may not be present. Sometimes the parents buy the kegs, with the excuse that at least they aren't doing drugs, or at least they aren't out on the street. Drugs are usually available at these parties. Keg parties are often advertised at school with flyers - even, occasionally, at intermediate level schools.

As usage progresses kids will do drugs under almost any circumstances, and will try anything they can find. Girls have told of raiding medicine cabinets for any labeled or unlabeled pills while babysitting, and of getting the children they sit for high. Many kids admit to getting their pets high. Some tell of getting high with their teachers, school counselors, therapists, policemen, probation officers, at school and on their jobs. Kids will try anything to get a "high", from drinking vanilla or lemon extract to eating nutmeg.

A PERSONAL STORY

Professionally I am associate professor of Chinese at the George Washington University. I have three children. I would like to relate to you our family's experience with drug abuse.

While my son, age 15, and daughter, age 13, were doing drugs, I was unaware for a long time that this was their major problem, even though I myself had smoked quite a bit of marijuana about ten years ago in the early 70's. Indeed, that was part of the problem. I assumed "pot" to be a relatively safe drug, even though, if I could have looked honestly at my own life back then, I would have seen - as I now do - the extent to which my decreasing energy and motivation at the time could be laid at the doorstep of this drug. Luckily, I had weaned myself away from it, and, again, assumed a kid could do the same. I was wrong on this count as well. So even with my own experience, I failed to recognize for a long time what was happening.

What I did see was my son becoming increasingly hostile, volatile in his outbursts of anger - punching big holes right through the wall - and then darkly withdrawn into his cave-like room, which was designed as a shrine to heavy-metal rock groups and the death-like imagery they projected. He was also clearly in great pain and loneliness, although this was covered over for me by the outward behavior.

As for me, I was frightened both for him and of him; and beyond that, furious with him, practically hating him at times. And I was unbearably guilty; I was sure he was doing drugs because I was his adoptive father and he sensed that I rejected him. I was so confused

CONTINUED ON PAGE 11

to try to justify "responsible drug use." Proponents of responsible use contend that "careful use" in people who have no genetic predisposition toward addiction is relatively safe. The problem is that what may be careful use to one person is abuse to another. Alcohol may be a problem for some people; cocaine or marijuana for others. There is no effective way to predict who will become impaired or addicted. Drug use is like Russian roulette, and the earlier that an individual is exposed to mood altering chemicals, the greater risk of addiction. I have yet to meet an addict who intended to become addicted when he started using drugs or alcohol.

The disease of addiction is most effectively handled through a combined approach of prevention, intervention, and rehabilitation. This is the goal of the parents' movement. We must give our children a set of values and good self esteem; we must teach chem how to "say no" and be certain that they do.

We must try to make waters safe by enhancing prevention efforts, decreasing the supply of drugs, and working to rehabilitate individuals so as to not lose them to this disease.

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RECOMMENDED READINGS

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