the maps / california norml **marijuana** waterpipe / vaporizer study

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EVERYTHING IS FINALLY IN PLACE for the beginning of the long-awaited MAPS/California NORML marijuana smoke filtration study. By the time you read this, 250 grams of marijuana, donated by the United States Government, will almost certainly have arrived at the research laboratory. After six months of trying and failing to import high-potency marijuana from the Netherlands for this study, MAPS has succeeded in obtaining marijuana from the National Institute on Drug Abuse (NIDA). NIDA has kindly agreed to supply the research project with the same variety of marijuana that NIDA supplies to the eight patients who receive marijuana legally for their medicinal use.

Purpose of the study

The smoke filtration study is aimed at gathering scientific data about several possible methods of reducing the amount of harmful constituents of marijuana smoke. The researchers will conduct a thorough analysis of the chemical constituents of marijuana smoke both before and after it has been filtered by a variety of methods. Researchers will quantify the total emissions of tar, various cannabinoids (the THC and other chemically similar therapeutic ingredients), volatile aldehydes (which inhibit lung function), and carbon monoxide (which is highly toxic). If the results of the initial study are promising and if funds can be obtained, a subsequent study will analyze marijuana smoke for tumor-promoting compounds like benzene, volatile phenols, benzo(a)pyrene, and volatile N-nitrosamines. These studies are part of an overall clinical plan to evaluate marijuana's safety and efficacy for the treatment of the HIV-related Wasting Syndrome (p. 16).

This study is needed because there are no scientific data currently available describing the filtration effects of water pipes and vaporizers on marijuana smoke. Data about the filtration effects of water pipes for tobacco smoke are encouraging (see MAPS Vol. 3, No. 2, p. 4), so it may well be that with marijuana smoke these devices would substantially reduce the proportion of tars and particulate matter inhaled along with the THC and other cannabinoids. This study is especially important since the patient population in which the medicinal use of marijuana will soon (I hope) be tested is composed of AIDS patients, who already have a compromised immune system (p. 11). If delivery systems can be developed that minimize the potentially stressful effect of marijuana smoke on the immune system, the risk/benefit ratio for the medical use of marijuana may decrease dramatically. This research will help the FDA balance the harmful effects of marijuana against its beneficial effects. Of particular interest in this regard is a recent scientific study at the University of Florida which demonstrated that THC itself seems to enhance immune system functioning in AIDS patients. The more that the non-therapeutic ingredients in marijuana smoke can be filtered out, the greater the beneficial effect of smoked marijuana.

Some critics of this study suggest that it will provide ammunition for the argument that marijuana is not safe enough for medicinal use when its smoke is not filtered. They fear that this study will thus undermine the effort to secure approval for unfiltered marijuana smoke as a medicine, and place people who claim a medical necessity defense at greater risk of losing their cases. I personally believe that these fears are unfounded. Moreover, I think it is irresponsible and ultimately self-defeating to ignore the risks of marijuana smoke. The search for safer and more effective methods of helping severely ill patients must be conducted in the most comprehensive and highly scientific manner. Marijuana, like any other drug, has it risks. It behooves those who believe it has benefits to seek ways to minimize those risks.

Rather than pretending that marijuana has no harmful effects, MAPS continues to explore ways to clarify and minimize those harms.

MAPS' Harm-Reduction Strategy

This study is an excellent example of a harm-reduction strategy in action, a rising-star strategy in the world of drug policy analysis. Rather than pretending that marijuana has no harmful effects, MAPS continues to explore ways to clarify and minimize those harms.

MAPS' approach to the risks associated with marijuana smoking contrasts dramatically with the approach taken by the tobacco industry regarding the health risks of the cigarette. In a fascinating series of articles in the New York Times (June 16 -18,1994), the

secret research projects of the tobacco industry were described. A major direction of research was called Project Ariel, which was a series of studies in the 1960's intended to produce a nicotine delivery device safer than the cigarette. Project Ariel was abandoned after initial prototypes were unsuccessful, in part because they delivered too much nicotine in too short a time. After Project Ariel was closed down, all reports about this direction of research were kept secret.

In the effort to develop safer methods of smoking marijuana, MAPS will report all the data that are gathered, whatever the results.

The experimental team

The water pipe/vaporization study will take place at a respected research center which has been at the forefront of tobacco smoke analysis, so much so that when the tobacco companies recently released their top secret list of tobacco ingredients, the main person quoted by the media about the health risks of those ingredients was the research director of MAPS' study. As always, MAPS seeks out the most respected scientists in their fields to conduct its research. Since MAPS' research agenda is so controversial, it is essential that the scientists who conduct the research have the respect of their peers across the political spectrum. Otherwise, the results of the studies will not be given much credence and MAPS' limited resources will have been wasted.

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The Scientific Issues – Water Pipes

Whether water pipes and vaporizers will actually prove useful is an open scientific question. Combustion gases like carbon monoxide are water soluble, making water an effective filter medium for these kinds of components in marijuana smoke. On the other hand, THC and other cannabinoids are not water soluble, permitting them to pass through water and to be inhaled. While tars and particulate matter are not water soluble, water nevertheless does seem to retain some of them. On the other hand, the cannabinoids have certain chemical properties that make them "sticky". The practical implication of this chemical property is that the cannabinoid molecules tend to adhere tightly to the tars (particulate matters) produced when marijuana is burned. Therefore, when marijuana smoke is filtered through a water medium, some of the cannabinoids will be filtered out along with the tars to which they are chemically bonded.

The key question is whether the tars will be selectively filtered out to a greater degree than the cannabinoids, resulting in a smoke that has a higher proportion of cannabinoids than before it passed through the water. If the cannabinoids and tars are filtered out equally, smokers will still end up inhaling the same proportion of each to reach the desired therapeutic levels of the cannabinoids.

The Scientific Issues – Vaporizers

Vaporizers are another story entirely. Vaporizers theoretically permit the cannabinoids to be inhaled virtually without any particulate matter. Vaporizers work by heating the marijuana to a temperature at which the cannabinoids boil out from the marijuana, creating a vapor that can be inhaled. The temperature at which the cannabinoids turn into vapor is below that at which the marijuana leaf combusts, so there are presumably few or no combustion products such as carbon monoxide and tars. This is the theory this study will put to the test.

Vaporizers also have another extremely useful property; they are extraordinarily efficient. When marijuana is burned, only a fraction of the cannabinoid constituents are turned into a vapor and inhaled with the smoke. Cannabinoids are highly combustible, so much so that a large proportion of them in a marijuana joint are burned up and destroyed. With a vaporizer, the same amount of marijuana can produce at least twice as many inhaled cannabinoids, and probably much more. Given that AIDS patients in the final stages of their disease have usually exhausted all financial resources, the efficiency of the vaporizer can dramatically reduce the cost of the medicinal use of marijuana.

Whether vaporizers will work as they theoretically should is an open scientific question not previously tested. Some anecdotal reports indicate that the subjective experience of marijuana smoke that has been vaporized is somewhat different than when the same marijuana is smoked in a joint. It remains to be determined what these differences are, and what implications, if any, they have for the therapeutic effects of the vaporizer.

The Experimental Water Pipes

A rather unique collection of water pipes will be used in this experiment. One factor that may influence the filtration potential of a water pipe is the volume of water that the marijuana smoke is forced to pass through. Common sense suggests that the more water the marijuana smoke passes through, the more filtration will take place. However, this may not be the case, especially if the tars and cannabinoids are filtered out at an equal rate. To evaluate this, the study will test a water pipe especially designed to prolong the mixing time of the smoke and the water. This water pipe,

called the HealthPipe, was manufactured in the 1970's. Thousands were sold before it was driven off the market by aggressive paraphernalia laws. The pipe is rather ingenious. It looks like a fairly small, traditional water pipe, except that it has a battery-operated paddle blade extending down into the water. When activated by a push button, the paddle blade spins and creates turbulence in the water. This turbulence promotes a more thorough and vigorous mixing between the smoke and the water, breaking up the smoke into smaller particles and increasing the surface area of the smoke that is placed in contact with the water. These pipes are not inexpensive, and would cost about $40 each to manufacture. However, if they do reduce the amount of particulate matter that an AIDS patient needs to inhale, they will be well worth the cost.

The second water pipe that will be tested was manufactured by a MAPS member and donated to the project. This pipe is basically a hookah, with a long plastic hose attached to a bowl. It may be that the passage of marijuana smoke through a long hose will cause some of the heavier particulates to become deposited in the hose, leaving smoke with a higher concentration of cannabinoids. This pipe is also designed to release the smoke at the bottom of the water bowl, for maximum contact with the water.

The third pipe to be studied will be a standard water pipe, just like the varieties that used to be commercially available in some stores (usually with a note saying that they are for tobacco use only) before a recent Supreme Court ruling outlawed them. This water pipe is simply a long plastic cylinder about a foot long and several inches in diameter. A short air tube is positioned near the bottom of the cylinder so that it lies under a few inches of water. I imagine that most water pipes in use in the United States today are of this variety.

Experimental Vaporizers – The Complex Model

The vaporizer to be used in this study is a remarkable find. Several AIDS patients showed me their homemade prototype a few months ago when I visited the San Francisco Cannabis Buyers Club, an organization of hundreds of AIDS and cancer patients who have formed a co-op to obtain marijuana for medicinal purposes. The members of the co-op feel that they have a medical need for marijuana, and that their use is therefore legal under a defense of medical neccesity. Many members of the Buyers Club are aware of (but not overly concerned with) the health risks of marijuana smoking, and have experimented with vaporizers to try to reduce that risk.

The vaporizer that I saw was an ingenious combination of a vaporizer and a water pipe, and was designed to get the benefits of both devices. For those of you who have access to the Internet, in particular the alt.drugs discussion group, you may have noticed a long-running discussion on vaporizer theory and design. All of the vaporizers that have been mentioned have utilized a hot plate of some sort, often a car cigarette lighter, with a temperature control device permitting the user to heat the marijuana to the desired temperature.

The vaporizer we will use in this study is of a completely different design. Rather than using a hot plate for the heating element, this vaporizer uses hot air. The hot air is generated by a commercially available paint stripper gun available at hardware stores, at a cost of about $40. The tool blows a stream of hot air through the interior of a round metal tube with a diameter of about an inch, at a range of temperatures from several hundred degrees up to and exceeding 1000°F. When used as a marijuana vaporizer, the temperature is set at about 450°F. The end of the tube is positioned about an inch above a small pipe bowl which has a hole at the bottom, just like a standard pipe bowl. That small bowl is placed on top of a much larger beaker which is filled with several inches of water. Attached to the hole in the bottom of the small bowl is a glass rod and a small metal wire, both of which descend almost to the bottom of the beaker, below the level of the water. The wire acts as a heat sink, and the glass tube guides the vapor down into the beaker and releases it into the water. A small tube for inhaling the vapor has been inserted into the larger beaker.

Rather than using a hot plate for the heating element, this vaporizer uses hot air.

The vaporizer/water pipe works rather simply. The hot air blows down on the marijuana that is in the small bowl. A screen is secured on both the top and the bottom of the bowl so that the marijuana stays in place. As the temperature of the marijuana increases, the cannabinoids start to vaporize. The downward pressure of the hot air pushes the vapor down through the glass tube into the beaker below. The vapor passes through the water and collects in the air volume inside the large beaker. When enough vapor has collected in the beaker, the smoker inhales on the tube. This draws the vapor into the lungs. At no time does the marijuana burn. The people at the Buyers Club report that the smoke is so smooth that sometimes they are not even sure that anything has been inhaled. The used marijuana changes color slightly, and loses weight due to the removal of the cannabinoids by vaporization.

One disadvantage of this system is that it requires an electric outlet, and is not portable. Another is that the paint stripper gets extremely hot and can inflict pain if touched. If this technology proves useful after scientific analysis of the smokestream, further modifications of the prototype will be made.

Experimental Vaporizers – The Simple Model

A clever and industrious MAPS member made a prototype vaporizer that operates in a much simpler manner. This vaporizer is a simple glass pipette about five inches long with a crimp about one inch from one end. Marijuana is placed in the end up to the crimp. Then, a steady heat source such as an oil lamp, a cigarette lighter or a candle is used to heat the marijuana inside the glass pipette. When a small vapor stream of cannabinoids starts to swirl off the marijuana, the smoker removes the heat source and inhales the vapor from the other end of the pipette. The crimp in the pipe prevents the marijuana itself from being inhaled. I took about 20 of these vaporizers to the Buyers Club and gave them away to appreciative patients. The main advantage of this vaporizer is that it is portable. The main disadvantage is that a great deal of care must be used so as not to burn the marijuana in the pipette. It also does not work all that well with marijuana that is powderized, or of low-potency. For experimental purposes, it is difficult to standardize the output of this pipe. Thus, the pipe that will be used in the experiment is the more complex combination vaporizer/ water pipe.

The nature of research is that your cherished beliefs and deepest hopes may turn out to be wrong. But, after all, isn't it better to know for sure?

The Marijuana Filter-Tippped Cigarette

The scientists conducting the study have a great deal of experience measuring the effects of cigarette filters. We have therefore requested that they design a filter for a marijuana cigarette, and test its effectiveness. Their initial impression was that a standard tobacco filter would not work well for marijuana, since it would filter out the cannabinoids as well as the particulate matter. The filter that may be used in this study will be designed to filter out harmful combustion gases rather than tars, particularly removing carbon monoxide. The filter will probably be a short thin empty tube with perforations which increase the amount of oxygen getting into the smoke stream, converting some of the carbon monoxide to the safer carbon dioxide.

The cost of the study

This study will take six months and will cost $25,000. MAPS is providing $18,000 for the study and California NORML is committed to providing the remaining $7,000. MAPS' support for the study was made possible by a donation of $18,000 from one donor, $14,000 of which was donated directly to the study and $4,000 of which was donated by the same person for the two original art drawings from the Doonesbury Brownie Mary/ medicinal marijuana series, donated to MAPS by Garry Trudeau.

MAPS has made an initial $9,000 payment toward the study's cost, paid at the commencement of the research phase of this project. After MAPS receives a progress report at the three month point, an additional $8,000 will be paid. The final $8,000 will be paid upon receipt of the final report, in part by MAPS and in part by California NORML. In addition to its report to MAPS and California NORML, the scientists conducting the study have agreed to prepare a scientific paper describing its results which will be submitted to a peer-reviewed scientific journal for publication.

If this initial study is promising, it would be desireable to conduct a subsequent study to further analyze the constituents of marijuana smoke. This study would include the vaporizer, the most effective of the different water pipes tested, and both a filter-tipped and a nonfilter marijuana cigarette. The cost of this study has been already negotiated and would be $15,000. This sum has not yet been raised.

Conclusion

Out of all the tens of millions of dollars that have been spent by the U.S. government on marijuana research, not one penny that I know of has gone toward studies designed to see if the health risks of marijuana smoke could be reduced. One of the primary functions of MAPS is to identify strategic gaps in the scientific literature, and to ensure that those gaps are filled. For a relatively small investment of $25,000, MAPS and California NORML might help identify several methods for reducing what is probably the greatest health risk of marijuana, its harmful effects on the lungs. In terms of the medical use of marijuana, this study may fundamentally change the risk profile of smoked marijuana, and provide data to the FDA that makes its approval of the prescription use of marijuana much more likely. It is also possible that this research may demonstrate that water pipes and vaporizers don't really have that much of a beneficial health effect.

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