



*California Chapter of the National Organization for the Reform of Marijuana Laws
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[Study Shows Vaporizer Can Drastically Reduce Toxins in Marijuana Smoke](#)

Harmful toxins in marijuana smoke can be effectively avoided by a vaporization device, according to a new study by California NORML and MAPS (Multidisciplinary Association for Psychedelic Studies) with support from a grant from the MPP (Marijuana Policy Project).

The study, conducted by Chemic Labs in Canton, Mass., tested vapors from cannabis heated in an herbal vaporizer known as the Volcano® (manufactured by Storz & Bickel GmbH&Co. KG, Tuttlingen, Germany; [http:// www.storz-bickel.com](http://www.storz-bickel.com)) and compared them to smoke produced by combusted marijuana. The Volcano® is designed to heat material to temperatures of 130° to 230° C (266° to 446° F) where medically active vapors are produced, but below the threshold of combustion where smoke is formed.

The vapors from the Volcano® were found to consist overwhelmingly of THC, the major active component in marijuana, whereas the combusted smoke contained over 100 other chemicals, including several polynuclear aromatic hydrocarbons (PAHs), carcinogenic toxins that are common in tobacco smoke. The respiratory hazards of marijuana and tobacco smoke are due to toxic byproducts of combustion, not the active ingredients in the plant, known as cannabinoids.

The study suggests that medical marijuana patients can avoid the respiratory hazards of smoking by using a vaporizer. In its 1999 report on medical marijuana, the Institute of Medicine recommended against long-term

use of smoked marijuana because of the health risks of smoking. However, the IOM failed to take account of vaporizers.

Previous studies have found that vaporizers can reduce harmful toxins in cannabis smoke. However this is the first study to analyze the gas phase of the vapor for a wide range of toxins. A previous NORML/MAPS study conducted by Chemic Labs found that a vaporizer known as the M-1 Volatizer® (<http://www.volatizer.com>) completely eliminated three specific toxins (naphthalene, benzene and toluene) in the solid phase of the vapor (D. Gieringer, "Cannabis Vaporization: A Promising Strategy for Smoke Harm Reduction," *Journal of Cannabis Therapeutics* Vol. 1#3-4: 153-70 (2001).

The new study used a gas chromatograph mass spectrometer (GCMS) to examine the gas components of the vapor. The analysis showed that the Volcano® vapor was remarkably clean, consisting 95% of THC with traces of cannabidiol (CBD), another cannabinoid. The remaining 5% consisted of small amounts of three other components: one suspected cannabinoid relative, one suspected PAH, and caryophyllene, a fragrant oil in cannabis and other plants. In contrast over 111 different components appeared in the gas of the combusted smoke, including a half dozen known PAHs. Non-cannabinoids accounted for as much as 88% of the total gas content of the smoke.

The study used standard NIDA cannabis with 4% THC content. A quantitative analysis found that the Volcano® delivered 46% of the THC into vapor following three 45-second exposures of the sample to the heat. This compares favorably with the typical efficiency of marijuana cigarettes as observed in other studies, which depending on conditions can fall below 25% due to loss of THC in sidestream smoke. An important feature of the Volcano® is that it uses a balloon to capture the vapor, thereby avoiding leakage to the air. It is possible that higher THC efficiencies could have been reached with the Volcano® by stirring the sample around and exposing it to more heat.

The combusted sample achieved a relatively high THC efficiency of 78% upon complete combustion. The high efficiency seems due to the fact that the sample was completely consumed by combustion, and that smoke leakage was effectively prevented by the laboratory setup. Similar conditions do not obtain under normal circumstances when a marijuana cigarette is smoked and much of the THC is lost to the air or left in the unburned "roach."

Two other cannabinoids, cannabidiol (CBD) and cannabidiol (CBN), were detected in the NIDA cannabis in trace amounts of 0.1%. Both the Volcano® and combustion delivered an apparent increase in CBD and CBN, but the variance of the data was too high to reach statistically significant conclusions.

Sponsors believe that the study results lend support for wider use of vaporizers by medical marijuana patients and researchers. At present, the only

FDA-approved method for administering marijuana to human research subjects is via smoking NIDA cigarettes. NORML and MAPS are supporting efforts to have vaporizers approved by the FDA. As a first step in this effort, Dr. Donald Abrams of the University of California, San Francisco, has submitted a grant proposal to the California Center for Medical Cannabis Research in San Diego to test the Volcano® in human subjects. If the protocol is funded and the Volcano® approved by the FDA for human research, it will be the first human study using a vaporizer. If the FDA requests additional laboratory data about the Volcano®, additional funding may be necessary.

UPDATE

CMCR Study Finds Volcano® Vaporizer "Safe and Effective" Delivery Method for Cannabis

Dr. Abrams' study was approved and published in *Clinical Pharmacology and Therapeutics* April 11 2007 under the following title:

Vaporization as a Smokeless Cannabis Delivery System: A Pilot Study^[SEP]

DI Abrams, HP Vizoso, SB Shade, C Jay, ME Kelly and NL Benowitz

ABSTRACT: Although cannabis may have potential therapeutic value, inhalation of a combustion product is an undesirable delivery system. The aim of the study was to investigate vaporization using the Volcano^s device as an alternative means^[SEP] of delivery of inhaled Cannabis sativa. Eighteen healthy inpatient subjects enrolled to compare the delivery of cannabinoids by vaporization to marijuana smoked in a standard cigarette. One strength (1.7, 3.4, or 6.8% tetrahydrocannabinol (THC)) and delivery system was randomly assigned for each of the 6 study days. Plasma concentrations of D-9-THC, expired carbon monoxide (CO), physiologic and neuropsychologic effects were the main outcome measures. Peak plasma concentrations and 6-h area under the plasma concentration–time curve of THC were similar. CO levels were reduced with vaporization. No adverse events occurred. Vaporization of cannabis is a safe and effective mode of delivery of THC. Further trials of clinical effectiveness of cannabis could utilize vaporization as a smokeless delivery system. “