

## Cannabis vaporizer combines efficient delivery of THC with effective suppression of pyrolytic compounds

Dale Gieringer  
Joseph St. Laurent  
Scott Goodrich

**ABSTRACT.** Cannabis vaporization is a technology designed to deliver inhaled cannabinoids while avoiding the respiratory hazards of smoking by heating cannabis to a temperature where therapeutically active cannabinoid vapors are produced, but below the point of combustion where noxious pyrolytic byproducts are formed.

This study was designed to evaluate the efficacy of an herbal vaporizer known as the **Volcano<sup>®</sup>**, produced by **Storz & Bickel GmbH & Co. KG, Tuttlingen, Germany** (<http://www.storz-bickel.com>). Three 200 mg samples of standard NIDA cannabis were vaporized at temperatures of 155°-218°C. For comparison, smoke from combusted samples was also tested.

The study consisted of two phases: (1) a quantitative analysis of the solid phase of the vapor using HPLC-DAD-MS (High Performance Liquid Chromatograph-Diode Array-Mass Spectrometry) to determine the amount of cannabinoids delivered; (2) a GC/MS (Gas Chromatograph/Mass Spectrometer) analysis of the gas phase to analyze the vapor for a wide range of toxins, focusing on pyrene and other polynuclear aromatic hydrocarbons (PAHs).

The HPLC analysis of the vapor found that the **Volcano** delivered 36%-61% of the THC in the sample, a delivery efficiency that compares favourably to that of marijuana cigarettes.

The GC/MS analysis showed that the gas phase of the vapor consisted overwhelmingly of cannabinoids, with trace amounts of three other compounds. In contrast, over 111 compounds were identified in the combusted smoke, including several known PAHs.

The results indicate that vaporization can deliver therapeutic doses of cannabinoids with a drastic reduction in pyrolytic smoke compounds. Vaporization therefore appears to be an attractive alternative to smoked marijuana for future medical cannabis studies.

---

Dale Gieringer is affiliated with California NORML, 2215-R Market Street #278, San Francisco, CA 94114.  
Joseph St. Laurent and Scott Goodrich are affiliated with Chemic Labs, 480 Neponset Street, Building #7C, Canton, MA 02021.  
The authors offer thanks for insight and technical support to Jeff Jones, Elvy Musikka, Irvin Rosenfeld and Aidan Hampson.  
This research was supported by a grant from the Marijuana Policy Project. Additional support provided by the NORML Foundation, the Multidisciplinary Association for Psychedelic Studies and Storz & Bickel GmbH & Co. KG.

Source: Journal of Cannabis Therapeutics, Vol. 4(1) 2004