

## Technical Note

### Assessment of the Volatility (Smokeability) of Cocaine Base Containing 50 Percent Mannitol: Is it a Smokeable Form of “Crack” Cocaine?

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**ABSTRACT:** A defendant convicted of possession and use of “crack” cocaine claimed on appeal that cocaine base containing 44 percent mannitol was not a “smokeable form,” and therefore that Federal Sentencing Guidelines for “crack” cocaine were not applicable in his sentencing. To investigate this claim, a sample of “crack” cocaine was made by mixing molten illicit cocaine base with an equal weight of mannitol, then cooled to form a solid “rock” that was visually consistent with typical exhibits of “crack” cocaine. A sample of this formulation was heated in a device similar to a crack pipe, and the resulting vapors were collected by dissolution into chloroform. Analysis of the resulting solution by GC/MS identified cocaine, thereby confirming that “crack” formulated from equal parts cocaine base and mannitol is smokeable.

**KEYWORDS:** Cocaine, Mannitol, Crack, Gas Chromatography/Mass Spectrometry, Forensic Chemistry.

#### *Introduction*

“Crack” cocaine has been a major drug of abuse since the early 1980’s. The term “crack” is the most common street name used for cocaine base that is smoked. It can be in a rock-like, powder, or oil-like form, and can also be adulterated or diluted (“cut”) with a virtually unlimited number of substances; some of the most common include benzocaine, procaine, mannitol, acetaminophen, aspirin, and phenacetin. “Crack” is not a scientific term; however, for sentencing purposes, “crack” has been defined as cocaine base.

Because of the violence associated with trafficking and sale of “crack” cocaine, and its unusually high potential for addiction, the U.S. Congress mandated more punitive sentences for cocaine base versus cocaine hydrochloride. Some recent judicial rulings have decreed that cocaine base exhibits must be in a “smokeable form” in order to impose Federal Sentencing Guidelines for “crack” cocaine [1]. Recently, a defendant who had been convicted for possession and use of “crack” cocaine claimed on judicial appeal that cocaine base containing 44 percent mannitol (that is, the sample he had) was not a “smokeable form” of cocaine base. Herein, we report the results of experiments designed to determine if a “crack” cocaine sample containing 50 percent mannitol is a “smokeable form” of cocaine base.

#### *Experimental*

##### Materials

Illicitly prepared cocaine base (m.p. 84 - 88 °C) was obtained from the reference collection of this laboratory. Pharmaceutical cocaine base and mannitol were obtained from Merck Chemical (Rahway, NJ) and

Sigma-Aldrich Chemical (Milwaukee, WI), respectively. Chloroform was a distilled-in-glass product of Burdick and Jackson Labs (Muskegon, MI).

#### Gas Chromatography/Mass Spectrometry (GC/MS)

Mass spectra were obtained on an Agilent Model 5973 quadrupole mass-selective detector (MSD) interfaced with an Agilent Model 6890 gas chromatograph. The MSD was operated in the EI mode with an ionization potential of 70 eV, a scan range of 34-700 amu, and 1.34 scans/sec. The GC was fitted with a 30 m x 0.25 mm ID fused-silica capillary column coated with DB-1 (0.25  $\mu\text{m}$ ) (J & W Scientific, Rancho Cordova, CA). The oven temperature was programmed as follows: Initial temperature, 100 °C; initial hold, 0.0 min; program rate, 6 °C/min; final temperature, 300 °C; final hold, 5.67 min. The injector was operated in the split mode (21.5:1) and a temperature of 280 °C. The auxiliary transfer line to the MSD was also operated at 280 °C.

#### Formation of “Crack” Cocaine Containing 50 Percent Mannitol

Illicit cocaine base (1.0 gram) was placed into a 15 mL beaker and heated on a laboratory hotplate until it melted into an oil. Mannitol (1.0 gram) was added and stirred for about 1 minute, resulting in a uniform oil. Upon cooling to room temperature, the oil solidified, after which it was broken into small, off-white to yellowish “rocks” that were visually consistent with typical exhibits of “crack” cocaine (m.p. 86 - 93 °C).

#### Vaporization of Crack Cocaine Containing 50 Percent Mannitol

The melting points of pharmaceutical grade cocaine base and cocaine hydrochloride are 98 °C and 195 °C, respectively [2]. Illicitly prepared cocaine base and cocaine hydrochloride have lower melting points since they contain cocaine-related impurities resulting from the crude illicit processing methodologies [3], and illicit cocaine base containing 50 percent mannitol would be expected to have an even lower melting point (in this case, however, it was actually several degrees higher than the illicit cocaine base used to prepare it).

A device similar to a “crack” pipe was fashioned from a 9-inch Pasteur pipette by inserting a tight plug of glass wool into the larger opening. The pipette was loaded with a small “rock” of the formulated “crack” (approximately 20 mg), and then fitted into a 125 mL suction filtration flask containing 5 mL of chloroform. A slight vacuum was applied to the flask and the section of the pipette containing the “rock” was gently heated with a propane flame. The “rock” vaporized within seconds (with some charring), and the produced vapors were drawn by the vacuum into the chloroform. The resulting solution was analyzed via GC/MS to determine what substances were trapped from the vapors. The chloroform was subsequently evaporated to dryness under a stream of nitrogen to provide 9 milligrams of solid material, which was also analyzed by GC/MS.

### ***Results and Discussion***

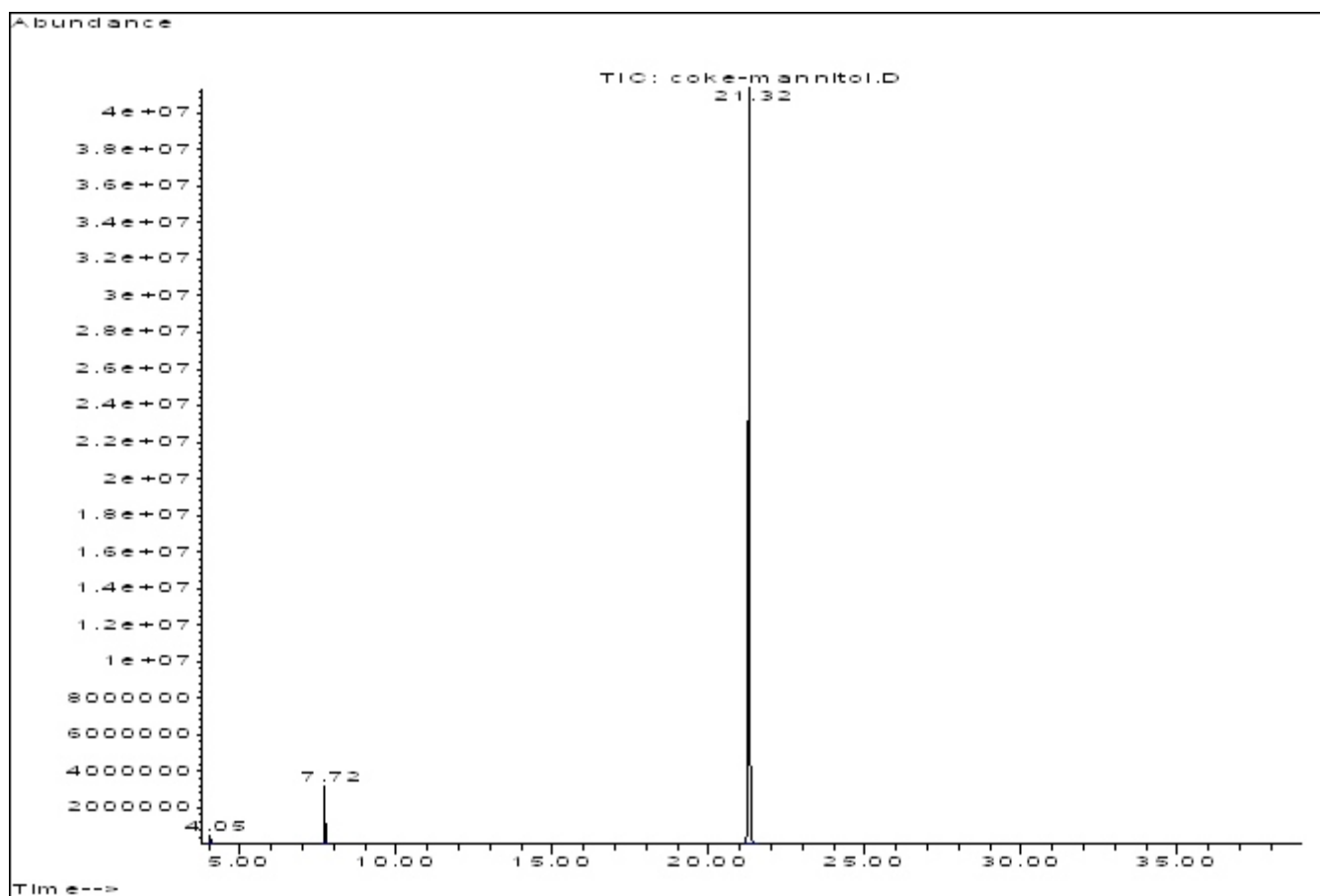
“Crack” cocaine containing 50 percent mannitol was easily prepared. Upon gentle heating with a propane flame, the mixture melted and boiled within a few seconds, giving white-colored vapors. Analysis of the chloroform solution of these vapors by GC/MS confirmed primarily cocaine and a small amount of methylecgonidine (Figures 1 – 3); mannitol was not detected. Methylecgonidine is a well-known byproduct of cocaine degradation due to heat, and has been previously documented [4]. The mass spectrum of the recovered cocaine was identical to the pharmaceutical standard. Quantitative analysis of the solid resulting from evaporation of chloroform solution confirmed that approximately 90 percent of the cocaine base present in the original “rock” was delivered into the chloroform.

### ***Conclusions***

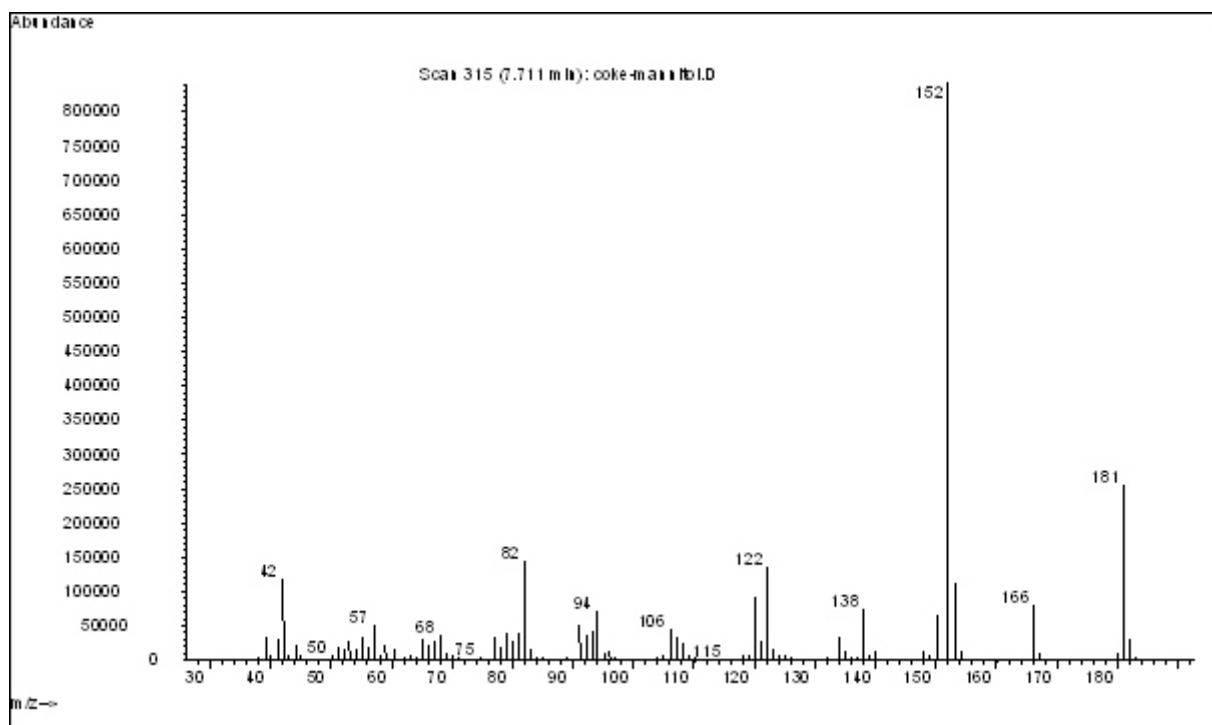
“Crack” cocaine containing 50 percent mannitol is a “smokeable form” of cocaine base. Although beyond the scope of this study, similar results may be reasonably expected from “crack” cocaine made from any other common adulterant or diluent, regardless of their relative proportions.

## References

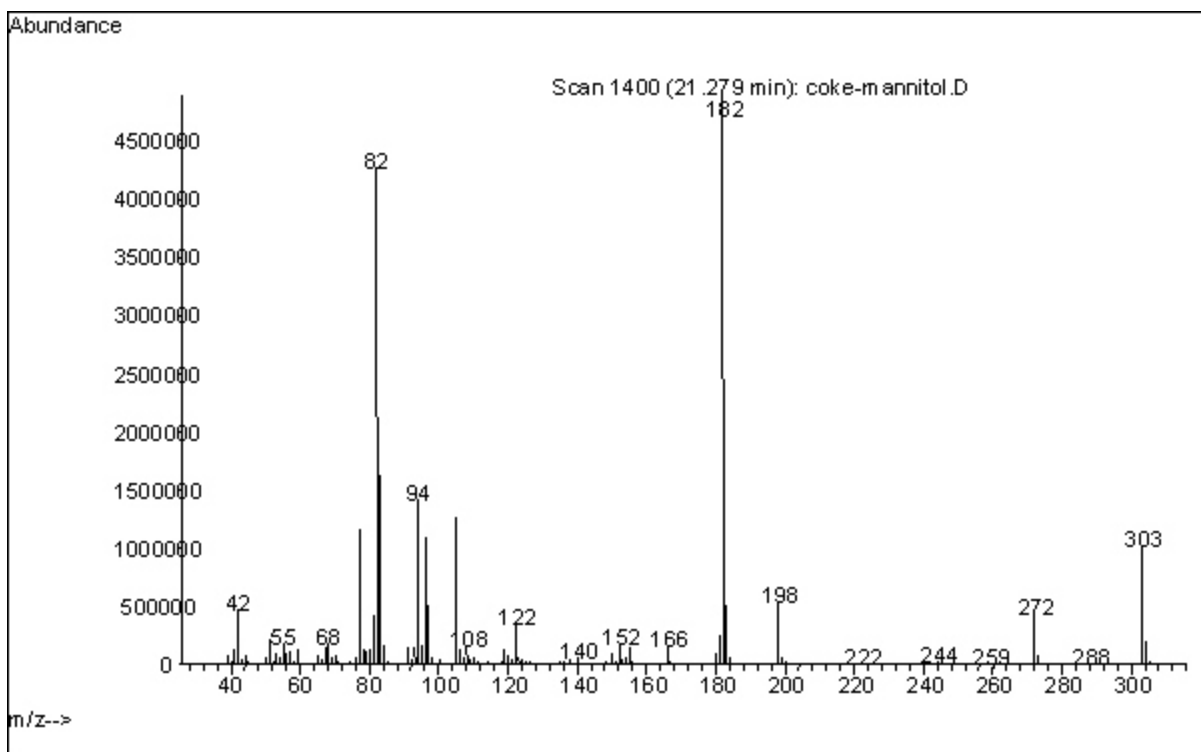
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2. Merck Index. 12th Edition, Whitehouse Station: Merck Research Laboratories: 1996, p. 416.
3. Casale JF, Klein RFX. Illicit production of cocaine. Forensic Science Review 1993;5(2):95-107.
4. Casale JF. Methyl esters of ecgonine: Injection port produced artifacts from cocaine base (crack) exhibits. Journal of Forensic Sciences 1992;37(5):1295-1310.



**Figure 1.** Total ion chromatogram of chloroform soluble vapors from heating crack cocaine containing 50 percent mannitol. Peak identification: Methylecgonidine (7.72 min) and Cocaine (21.32 min).



**Figure 2.** Electron Ionization Mass Spectrum of the Recovered Methylecgonidine.



**Figure 3.** Electron Ionization Mass Spectrum of the Recovered Cocaine.