Letters to the Editor

Cocaine Sentencing

Dear Sir

The U.S. Code (1) for cocaine violations requires that the same penalty applies to those who have 5 kilograms (5000 g) or more of a mixture or substance containing a detectable amount of cocaine or 50 g or more of a mixture or substance containing a detectable amount of cocaine base. Sentencing Guidelines (2) lists the specific sentences for the various quantities of cocaine and cocaine base.

The problem with the above is that the penalties depend upon how a chemist reports results. 100 g of a mixture may contain a fraction of a gram of cocaine or 100 g of cocaine. If the substance is reported as containing 1 g of cocaine base, the sentence would be the same as when the substance is reported as containing 100 g of cocaine.

Cocaine is available as two distinct chemicals, cocaine and cocaine hydrochloride. Cocaine is a nitrogenous organic base and thus it is also referred to as cocaine base. When hydrochloric acid is added to cocaine an organic salt is formed which is cocaine hydrochloride. Cocaine is cocaine base and cocaine base is cocaine. Cocaine may appear as a fine powder, as crystals, as a solution and as a hard flaky material. The unscientific name of the hard flaky material is "crack." Cocaine hydrochloride is very soluble in water (1 g in 0.4 mL), Cocaine is relatively insoluble in water (1 g in 600 mL). Cocaine can be volatilized at about 200°C.

Cocaine powder and cocaine hard flakes have been smoked using a water pipe or by sprinkling on marijuana or tobacco cigarettes. Smoking cocaine is an efficient way of getting "high" on cocaine. Tobacco smokers have discovered that the lungs are very efficient. Inhaled cocaine smoke is very rapidly absorbed and affect the brain within half a minute (3). The cocaine concentration peaks in the plasma almost immediately and the effects pass in about 30 minutes. Peak plasma concentrations occur in about 30 minutes when cocaine powder is inhaled through the nose.

After the cocaine overdose death of the basketball player, Len Bias, Congress passed the Anti-Drug Abuse Act of 1986, Pub. Law. 99-570. The type of cocaine used and the method of ingestion were not reported. The statute drastically amended the penalties and sentencing guidelines by creating a new set of penalties for cocaine base. Congress established a 100 times greater penalty for cocaine base convictions than for cocaine convictions.

Sentencing questions arise when cocaine is identified as cocaine or as cocaine base. The problem is with the penalties established by the U.S. Code (1) which states, "in the case of subsection (a) of this section involving-. . . .

(ii) 5 kilograms (5000 g) or more of a mixture or substance containing a detectable amount of-

(II) cocaine, its salts, optical isomers, and salts of optical isomers;

(iii) 50 grams or more of a mixture or substance described in clause (ii) which contains cocaine base; . . . . . such person shall be sentenced to a term of imprisonment which may not be less than 10 years or more than life. . . . .

One problem is the indefiniteness of a detectable amount which can vary greatly with the method used to detect and identify cocaine. A mixture containing a fraction of a microgram of cocaine and 5000 grams of legal substances could result in the same sentence as that given for 5000 grams of pure cocaine.

Cocaine base supposedly identifies crack which Congress believed was more dangerous than cocaine. Cocaine powder or crystals have been smoked for years and are just as dangerous as smoking crack. Congress believed that it was more dangerous than cocaine hydrochloride which is used by injection. The danger of AIDS from the injection of cocaine hydrochloride was one of the reasons users switched to crack, which can be smoked. Chemists are reporting detectable amounts of cocaine base rather than cocaine. It is impossible to support any difference scientifically. The lethality of cocaine depends on its purity, dose and method of use.

In U.S. v. Brown (4) there is the following: "The government adopts the nomenclature of organic chemistry which classifies compounds with the hydroxyl radical (OH−) as a base and those with the hydrogen nucleus (H+) as an acid. 'Cocaine base' therefore is any form of cocaine with the hydroxyl radical; 'cocaine base' excludes, for example, salt forms of cocaine. The appellant fails to show why the definition is unreasonable. Two witnesses testified at the trial in support of it." Cocaine (cocaine base) is a nitrogenous organic base and has no hydroxyl radical. U.S. v. Pinto (5) states that "Cocaine base or crack is any form of cocaine with [a] hydroxyl radical in the chemical compound."

U.S. v. Davis (6) states that "Cocaine's molecular formula is C17 H21 N4." The formula is $C_{14}H_{21}NO_4$.

Sentences have been challenged unsuccessfully on the basis of racial inequality. U.S. v. Thomas (7) reported that cocaine base penalties do not violate the Eighth Amendment and do not lack a rational relationship to a legitimate state end. U.S. v. Bynum (8) reported that the 100 to 1 ratio rationally related to a legitimate government end despite impact on blacks. U.S. v. D'Anjou (9) reported that there is no discriminatory intent by Congress and that the statute passes rational basis test.

U.S. v. Jones (10) reported that cocaine base sentences are not violative of equal protection component of the Fifth Amendment's due process clause. U.S. v. Wallace (11) reported that cocaine base sentences are not challengeable because of alleged disproportionality, are not unconstitutionally vague, and do not constitute racial genocide.

The penalties were challenged successfully in U.S. v. Davis (6) where the Judge examined the question of whether there is any

difference between cocaine and cocaine base. Four experts both in and out of government testified.

"All of the experts testified the term 'cocaine base' is synonymous with cocaine. In the scientific community, cocaine base has no other meaning. The term is also synonymous with cocaine free base, which means that it is the cocaine molecule, free of other salts and isomers in its basic form."

"There was also unanimous agreement among all four experts that the term 'crack' as it relates to cocaine substances does not have a fixed meaning in the scientific community. The term crack had its origins with illicit drug abusers."

"Later, illicit users began producing cocaine or cocaine base from cocaine hydrochloride and exposed the cocaine to organic solvents such as ether during the process. Cocaine or cocaine base is also manufactured by mixing cocaine hydrochloride, water and bicarbonate of soda (baking soda) and heating the mixture. These latter two procedures convert the salt, cocaine hydrochloride, back to the basic form of cocaine. Crack is often seen in chunks or lumps but can be milled to a powder and cocaine hydrochloride can appear lumpy if it is pressed."

"In sum, cocaine base describes no other substance than cocaine. It is cocaine which is most readily ingested by inhaling (smoking) because of its low melting point. It is the controlled substance which is intended to be volatilized for smoking."

"The DEA chemist, Mr. Clarke, testified that DEA chemists today define crack as a lumpy substance containing cocaine and bicarbonate of soda because this is the usage of enforcement agents."

It is obvious that there is ambiguity in the statute and in the sentencing guidelines. The rule of lenity should apply to the sentencing. "This rule requires a sentencing court to impose the lesser penalty where there is ambiguity about the reach of a criminal statute or the penalties to be imposed. *Bifulco v. United States,* 447 *U.S.* 381, 387 *et seq.,* 100 S. Ct. 2247, 2252 *et seq.* 65 L.Ed.2d 205 (1980)."

In March of 1995, (12) the U.S. Sentencing Commission reported, "While some aspects of drug use and distribution may justify a higher penalty for crack than for powder cocaine, the present 100-to-1 quantity ratio is too great." "The factors suggest a difference between the two forms of cocaine do not approach the level of a 100-to-1 quantity ratio."

A 1982 study supported by the National Institute on Drug Abuse compared the effects of smoking free base cocaine and of injecting cocaine hydrochloride (13). The authors reported, "Fifty milligrams of cocaine free base, inhaled at 30-sec intervals over 5 min, induced psychological and cardiovascular effects of the same order as the effects of intravenous injection of 20 mg of cocaine HCl over 1 min. This result was surprising in view of the difference in the duration of administration." The authors found that a substantial amount of cocaine was destroyed during heating. They also reported that, "Assuming that these in vitro experiments accurately replicate inhalation of cocaine, it follows that approximately 15 mg cocaine was inhaled during the first 2 min of smoking. This amount of cocaine free base approximates the 20 mg of cocaine HCl (equivalent to 18 mg of cocaine) injected intravenously. This explains the similarities in the magnitude of pharmacological effects between the two routes of administration."

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References

(1) U.S. Code (1) (21 U.S.C. §841 (b) (1) (A).
(2) 18 USCS Appx § 2D1.1.
(3) Strang J, Edwards G. Cocaine and crack. BMJ 1989;299:337–338.
(4) U.S. v. Brown 859 F.2d at 975–6, 1988.
(5) U.S. v. Pinto, 905 F.2nd 47, 1990.
(6) U.S. v. Davis, 864 F.Supp. 1303, 1994.
(7) U.S. v. Thomas, 900 F.2d 37, 1990.
(8) U.S. v. Bynum, 3 F.3d at 774, 1993.
(9) U.S. v. D'Anjou, 16 F.3d 604, 1994.
(10) U.S. v. Jones, 18 F.3d 1145, 1994.
(11) U.S. v. Wallace, 22 F.3d 84, 1994.
(12) Cocaine and Federal Sentencing Policy, Special Report to the Congress, United States Sentencing Commission, February 1995.
(13) Perez-Reyes M, DiGuiseppi S, Ondrusek G, Jeffcoat AR, Cook CE. Free-base cocaine smoking. Clin Pharmacol Ther 1982;32:459–465.

Commentary on "Fatal Carbon Dioxide Embolism Complicating Attempted Laparoscopic Cholecystectomy—Case Report and Literature Review" (J Forensic Sci 1994;39(6):1468–80)

Dear Sir

I read with interest the paper of Lantz P. E. and Smith D. "Fatal Carbon Dioxide Embolism Complicating Attempted Laparoscopic Cholecystectomy—Case report and Literature Review" published by the Journal of Forensic Sciences, 39;6:1468–1480, 1994. The literature review was very accurate.

The authors reported the well known possibility that gas may pass through anomalous right left heart communications from venous to arterial systemic circulations. They did not describe the most frequent pathologic shunt formation through pulmonary arterial branches and pulmonary veins, mainly subpleural, with the subsequent gaseous embolism of the systemic arterial circulation.

These shunts occur because of the pulmonary arterial hypertension occurring from the embolic occlusion, causing arteriolar rupture allowing gas to penetrate the interlobular septa causing interstitial emphysema and subpleural gas bubble formation. These bubbles are frequently numerous and very small in size with a pearly appearance. Gas bubbles then may flow into the pulmonary veins and into the systemic arterial circulation. Usually in these cases, interstitial emphysema does not worsen during hemorrhagic manifestations, as shown by Rössle in his classical studies (1).

Some of the cases of pneumothorax and pneumomediastinum cited by Lantz and Smith may be attributable to rupture of subpleural gas bubbles and massive pulmonary interstitial emphysema (2,3).

In the case reported by Lantz and Smith multiple minute air bubbles were observed in coronary veins, coronary sinus, and leptomeningeal vessels. Undoubtedly the evidence of gas bubbles in coronary veins may be explained as the consequence of retrograde flow because of the high right atrial pressure, overcoming the coronary sinus valve where it enters into the atrium. The evidence of gas bubbles in the leptomeningeal vessels is to be attributed to the gas flow through newly formed pulmonary pathologic shunts into the systemic arterial circulation.

Those organic lesions that follow gas embolism to the systemic arterial circulation are similar to those observed in barotraumatic gaseous embolism, especially at the central nervous system level (4–8).

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References

(1) Rössle R. Ursachen und folgen der arteriellen luftembolien des grossen kreislauf. Virchows Arch Path Anat, 1947;314:511–33.

(2) Woolner DF, Johnson DM. Bilateral pneumothorax and surgical emphysema associated with laparoscopic cholecystectomy. Anaesth Intensive Care 1993;21:108–10.

(3) Gabbott DA, Dunkley AB, Roberts FL. Carbon dioxide pneumothorax occurring during laparoscopic cholecystectomy. Anaesthesia 1992;47:587–8.

(4) Rössle R. Über die ersten veränderungen des menschlichen gehirns nach arterieller luftembolie. Virchows Arch Path Anat 1948; 315:462–80.

(5) Staemmler M. Kreislaufstörungen und gefässerkrankungen des zentralnervensystems mit hirnödem und hirnschwellung" in: Kaufmann E.: Lehrbuch der Speziellen Pathologischen Anatomie, V. III, 1958, De Gruyter, Berlin, 1958, pp. 315–19.

(6) Peters G. Klinische Neuropathologie. Thieme, Stuttgart, 1970; 368:405–6.

(7) Englund G. Neuropathology of Cardiorespiratory Diseases, in: Minckler J.: Pathology of the Nervous System. McGraw-Hill, New York, 1968, pp. 997–1005.

(8) Zülch KJ. Hemorrhage, Thrombosis, Embolism, in: Minckler J.: Pathology of the Nervous Systems. V. II, McGraw-Hill, New York, 1971;1499–1536.