Cocaethylene as a Component in Illicit Cocaine

To the Editor:

In response to your request for information concerning the presence of cocaethylene content in illicit cocaine exhibits, the following comments are provided, based on research and sample analysis performed within the Cocaine Signature Program (CSP) of the Drug Enforcement Administration’s Special Testing and Research Laboratory since 1992. In addition to our in-depth cocaine sample analysis and applied research, we have debriefed hundreds of South American illicit cocaine laboratory operators on the details of their processes to include observing, first hand, dozens of these operators making cocaine in the illicit setting.

Cocaethylene is not a natural product derived from coca. Rather, it is a manufacturing by-product resulting from both pharmaceutical and illicit production processes and certain smuggling techniques. Because cocaethylene is a manufacturing by-product, it has no intrinsic origin value, and thus is not a quantitative target compound in our geographic origin classification program (1). However, we have detected it at various levels in illicit cocaine exhibits for over 10 years.

It would be appropriate to explain the known licit and illicit processes that produce cocaethylene in cocaine samples. In each case, the methyl ester of cocaine is transesterified to some degree in the presence of ethanol to the ethyl homologue, cocaethylene. Pharmaceutical cocaine contains various levels of cocaethylene because of the recrystallization step, which uses ethanol. We reported cocaethylene levels in five differing lots of pharmaceutical cocaine over 12 years ago (2).

There are three well-known processes that give rise to cocaethylene as a manufacturing by-product within an illicit cocaine sample. These processes are 1. dissolution of cocaine in ethanol for smuggling purposes, 2. “washing” crude cocaine base with ethanol as a purification step, and 3. conversion of cocaine base to cocaine HCl utilizing ethanolic HCl (HCl gas dissolved in ethanol).

First, it is not uncommon for cocaine to be smuggled dissolved in ethanol (usually in bottles of liquor). We have detected significant levels of cocaethylene in these exhibits. Prolonged exposure of cocaine to ethanol results in significant levels of cocaethylene. For example, Janzen (3) reported levels of 20% cocaethylene in illicit cocaine HCl exhibits that were obtained from this type of smuggling operation.

Second, Peruvian cocaine base processors are now known to use ethanol for the purification of crude cocaine base. This process is referred to as the “base lavada” or “washed base” process. It is a substitute method for the potassium permanganate purification methodology, a recent development over the past 3–5 years. The process involves adding sufficient ethanol to crude cocaine base to give it a dough ball consistency. The dough ball is wrapped in a cloth and pressed in a perforated mold. Ethanol containing dissolved colored impurities and some cocaine leach from the mold to give a slightly purer cocaine base. Peruvian processors then utilize acetone and concentrated HCl for the conversion of this “washed” cocaine base into cocaine HCl.

We recently completed a study on authentic Peruvian cocaine which included both washed cocaine base (N = 114) and cocaine HCl (N = 46) exhibits. The details of this study will be reported elsewhere; however, we present the following preliminary findings at the request and in the interests of this journal. To summarize, cocaethylene was detected in all 114 cocaine base exhibits with an average concentration of 0.12% relative to cocaine; the highest concentration was 0.93%. Five other transesterified minor alkaloids were also detected in many of these exhibits. Cocaethylene was also detected in all 46 cocaine HCl exhibits as well, with an average concentration of 0.013% relative to cocaine; the highest concentration was 0.084%. Ethanol was detected in all the Peruvian base exhibits and in 30 (65%) of the HCl exhibits. It should be noted, however, that Peruvian HCl method (acetone/concentrated HCl) processed exhibits account for only 1–2% of all cocaine HCl examined in the CSP from seizures in the United States. In addition, the cocaethylene content of the Peruvian HCl exhibits is significantly lower than what we have observed in the past for Colombian HCl-processed exhibits. It should also be noted that in 2006, we found (through the CSP) that 6% of the cocaine HCl analyzed from submitted seizures in the U.S. were actually Peruvian cocaine base converted to cocaine HCl through Colombian methodologies (Peruvian cocaine base smuggled into Colombia for conversion into cocaine HCl). This study did not examine any samples of this latter type, since we were interested in the newer Peruvian process.

Finally, many Colombian processors convert cocaine base into cocaine HCl utilizing ethanolic HCl as a substitute for concentrated HCl. Approximately 98% of cocaine HCl exhibits analyzed from seizures within the United States are processed by...
Colombian method solvents (various acetates and methyl ethyl ketone), which usually include the use of ethanolic HCl. The current Colombian methodology of using ethanolic HCl has been utilized for over 10 years. The described study of Peruvian cocaine did not examine any samples of this type. However, as routine signature target components, we detect ethanol and ethyl chloride (an ethanolic HCl manufacturing by-product) in cocaine HCl exhibits produced from Colombian methodologies. Ethanol was detected in 41 of 45 (91%) recent headspace analyses of Colombian-produced HCl exhibits. Although cocaethylene content was not determined for these latter exhibits, it would not be unreasonable to expect cocaethylene as a manufacturing by-product at some level. In the past, we have detected cocaethylene (up to 2%) in Colombian processed samples, and we have made personal communications to various investigators concerning these findings.

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References