



Technical Note

Variation in chemical profiles within large seizures of cocaine bricks

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ABSTRACT

Cocaine is usually trafficked from South America throughout the world in packages of approximately one kilogram shaped as bricks and imprinted with a logo. Seizures consisting of multiple cocaine bricks gives the opportunity to examine the variation in the chemical profile within cocaine bricks assumed to originate from the same manufacturer and maybe even the same production batch. This knowledge may be important to the forensic investigator when chemical profiles from cocaine samples of unknown origin are compared.

In the present study, the alkaloid and residual solvent profiles from three large cocaine seizures each containing identical cocaine bricks was examined. The three cases consisted of 36, 84 and 100 cocaine bricks, respectively. Each cocaine brick was profiled according to its cocaine alkaloid and residual solvent content using gas chromatography–mass spectrometry (GC–MS) and headspace GC–MS.

The study showed that each of the three identical looking seizures consisted of up to four groups of cocaine bricks displaying the same cocaine alkaloid and residual solvent profile. The size of the groups varied from 2.4 to 63.3 kg cocaine. The study also showed that the residual solvent profile within each of the three large seizures exhibited very little variation whereas the alkaloid profile varied considerably more. This finding suggest that the same organic solvent is used for the production of several batches of cocaine HCl. Therefore, the residual solvent profile may be a tool to link different production batches from the same manufacturer even though the alkaloid profile are different.

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1. Introduction

In 2013 and 2015, Danish police seized an extraordinary large amount of cocaine. A total of 681 kg and 548 kg cocaine was seized in 2013 and 2015, respectively. These amounts opposes the more moderate seizures made in the previous years where the amount of cocaine confiscated by the police ranged between 42 and 92 kg (2006–2012 and 2014) [1]. The explanation for these peak amounts of cocaine seized in 2013 and 2015 was that, in a few cases, the seizure consisted of numerous one-kilogram cocaine bricks. In three specific cases, a large number of cocaine bricks were found by chance in containers shipped from South America. All cocaine bricks from each case were wrapped identically in multiple layers of plastic and imprinted with the same logo. Thus, these cases were assumed to originate from the same clandestine manufacturer and

therefore considered suitable for examining the batch variation of clandestine cocaine production.

Limited information is available regarding the batch variation within large cocaine seizures consisting of multiple one-kilogram cocaine bricks. Earlier work has tried to link cocaine bricks imprinted with the same logo by analysing the isotopic ratios of a big seizure in Germany [2]. No correlation between the isotopic ratio and the respective logo was, however, observed. A more frequently used analytical technique in cocaine profiling is gas chromatography–mass spectrometry (GC–MS) analysis of the major and minor cocaine alkaloids [3–6] and the residual solvents [7–9] occluded in the cocaine crystals. It has been reported that the alkaloid profile of a cocaine brick can change if the brick is exposed to a heat source due to decomposition and this decomposition is proportional with the distance from the heating source [3]. The unstable nature of the alkaloid profile has also previously been reported by the authors [10].

In the present study, we examine the variation of the alkaloid and residual solvent profiles of three large seizures containing multiple cocaine bricks branded with the same logo and assumed to originate from the same clandestine manufacturer. The

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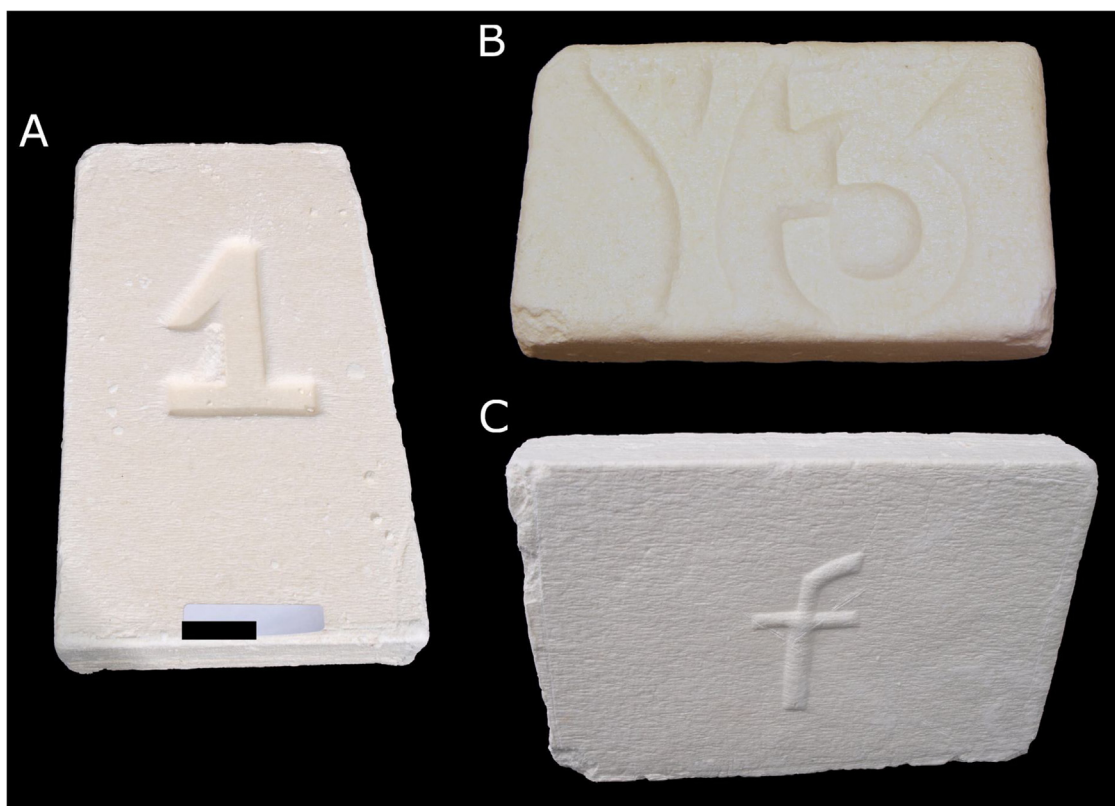


Fig. 1. Imprinted logos on the cocaine bricks in case A (left), B (right, top) and C (right, bottom).

objective of the study is to identify different groups of chemical profiles, reflecting the presence of smaller production batches within each of the larger seizures. Furthermore, the size and variation in the chemical profile within and between these batches are examined. We discuss the possibilities of linking samples using the alkaloid and residual solvent profile within larger cocaine seizures.

2. Case material

A total of 220 cocaine bricks from three different seizures were included in the study. Each of the three seizures were confiscated from containers shipped directly from South America. It was assumed that each of the large seizures originated from the same illicit manufacturer based on the following characteristics. All cocaine bricks within each of the three seizures were wrapped in a similar manner with multiple layers of plastic and/or duct tape of similar appearance and bagged in the same type of bags. The bricks within each seizure were imprinted with the same logo (Fig. 1). In addition, the cocaine bricks exhibited similar dimensions, weight, purity and presence of adulterants (Table 1). For investigation purposes, 22 of the 220 cocaine bricks were returned to the police in their original wrapping and these were therefore not included in

the study. Hence, 198 cocaine bricks were subjected to profiling analysis.

3. Materials and methods

3.1. Cocaine brick sampling

Sampling of the 198 cocaine bricks was carried out in the centre of the brick in order to avoid any potential decomposition of the chemical profile on the exterior of the cocaine bricks [3]. Thus, any exterior influences such as temperature fluctuations should have been avoided, thereby ensuring the most reliable sampling for analysis of the alkaloid profiles. A sub-sample of approximately 2–5 g was sampled from each brick and homogenised in a mortar. Subsequently, a smaller amount of the homogenised material was used for the analysis. In addition, one randomly chosen brick was subjected to ten times randomised sampling (both interior and exterior) in order to confirm homogeneity across a brick.

3.2. Analytical methods

Two previously described GC–MS based analytical methods were used for alkaloid and residual solvent profiling [10]. Both

Table 1

Description of the cocaine bricks in the three cases.

Case	No. of bricks	Imprinted logo	Colour	Brick size (cm)	Weight (g)	Total weight (kg)	Purity (% w/w cocaine base)	Adulterants
A	36	"1"	White to beige	22 × 12 × 3.0–3.4	959–997	35.4	63–69	Levamisol
B	84 ^a	"Y3"	White	23 × 14 × 3.5–4.2	1188–1213	101	69–72	–
C	100 ^b	"f"	White	20 × 13 × 4.0	984–1033	101	72–74	Levamisol

^a 12 bricks were returned to the police in their original packaging without any further analysis.

^b 10 bricks were returned to the police in their original packaging without any further analysis.

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