Forensic Science International 262 (2016) 73–83

Contents lists available at ScienceDirect

Forensic Science International

journal homepage: www.elsevier.com/locate/forsciint

Review Article

The cutting of cocaine and heroin: A critical review

Julian Broséus *, Natacha Gentile, Pierre Esseiva

Ecole des Sciences Criminelles, Faculté de Droit, des Sciences Criminelles et d'Administration Publique, Université de Lausanne, Switzerland

ARTICLE INFO

Article history:
Received 14 August 2015
Received in revised form 6 February 2016
Accepted 18 February 2016
Available online 26 February 2016

Keywords:
Illicit drug
Adulterant
Diluent
Drug market
Interdisciplinary
Drug policy

ABSTRACT

The illicit drug cutting represents a complex problem that requires the sharing of knowledge from addiction studies, toxicology, criminology and criminalistics. Therefore, cutting is not well known by the forensic community.

Thus, this review aims at deciphering the different aspects of cutting, by gathering information mainly from criminology and criminalistics. It tackles essentially specificities of cocaine and heroin cutting. The article presents the detected cutting agents (adulterants and diluents), their evolution in time and space and the analytical methodology implemented by forensic laboratories. Furthermore, it discusses when, in the history of the illicit drug, cutting may take place. Moreover, researches studying how much cutting occurs in the country of destination are analysed. Lastly, the reasons for cutting are addressed.

According to the literature, adulterants are added during production of the illicit drug or at a relatively high level of its distribution chain (e.g. before the product arrives in the country of destination or just after its importation in the latter). Their addition seems hardly justified by the only desire to increase profits or to harm consumers' health. Instead, adulteration would be performed to enhance or to mimic the illicit drug effects or to facilitate administration of the drug. Nowadays, caffeine, diltiazem, hydroxyzine, levamisole, lidocaïne and phenacetin are frequently detected in cocaine specimens, while paracetamol and caffeine are almost exclusively identified in heroin specimens. This may reveal differences in the respective structures of production and/or distribution of cocaine and heroin.

As the relevant information about cutting is spread across different scientific fields, a close collaboration should be set up to collect essential and unified data to improve knowledge and provide information for monitoring, control and harm reduction purposes. More research, on several areas of investigation, should be carried out to gather relevant information.

Contents

1. Context

The wider public has the perception that drugs are deliberately and frequently cut using substances potentially harmful for health, such as household cleaning products, brick dust, strychnine or ground glass [1–3]. It is worth noting that such perception is

* Corresponding author. Tel.: +41 21 692 46 46.
E-mail address: julian.broseus@unil.ch (J. Broséus).

http://dx.doi.org/10.1016/j.forsciint.2016.02.033
0379-0738/

spread both among consumers (who are largely ignorant of the actual content of their samples) and even street dealers [4–8]. This perception may arise because of the main argument put forward to justify cutting. Indeed, cutting is usually explained by the seller's desire to increase its profits. This would be performed by adding to the illicit drug any substance that looks like it and/or would have the same effect, with no possibilities for the buyer to notice the addition, and that may be harmful [9]. However, the dealer sells commodity and relies on repeat custom, sometimes interacting with the same people. Thus, he should be seen as a businessman: poisoning customers does not make good business sense regarding income supply or reputation [3]. Furthermore, some dealers even say being concerned by their customers' health [5,10,11]. This is why presence of harmful substances in illicit drugs may only occur if dealers or suppliers were ignorant or inexperienced (i.e. that they would try cutting drugs by themselves, with available substances, therefore taking the risk to create toxic mixtures), if they wanted to kill the maximum number of people or had a desire for revenge. But these scenarios are not considered as "normal" cutting approaches [1,12].

Usually, substances detected by forensic laboratories in cocaine and heroin specimens either are natural compounds, by-products, cutting agents or artefacts. Typically, cutting agents refer to *diluents* (pharmacologically inactive and readily available substances) and *adulterants* (pharmacologically active substances, usually more expensive or less available than diluents) [13]. Cutting agents may be added at different steps in the history of the illicit drug. Therefore, cutting may be studied at the production stage, in the country of origin, as well as at different levels of the distribution chain, until the final one, in the country of consumption [12].

Information (type, appearance frequency, concentration, etc.) related to cutting agents detected in illicit drugs is limited in forensic literature. This is probably due to the fact that these substances are not listed and therefore the record and transmission of their presence are not compulsory. Furthermore, their identification is not straightforward due to their various types (pharmaceuticals and sugars). Thus, forensic laboratories mainly focus on the qualification and the quantitation of the illicit drug under analysis, especially when both aspects are used for judiciary purposes [14].

Therefore, this article aims at improving the knowledge of this key aspect of illicit drug markets. It provides the forensic science community with an in-depth analysis of cutting, based on data convergence mainly from criminology and criminalistics. The article summarises the evolution in time and space of adulterants and diluents detected in cocaine and heroin specimens as well as the analytical methodology used by laboratories to identify cutting agents. Furthermore, it discusses when, from the country of production to that of destination, cutting takes place. Moreover, researches studying how much cutting occurs in the country of destination are compared. Lastly, the reasons for cutting are analysed.

2. Evolution in time and space

As aforementioned there is a lack of standardised analyses and reporting of cutting agents. This makes the comparison of cutting approaches over time and space uncertain. Furthermore, the knowledge of various factors such as changes in production of illicit drugs, supply routes of illicit drugs and cutting agents (in particular, adulterants) and the history, structure and organisation of drug markets in each country are often unknown. It is also worth to note that according to the chemical form of cocaine and heroin (i.e. base or salt forms), different cutting agents may be found. Nevertheless, a review of the literature enables to discuss public perceptions with objective results and highlights trends in the cutting approaches of cocaine and heroin.

The review of literature reveals that the perceptions spread among the wider public were not really supported by the analysis of cocaine and heroin specimens (see Appendix 1 – Table A1: cocaine and Table A2: heroin). Indeed, forensic results indicate that cutting consists more in diluents such as sugars or in adulterants that will enhance/mimic the effects of the illicit drug than with substances chosen to cause serious health problems or death (see Section 5).

The review of literature reveals temporal differences in the type of cutting agents and/or their appearance frequency. The evolution in the cutting of cocaine and heroin may be summarised as follows. In cocaine, lidocaïne and sugars were the two main cutting agents in the 1980s [15]. At the beginning of the 1990s, lidocaïne was not anymore detected in Spain [16], while at the end of this period this was one of the main adulterants in Italy – along with caffeine and phenacetin [17]. Diltiazem, hydroxyzine and levamisole were first reported from 2004 to 2006, in the Netherlands [18], the United-States [19,20], Switzerland [21,22], Italy [23] and France [7,24]. Nowadays, phenacetin, levamisole, caffeine, diltiazem, hydroxyzine and lidocaine are considered as the main adulterants of cocaine in Europe [7,18,22,24–31]. Several studies performed in Brazil, the country with important trafficking routes to North America, Africa and Europe, showed that adulterants similar to the ones mentioned above were detected [32–40] (see Appendix 1 – Table A1). Recently, presence of new psychoactive substances (NPS) has been reported in cocaine specimens, but at very low appearance frequency [41]. Concerning heroin, substances such as caffeine, quinine, lactose and mannitol were reported between the 1960s and the 1970s in Europe [15]. In the 1980s, caffeine, procaine, paracetamol and phenobarbital were common adulterants and quinine was less detected [15]. At the beginning of the 1990s, procaine, phenobarbital and methaqualone progressively disappeared, for instance in France [42], Denmark [43] and Spain [44]. Since then, caffeine and paracetamol were reported as the main adulterants for heroin in many European countries and the most recent studies reported their detection at similar and high appearance frequency (more than 90% of specimens contain caffeine and paracetamol) [21,22,25,30,31,42,44–52] (see Appendix 1 – Table A2). Griseofulvin, an antifungal drug, was first mentioned as an adulterant of heroin in 2000 [30]. Lastly, nowadays, the most detected diluents both for cocaine and heroin are glucose, sucrose (saccharose), lactose, mannitol and even inositol [15,22]. Starch and carbonates are also reported as diluents for cocaine [35].

These results provide us with important information to better understand the cutting of illicit drugs. Indeed, the presence of similar adulterants detected in different countries tends to highlight a consensus or knowledge from the people involved in production or distribution about which cutting substances to use. Their choice does not seem to be meaningless. This makes us also infer that these substances may be added during the production of the illicit drug or at a high level of the distribution chain of the product (see Section 3). Moreover, forensic results inform on the structure/organisation of illicit drug markets. Thus, from 1980 to date, we have observed an increase (resp. a decrease) in the number of cutting agents detected in cocaine specimens (resp. heroin specimens) [18,25,30,43,50]. In particular, since the beginning of the 1990s, the adulteration of heroin market was particularly stable with the predominance of caffeine and paracetamol, even at similar concentrations (see Section 2). Since, at the same time, we have observed more changes in the