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CONTENTS

An evaluation of the results of a drug sample analysis

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ABSTRACT

An analysis of drug samples received by the National Toxicology Institute at Madrid during the period from September 1985 to May 1987 was undertaken with a view to carrying out an epidemiological assessment of drug abuse. Of 414 street drug samples, 63.5 per cent contained heroin, 12.5 per cent cocaine, 8.5 per cent amphetamine and 15.4 per cent other substances. The concentration of heroin ranged from 21 to 60 per cent in most of the samples (91.8 per cent) that contained it. Similar concentrations of cocaine were found in the samples containing that substance. Adulterants were detected in 78.8 per cent of the samples containing heroin, 59.6 per cent of the samples containing cocaine and 56 per cent of the samples containing amphetamine. The most common adulterants in the samples containing heroin were caffeine (68.4 per cent), phenobarbital (19.7 per cent), methaqualone (13.4 per cent) and procaine (13.4 per cent), while lidocaine was the most common adulterant (52 per cent) in the samples containing cocaine.

Introduction

In Spain, there has been a sharp increase in illicit drug consumption and in the number of deaths related to drugs, primarily heroin, in recent years. A study was undertaken to determine the content of drugs, adulterants and diluents in street drug samples and in packets and syringes found near corpses. Information on the analytical techniques used and the results obtained, particularly those relating to the samples containing heroin is provided below.

Method

A total of 414 street drug samples received in powder form by the National Toxicology Institute at Madrid during the period from September 1985 to May 1987 were analysed. Samples taken from nine packets and 22 syringes found beside corpses were also analysed. An investigation was made of the composition of the drug and the accompanying adulterants and diluents in each sample [1-2].

The analysis was conducted using a combination of different techniques: thin-layer chromatography, gas chromatography, high-pressure liquid chromatography, mass spectrometry and atomic absorption spectrophotometry [3-11].

Gas chromatography and high-pressure liquid chromatography were used to determine the qualitative and quantitative composition of the drugs and their adulterants. When an unknown or unusual substance was detected, the analysis was supplemented by mass spectrometry.

Results

In table 1, the 414 samples are classified by substance. The largest proportion (63.5 per cent) of the samples contained heroin.

Table 1

Percentage distribution of the samples by substance

(N = 414)

Substance	*Number of samples*[a]	*Share of the total (percentage)*
Heroin	263	63.5
Cocaine	52	12.5
Amphetamine	36	8.6
Other substances	63	15.4

[a]Only samples obtained in powder form are included.

Samples containing heroin

Heroin was present in 63.5 per cent of the total number of samples. Most of those samples (91.8 per cent) contained a heroin concentration of between 21 and 60 per cent. A small number of the samples (2.4 per cent) contained less than 1 per cent heroin, as a result of being extensively adulterated or diluted with other substances.

A large number of other substances were detected in the samples containing heroin. They are classified below into three groups, depending on their origin or intended function: substances commonly found even in unadulterated, undiluted heroin; adulterants; and diluents.

By-products and other substances commonly found even in unadulterated, undiluted heroin

Substances commonly found even in unadulterated, undiluted heroin were detected in the majority of the 263 samples containing heroin, as follows:

Substance	*Share of the samples* (percentage)
Monoacetylmorphine	89.60
Acetylcodeine	89.20
Narcotine	86.10
Papaverine	85.70
Morphine	24.60
Codeine	1.15

These were by-products emanating from the source of the heroin or its manufacture. Some of these substances, such as narcotine and papaverine, are derived from opium; some, such as acetylcodeine, arise from the acetylation of opium; and some, such as monoacetylmorphine and morphine, are a product of heroin hydrolysis. Morphine and codeine were generally found in very small amounts (these increase when samples are kept under poor, particularly humid, conditions).

Adulterants

Adulterants, substances added to heroin because of their psychoactive properties, were present in varying concentrations in most (78.8 per cent) of the 263 samples containing heroin. The concentration of adulterants was between 1 and 10 per cent in the majority of the samples. A considerable share of the samples (37.3 per cent) contained a single adulterant, as indicated below:

Number of adulterants	*Share of the samples* (percentage)
0	21.0
1	37.3
2	16.5
3	23.6
4	1.6

The adulterants included a variety of compounds, the most frequently used being caffeine (68.4 per cent), followed by phenobarbital (19.7 per cent), methaqualone (13.4 per cent), procaine (13.4 per cent), piracetam (7.2 per cent) and lidocaine (5.4 per cent). The most common combinations were caffeine and procaine; caffeine, procaine and phenobarbital; and caffeine, procaine and methadone.

No strychnine or quinine was detected in any of the samples.

Diluents and inert substances

Diluents and inert substances, primarily glucose, lactose and mannitol, were present in 72.5 per cent of the samples containing heroin. The presence of magnesium aluminium silicate (talc) was detected in only one sample.

Packets and syringes found beside corpses

The contents of nine packets found beside the bodies of drug addicts were analysed separately. Table 2 shows that five of the packets contained between

Table 2

Concentration of heroin and adulterants in nine packets found beside corpses

(Percentage)

Packet	*Heroin*	*Adulterants*
1	61	Phenacetin: 2.5; methaqualone: 1.5; phenobarbital: 0.5
2	40	Procaine: 20; caffeine: 1.3
3	35	—
4	40	Procaine: 23; lidocaine: 1
5	55	Caffeine: 2.8; methadone: 0.1
6	25	Lidocaine: 8.9; caffeine: 0.5; phenobarbital: 0.45
7	35	—
8	48	—
9	..	—

30 and 40 per cent heroin, while three of them had a higher percentage. The concentration of heroin in one of the packets was not calculated.

Two of the packets contained a substantial amount of procaine. Among the other adulterants detected were lidocaine, caffeine, phenacetin, methaqualone, phenobarbital and methadone.

Included in the analysis were 22 syringes found beside corpses. Only a qualitative analysis was carried out in respect of their contents. The composition of the substances detected in the syringes was similar to that in the samples containing heroin in powder form except that morphine was generally the major component, owing to the *in vitro* hydrolysis of the heroin. With reference to adulteration, no differences were detected compared with the rest of the samples.

Samples containing cocaine

The 52 samples containing cocaine represented 12.5 per cent of the total and were of varying concentrations. Most of them contained concentrations of between 21 and 30 per cent or over 60 per cent, as indicated below:

Cocaine concentration (percentage)	*Share of the samples* (percentage)
0-10	10.2
11-20	8.1
21-30	34.69
31-40	6.12
41-60	8.16
Over 60	32.64

Anhydroecgonine methylester, emanating from the source of the cocaine, and ecgonine benzoylester, a product of cocaine hydrolysis, were found in the majority of the samples containing cocaine. Such by-products are often found in small amounts even in unadulterated, undiluted cocaine.

Adulterants were detected in 59.6 per cent of the samples containing cocaine. Lidocaine was found in a far greater percentage of those samples (52

per cent) than caffeine, procaine or other adulterants, which were detected only occasionally. Of the adulterated samples, 84 per cent contained a single adulterant.

Of the diluents, sugars were detected in 45 per cent of the samples; those used most often were mannitol and glucose.

Samples containing amphetamine

Amphetamine was detected in 8.6 per cent of the samples analysed. One sample contained methylenedioxyamphetamine (MDA).

Adulterants were detected in 56 per cent of the samples containing amphetamine. These included caffeine, ephedrine, piracetam, paracetamol, lidocaine, heroin and acetylsalicylic acid.

Samples containing other substances

The following substances were found alone or in combination with others in the remaining 15.4 per cent of the samples analysed:

Acetylsalicylic acid
Ampicillin
Caffeine
Cinnarizine
Doxylamine
Fenfluramine
Glucose
Lactose
Lidocaine
Lorazepam
Mannitol
Metronidazole
Nordiazepam
Opium in powder form
Paracetamol
Piracetam
Propyphenazone
Quinidine
Triazolam

These substances were used for their pharmacological effect, as is the case with benzodiazepine or analgesics.

Concluding remarks

Of the 414 samples analysed, the largest proportion (63.5 per cent) contained heroin. The majority of those samples contained a heroin concentration of between 21 and 60 per cent.

In the samples containing heroin, a large number of adulterants were detected, including hypnotics such as phenobarbital, analgesics such as phenacetin, stimulants such as caffeine, and local anaesthetics such as procaine and lidocaine. An analysis of the contents of the nine packets and 22 syringes found beside corpses yielded similar results.

The samples containing cocaine were less often adulterated than those containing heroin, the most commonly used adulterant being lidocaine.

The results of the drug sample analysis should prove useful in an epidemiological assessment of drug abuse.

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