Monitoring Current Drug Use on the Dance Scene and Investigation of Ultra Violet Spectroscopy for the Characterisation of Tablets and Capsules

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Aims

To document the current range of illicit and controlled drugs used on the dance scene in London and Manchester and explore whether there are any significant similarities or differences between the types of drugs deposited.

To investigate ultra violet (UV) spectroscopy for its usefulness to characterise drugs faster and more efficiently than current screening methods.

Introduction

Drugs and the Dance Scene

For many young people, a night out at a local dance venue or club is an inherent part of their social life. Nightclubs and bars are a place to meet up, socialise, dance and work off youthful energy, but for some, drug use at such venues has become an almost vital part of their night out. The true extent of drug taking at clubs is unknown, but some surveys of the peak clubbing age group 16-29 years old report that 1 in 5 clubbers go to dance venues because the drug taking is part of the enjoyment [1].

In the UK 'ecstasy' is the most common group of drugs now associated with the dance/ club scene [2], with its use still on the increase (12% in 2001 [3]). Ecstasy is especially associated with 'techno'/fast moving music, where such stimulants allow 'unlimited energy' and continuous dancing.
Cocaine is increasingly popular at dance events and a 9% increase was seen in cocaine use in 2001 [3]. This rise seems to continue with the amount of cocaine being seized by police in London having quadrupled over the last year [4]. Drug users in clubs that specialise in 'garage music' or 'drum and bass' tend to consume more cocaine, cannabis and alcohol compared to ecstasy [1].
Cannabis is still the most widely consumed drug in the European Union [5]. However, levels of its use has remained static amongst all age groups in most countries, even given its recent down grading in the United Kingdom from class B to class C of the Misuse of Drugs Act 1971.

Amnesty bins were first described by Ramsey *et al* 2001 [6] as a new method to monitor drugs in dance venues. Suspected drugs confiscated as a result of a search are deposited in an amnesty bin, as well as clubbers being persuaded to voluntarily deposit their drugs. The contents of the bin gives the best representative sampling method possible for the analysis of drugs currently being used on the dance scene.

UV Spectroscopy Database

Analysis of unknown samples is probably one of the most challenging processes in chemical analysis. It involves applying an array of different chromatographic and spectroscopic techniques and collating the results in an effect to determine the most likely identity. Many of the complex analytical methods can take a significant amount of time and money when only a simple confirmation method is often needed. UV spectroscopy is fast, easy, cheap and involves little sample preparation.
UV spectral libraries of compounds are not used routinely. Wallwitz and Baumann, 1996 [7] developed a complex computer algorithm for matching UV spectra of unknowns to a library database. Libraries like this are not readily available and laboratories usually rely on literature matches and subsequent running of standards.
This research aims at building a database of UV spectra of drugs and other compounds seen in tablets and powders, along with the development of a computer database program. Although UV data cannot be used as a confirmatory analytical process due to the lack of uniqueness in the spectrum and the fact that such tablets may contain mixtures of drugs, it may be possible to use it as a primary screening method. Long term the database can be expanded to contain more spectra, becoming a useful tool alongside other more complex analytical methods in unknown drug identification and forensic science.

Materials and Methods

Two sealed evidence bags were received from the London club and eight bags collected from seven different clubs in Manchester. The contents of each bag were sorted into items that looked identical eg. all tablets that were the same size, colour and had the same logo or markings were grouped together and assumed to belong to the same batch.

The TICTAC database was then used to attempt to identify the tablets. Pharmaceutical tablets were identifiable by their markings on the database and were not further analysed. Illicit tablets, which had logos comparable to those contained in TICTAC and assumed to contain MDMA were confirmed by the Marquis colour test. All unknown tablets and powders were analysed by a variety of analytical methods outlined in figure 1.

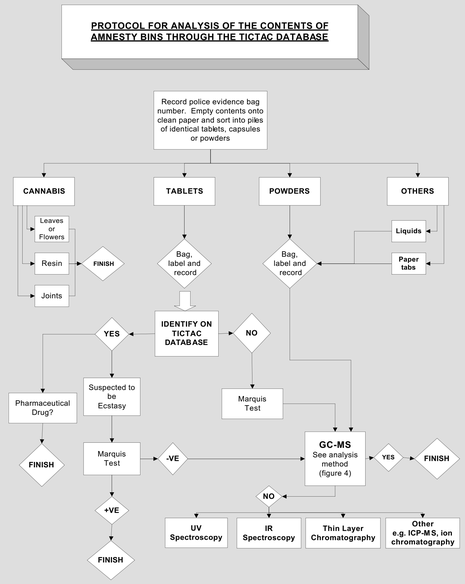

Figure 1: Standard Operating Protocol for the procedure of analysing the contents of amnesty bins.

Results

Two large police evidence bags were received from the London club; one containing multiple loose tablets, packets of powder, paper wraps, plastic containers and bottles along with other loose items; the other contained only cannabis plant material. Eight smaller bags were received from the Manchester clubs.
The bag containing cannabis material was found to contain 42 individual 'joints' containing herbal cannabis, 27.9g of cannabis resin (including individual packaging) and 84g of herbal cannabis (including individual dose bags). No further analysis was conducted on these items, and they are shown in Figure 2.

Figure 2: Cannabis material received from the London club, collected between January-March 2004.

Figure 3: All tablets, capsules and powders received from the London club between January-March 2004.

The London Dance Venue

A total of 753 tablets were identified. Of these, 714 (94.8%) were found to contain MDMA by GC-MS analysis or through identification on the TICTAC database. The vast majority of these, (712 tablets, 94.5%) contained only MDMA with no other active drug. Two tablets (0.3%) contained MDEA with MDMA. Thirty-nine (5.2%) were found to contain active drugs other than MDMA or related compounds. Of the 753 tablets, 39 (5.2%) were found to contain active drugs other than MDMA (figure 4). Four red capsules were found in their original package, marketed as "EX:1 100% Pure Stimulation" from the Herbal High Company.

Of 48 individual powder samples received; 14 (29.2%) were cocaine, 12 (25%) were amphetamine powder, 9 (19%) were ketamine, 9 (19%) were MDMA powder, one methamphetamine sample (2%), one heroin sample (2%) and one caffeine powder (2%). One powder sample was not analysed due to insufficient sample.

Other identified samples were one bottle of liquid 'poppers' (alkyl nitrite), one bottle of Visine eye drops and five paper tabs suspected to be LS D.

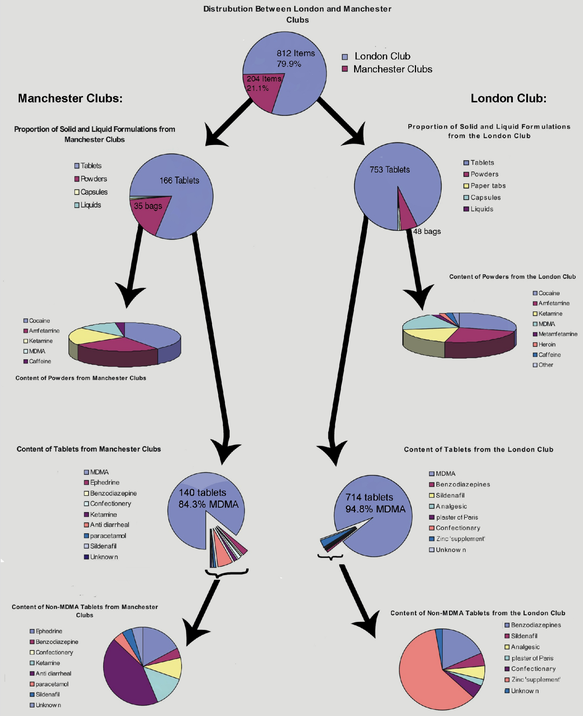

Figure 4: Summary and comparison of all items identified from the London andManchester amnesty bins.

The Manchester Dance Venues

A total of 166 tablets were received, 140 (84%) were found to be 'ecstasy', all containing MDMA and one (0.7% of ecstasy tablets) contained MDMA and caffeine. 26 (15.6%) were found to contain active drugs other than MDMA (see figure 4). In addition, 2 green capsules were found individually but appeared to have the same herbal contents through a visual inspection. No further analysis was carried out on these capsules due to time limitations.
Of the 35 powder samples received; 13 (37.1%) were cocaine, 7 (20%) were ketamine, 9 (25.7%) were amphetamine, 4 (11.4%) were MDMA powder, one (2.9%) contained caffeine only and one remains unknown. A brown residue on cling film was found to be cocaine.
One bottle of alkyl nitrite liquid was also found.

Unknown Tablets

London club:

Marquis test: Negative
GC-MS: NegativeGC-MS: Negative
Infra Red: Match to plaster of Paris
Result: Plaster of Paris moulded 'tablet'

GC-MS: Paracetamol, caffeine and methyl salicylate.
UV: Consistent with paracetamol and aspirin.
TLC: Aspirin and paracetamol
Result: Aspirin, paracetamol and caffeine.

Marquis test: Negative
GC-MS: Negative **UV:** Negative
TLC: Negative for sugars
†**ICP-MS:** Approx. 25mg of Zinc.
Result: Zinc supplement

Manchester club:

GC-MS: Bufotenine and small amount of cocaine.
UV: Consistent with bufotenine.
Result: Bufotenine containing

UV Spectroscopy Database

The user can compare an unknown UV spectrum to standards on the database. Searching by spectral features presents all compounds with the closest matching peak(s) in acid and alkali conditions. This gives added confirmation of identification if the compound shifts under different conditions. The database is also able to retrieve spectral data for a given compound name or drug group. The package is presented in a user-friendly operating environment with safe-guards to prevent accidental data editing or deletion.
The main front page known as a 'switch board' (figure 5) allows the user to navigate all pages and functions in the database. The main search page is shown in figure 6.

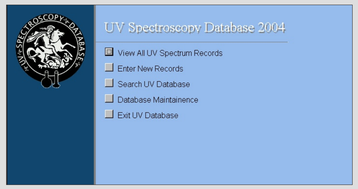

Figure 5: The main menu of the new UV Spectroscopy database.

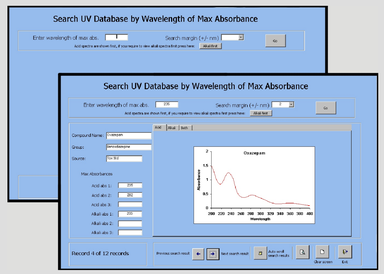

Figure 6: The main search page of the UV Spectroscopy database, before and after retrieval of information.

Conclusion

Over 1000 tablets, capsules and powder doses were received through the amnesty project this year. The analysis of the amnesty bins has given an indication of the subtle changes that are occurring in drug use on the dance scene. Most notably, the prevalence of MDMA in ecstasy tablets.

- Involving clubs in Manchester as well as London, has allowed the amnesty bin analysis method to expand and prove its effectiveness in accessing the current drug use on the dance scene. This illustrated clubs hundreds of miles apart with almost identical proportions of the commonly abused tablets and powders.

- Unknown tablet identification will continue to be a challenging aspect of forensic drug analysis. It is forensically important to confidently identify and then confirm the findings through more than one method. Although UV spectroscopy cannot alone match the powerful analytical methods of GC-MS and LC-MS, it has been shown that it can still be used efficiently along side them.

References

[1] Safer Clubbing. Guidance for licensing authorities, club managers and promoters. Russell Webster in partnership with Release. Commissioned by the Home Office Drug Strategy Directorate. Printed by Tradewinds, 2002

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† This method was conducted by the Regional Laboratory for Toxicology, City Hospital, Birmingham.