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THE BIOPROFILING OF ILLICIT DRUGS

Burgoyne, Catcheside & Kirkbride (2008)

Plain English summary and implications for police prepared by Roger Nicholas

Aims and Methodology

The researchers set out to determine whether illicit drugs contain traces of biological material such as micro-organisms, plant remains, and other cellular material, all of which potentially contain DNA. The drugs could contain this material as a consequence of them being manufactured, "cut", and distributed with no control over the addition of contaminants. This would mean that DNA could be extracted in sufficient quantities to allow profiling and to link apparently unrelated seizures, or to determine where they came from.

The project aimed to identify DNA sequences present in four different drug types (heroin, methylamphetamine, ecstasy, and LSD). It also sought to detect similarities between the drugs to determine whether there were common sources. The researchers also aimed to develop a profiling technique based on DNA arrays and ATNA-SMIPS$_{tm}$ technology, and an experimental database to validate the concept, and to explore the forensic usefulness of the technique. An important overall objective of the project was to assist police to use DNA technology to determine the links between batches of drugs and who has handled the drugs at some stage in the production and distribution processes, as well as any materials used to cut the drugs.

Key findings

The researchers found that DNA sequences can be readily extracted and amplified from typical drug seizures. They found that human and non-human DNA could be readily extracted from seizures and that this technology could be applied to police intelligence almost immediately. This has the potential for court usage after considerable experience and validation. A key, but unexpected, finding of the research was that drug seizures often contain potentially useful human DNA content. Even in the relatively small quantities of drugs subjected to testing, the human DNA content was sufficient for conventional forensic 'trace DNA' techniques to be quite promising. The researchers suggested that in principle, such human DNA profiling could be conducted by any suitably equipped forensic laboratory around Australia and across most of the world. The profiles generated would be compatible with DNA databases such as National Criminal Investigation DNA Database (NCIDD).

The profiling and comparison of non-human DNA is more complex and the researchers had to develop a new approach to achieve this. This involved the construction of arrays, which is a technically demanding procedure that forensic laboratories in Australia are not equipped to conduct. More sophisticated profiling techniques based on direct sequencing of the amplified DNA could replace the array technique as the cost of the sequencing declines.

It is hoped that the technology that flows from this research will allow law enforcement officers to use these DNA profiles in drug investigations to: identify new persons of interest through searching against the DNA database; indicate which seizures have been handled by a known person of interest; or to identify seizures that are linked by exposure to the DNA of an unknown person.

Although DNA profiling of drugs offers the same sort of support to law enforcement that chemical profiling provides, it is an advancement because it can identify *persons* that are involved (which cannot be done by chemical means) and it can be used on drugs that are difficult to profile using chemical means, such as "ice." Forensic drug chemistry laboratories do not currently have the capability to conduct DNA profiling of drugs. Forensic biology laboratories do have the capability for human profiling (and non-human profiling if arrays become commercially available) but the capacity to take on new and additional work is likely to be an issue.

Key implications for policing

This research has the potential to have very important implications for the investigation of illicit drug-related crime in Australia and worldwide. The ability to compare drug samples containing non-human DNA and to use drug samples containing human DNA to identify known, and link unknown, individuals is likely to be of major importance to drug law enforcement in the future. As a result, NDLERF has funded the researchers to expand on this work. In particular, the researchers are now undertaking a project to: identify the frequency with which illicit drugs contain human DNA; assess the relative merits of various methods for profiling this DNA; establish the conditions under which DNA survives in drug powders; and to make recommendations based on their findings.

A full copy of this report is available on the NDLERF website at www.ndlerf.gov.au

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