Chapter 1

Introduction to Drug Trends, Control, Legislation and Analysis

Learning Objectives

- To appreciate the problem of increasing drug use.
- To be aware of the international legislation relating to drugs.
- To be aware of the legislation in relation to the control of drugs in the United Kingdom, the United States and Australia.
- To appreciate the role of the drugs chemist in drugs analysis.
- To understand the need for quality assurance in the drugs laboratory.
- To gain an understanding of the ways to facilitate evidence presentation in court.

1.1 Introductory Remarks

The problems associated with psychotropic drugs and controlled substances have been, and continue to be, the subject of much debate. Regardless of one's views, however, there remains the fact that a number of drugs are *controlled substances*. There is now a considerable body of evidence that the number of people using controlled substances for non-medical purposes is increasing. Data from the United Kingdom (Figure 1.1) is mirrored by that collected from the international community.

Within the legal and forensic science context, in order to prove that an offence has been committed, it is necessary to prove that a drug is present, and, if required, to determine the amount of the drug and its relationship to other samples. It is essential for those working in this area to understand how such analyses are

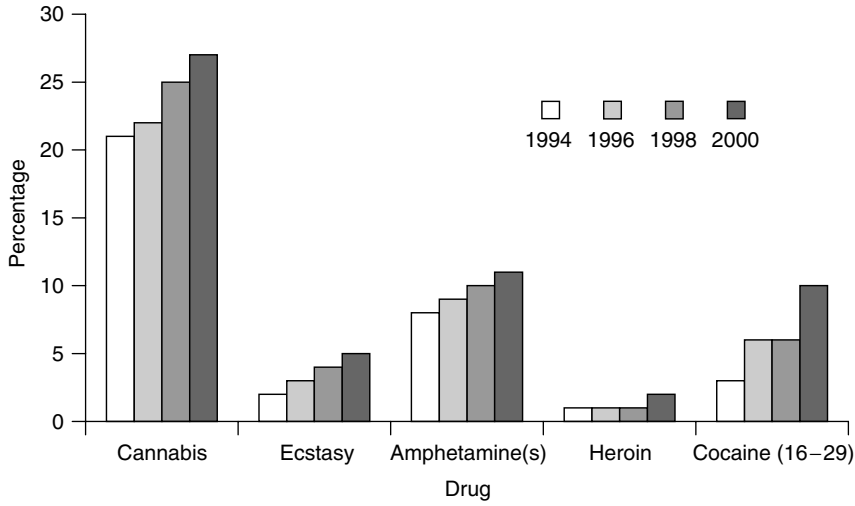

Figure 1.1 Percentage of 16–59 year-olds in the United Kingdom who claim to have used drugs – 'ever' (16–29 year-olds in the case of cocaine) [1].

carried out. In order to select, and critically evaluate, such analyses, it is also necessary to have an overview of the corresponding legislation in the jurisdiction in which one is working.

1.2 International Legislation

Within the international context, controls on drugs are set out in three treaties issued by the United Nations, namely:

1. The Single Convention on Narcotic Drugs, 1961.
2. The Convention on Psychotropic Substances, 1971.
3. The Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances, 1988.

Signatories to these treaties implement control through domestic laws. In the United Kingdom, the principle legislative document for drug control is the *Misuse of Drugs Act, 1971*. This has been the subject of 14 modification orders and is accompanied by the *Misuse of Drugs Act (Regulations), 1985*, which was superceded by the *Misuse of Drugs Act (Regulations), 2001*.

Within the United States, the situation is further complicated because drugs are scheduled at the Federal level, but there may also be legislation at the State and County levels.

1.3 Controlled Substances in the United Kingdom

1.3.1 Background to the Misuse of Drugs Act, 1971

In the UK today, the legislative documents that are used to control drugs of abuse are the Misuse of Drugs Act, 1971, its amendments and modification orders, and the Misuse of Drugs Act (Regulations), 2001, which supersedes the Misuse of Drugs Act (Regulations), 1985. In essence, the Misuse of Drugs Act, 1971 defines what may not be done with respect to these compounds, while the Misuse of Drugs Act (Regulations), 2001 defines what may be done under the appropriately controlled circumstances. Similarly, customs offences, such as 'knowingly evading prohibition on unauthorized import/export of controlled substances', are regulated by the *Customs and Excise Management Act, 1979*.

Historically, in the United Kingdom the *Dangerous Drugs Act, 1951* simply controlled vegetable narcotics, such as *Cannabis sativa* (cannabis) and opium, and a few chemically related synthetic substances. This was superseded by the *Dangerous Drugs Act, 1964*, which organized the controlled drugs into three schedules based on internationally accepted principles. This was the first time that stimulants, used as anorectics, such as amphetamine and its analogues, were included in British Law. It also introduced some specific offences in relation to cannabis. In 1965, a new act, i.e. the *Dangerous Drugs Act, 1965*, combined the provisions of the Dangerous Drugs Act, 1951 with those of the Dangerous Drugs Act, 1964, as well as providing a more comprehensive definition of herbal cannabis as 'the fruiting and flowering tops of any plant of the genus *Cannabis*'. Since the forensic scientist still came across difficulties in discriminating fragmented plant parts which could still be a potent source of the active constituents of the plant, herbal cannabis was therefore redefined in the Misuse of Drugs Act, 1971 as: 'all the aerial parts, except the lignified stem and the non-viable seed, of any plant of the genus *Cannabis*'.

Another problem to be corrected by the Misuse of Drugs Act 1971 was that of the analogues of amphetamines, which were defined as: 'structurally derived by substitution in the side-chain or by ring closure therein' in the Act of 1965. Several compounds, such as ephedrine, were specifically excepted, but over 90 others were not purposely included. This was corrected by naming the specific compounds. Care was taken to re-phrase the wording so that certain chemical compounds, having the potential to become drugs of abuse, which might not yet have been available, generally referred to as 'designer drugs', would still be included. References were made, for example, to 'ether and ester derivatives' and to the 'stereoisomers' of several compounds.

1.3.2 The Provisions of the Misuse of Drugs Act, 1971

The Misuse of Drugs Act, 1971 lists controlled substances in three classes in Schedule 2 to the Act. Class A drugs have the greatest propensity to cause

social harm, and Class C drugs the least. Class A drugs include cocaine, heroin, mescaline, morphine and opium, Class B includes amphetamine(s), and Class C the benzodiazepines. At the time of writing,† Cannabis is being reclassified. In addition, stereoisomers, salts, esters, ethers and certain preparations are also controlled groupwise, thus removing the need to name each of these individually. Associated with each class of drug are maximum penalties which may be prescribed. Those for Class A drug offences are more severe than those for Class C offences. For Class A drugs, some offences carry a maximum sentence of life imprisonment, for Class B 14 years in prison, and for Class C, five years in prison. With respect to each of the listed drugs, the Misuse of Drugs Act, 1971 is divided into several sections (Table 1.1), with each section relating to a specific type of offence under the Act which is prohibited.

In addition, the Government may create exceptions to the general rules and allow certain substances to be imported and exported, allow persons to use certain drugs under licence, allow medical and veterinary practitioners to supply certain drugs, and allow certain persons to manufacture, possess and work with drugs for educational or scientific research purposes. The mechanism by which much of this is achieved is detailed in the Misuse of Drugs (Regulations), 2001, which details what *may be done* and *how*, while the Misuse of Drugs Act, 1971 details what *may not be done*.

In this legal area, it is necessary to be able to provide scientific support for any charge brought against individuals to prove that an offence has been committed. The majority of offences relate to possession of controlled substances. However, it is sometimes necessary for the analyst to determine the amount as well as the

Table 1.1 Principle sections of the Misuse of Drugs Act, 1971 and corresponding offences

Section of the Misuse of Drugs Act, 1971	Type of offence which is controlled
3	Importation and exportation of controlled drugs
4	Production and supply of controlled drugs
5	Possession of controlled drugs
6	Cultivation of cannabis
8	Permit premises to be used for the purposes listed in Sections 3, 4, 5, 6 and 9
9	Preparing or smoking opium
9	Use utensils or allow others to do so in relation to smoking opium
20	Induce the commission of a 'corresponding offence' while overseas

† May, 2002.

presence of a drug and on occasion, particularly in relation to supply offences, establish relationships between drug samples. The amount of work that is required depends upon the drug in question and the charge being made. For a small amount of heroin, for personal use, and on admission of guilt, sufficient support is offered by a colour (presumptive) test. However, if the admission is later retracted, a full scientific investigation of the drug is required. For other drug types, it is possible to prove the identity by the simple use of microscopy. This is especially true for cannabis products and the identification of some fungi. However, for other case types a full and rigorous investigation must be undertaken.

1.4 Controlled Substances in the United States

At the Federal level, controlled substances are listed within a system of five schedules in the *Controlled Substances Act*. These Schedules are described in Table 1.2. Schedule I contains the most strongly controlled substances, while Schedule V includes the most moderately controlled. Those drugs contained in Schedules II to V may be prescribed, while those in Schedule I may not. The data in the table illustrate a point which requires to be addressed, particularly at cross-border (International, State or County) levels, that is, one of nomenclature. In the United Kingdom, 'heroin' is taken to mean the mixture of products resulting from the synthesis of diamorphine from morphine. Both compounds are listed separately in UK legislation, although 'heroin' is not. However, in the United States, 'heroin' can sometimes be taken to mean diamorphine and the two are sometimes used interchangeably.

1.5 Controlled Substances in Australia

In a situation analogous to that in the United States of America, legislation covering drugs of abuse has been written at the Territory and Commonwealth levels. The two principle documents relevant at Commonwealth level are the *Customs Act, 1901* and the *Crimes (Traffic in Narcotic Drugs and Psychotropic Substances) Act, 1990*.

1.6 The Drug Chemist and Drug Analysis

Forensic science, the application of scientific principles to the legal process, is especially important in drugs analysis because in every case, one or more samples must be investigated in order to prove, or otherwise, that a controlled substance is present. The drugs chemist must ensure that the materials provided are suitable for the analysis to be carried out, select the correct materials, carry out the correct analysis and achieve quality data of a certain standard, interpret

Table 1.2 Federal scheduling of controlled substances in the United States of America

Schedule	Examples	Potential for abuse	Acceptance or otherwise for medical use	Safety of drug under medical supervision
I	Lysergic acid diethylamide (LSD), 3,4-methylene-dioxymethyl-amphetamine (MDMA), cannabis, psilocybin, heroin	High	No currently accepted medical use	Lack of accepted safety data
II	Cocaine, morphine, opium, amphetamine, phencyclidine (PCP)	High	Accepted medical use with severe restrictions	Abuse may lead to severe psychological or physical dependence
III	Ketamine, lysergic acid, marinol (synthetic tetrahy-drocannabinol (THC))	Potential less than Schedules I and II drugs	Medical use accepted	Abuse may lead to moderate/low psychological or physical dependence
IV	Benzodiazepines	Low potential for abuse, cf. Schedules I, II or III	Medical use accepted	Abuse may lead to limited psychological or physical dependence relative to Schedule III
V	Prescription medicines containing low doses of codeine, etc.	Low potential for abuse, cf. Schedules I, II, III and IV	Medical use accepted	Abuse may lead to limited psychological or physical dependence relative to Schedule IV

the findings and present them in written and/or verbal form. Forensic scientists, and drug analysts in particular, should think of themselves as witnesses for the court – not specifically for the prosecution or defence. Their objective is to assist the court to *reach* decisions about either the innocence or guilt of the accused.

The majority of this text deals with specific drug classes, but regardless of the legislative system one is working in, or the drug class in question, a number

of basic forensic science principles should be followed at all times. The basic analytical process follows the sequence shown in Figure 1.2.

Having received the sample into the laboratory, the drug analyst should consider the particular question(s) being asked and whether the relevant answers can be obtained from the sample which has been provided. If the answer is in the affirmative, he/she should then proceed. The item should be fully documented and described, including the condition of the packaging. If for any reason this is not intact, the analysis should not go ahead. The data on the label should also be recorded and the analyst should sign and date the label, to ensure that continuity of evidence is complete. All of these data should be recorded contemporaneously, in a system in which each page is contiguously numbered. The analyst should also sign every page, and each sheet of paper that is produced by any instruments used throughout the course of the analysis.

Having recorded all of the physical data available, the decision must then be made as to whether the item contains trace or bulk materials. The latter can be

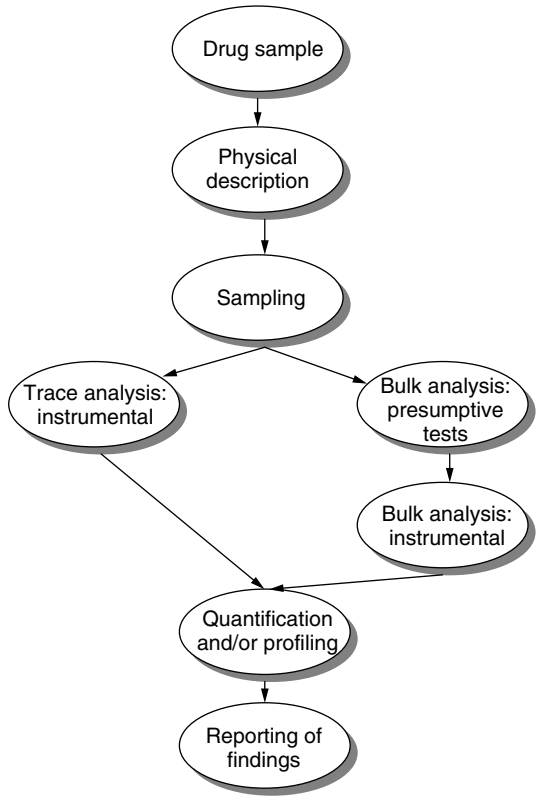

Figure 1.2 Generalized scheme for drug analysis.

seen with the naked eye and present the opportunity to contaminate other samples. Trace samples cannot be seen and/or are easily contaminated. Examples include the surfaces used to cut drugs, knives and the surfaces of balances used to weigh the materials. Given that contamination is an important issue, the analyst should not handle trace samples if bulk samples have previously been handled or if the analyst has been exposed to bulk samples. Ideally, trace samples should be analysed in a separate laboratory which is demonstrably free from contamination. Protective clothing is especially important if (i) trace samples are being handled, and (ii) *very* large samples are being examined. The former situation is important because it prevents the sample itself becoming contaminated, and the latter because it reduces the risk of contact with or ingestion of the drug by the analyst. Personal protective equipment (PPE) or clothing should be used/worn whenever required, particularly since some of the reagents used to analyse drugs are caustic or corrosive and many of them are classified as 'harmful'.

If the specimen provided is a trace sample, sufficient material should be recovered to allow an instrumental analysis directly. The nature of the sample will often provide a clue as to the drug(s) involved and direct comparison can be made by using gas chromatography–mass spectrometry (GC–MS), for example. If the specimen is a bulk sample, presumptive (colour) tests are undertaken to determine the class or classes of drugs which the sample contains. Thin layer chromatography (TLC) is used to determine which members of the classes are present and it might also be possible to make a semi-quantitative estimate of the amount(s) of drug(s) present. Standard mixes can then be prepared for use in the confirmatory techniques.

If drug comparisons are to be made, the drugs themselves and also the wrapping/packaging materials may be compared. It is now recognized by the European Network of Forensic Science Institutes (ENFSI) Working Group (Drugs) that there are four levels of comparison of the drug itself, as follows:

1. Drug identification
2. Drug quantification
3. Identification of cutting agents added to the drug
4. Chemical impurity profiling

The first two of these processes are the same as for simple drug identification and quantification. Identification of the cutting agents may be of help, for example, where a rare cutting agent is used, but this information cannot be used to definitively state that two drug samples are related. This latter can only be achieved by examination and analysis of the chemical impurities arising from the drug manufacture and preparation itself. Most drugs are produced in a batchwise process and each batch will have a unique profile which will not be affected by the addition of cutting agents, provided that the cutting agent(s) does not appear in the impurity profile.

Having carried out the analysis, whether it be a qualitative, quantitative or comparative analysis, a report must be written. There is no universal 'recipe' for such report writing. However, there is some essential information which must be included, namely the full name, age (may be stated as over 21 on Witness Statements in England and Wales) and qualifications of the person(s) preparing the report. The time (date) on which the items were received and from whom must be recorded. The materials analysed should be detailed. Much of this latter information is taken directly from the physical description which will have been previously prepared. The report should then state the findings and conclusions of the analyst. This includes the major facts, for example, what the drug is, how much is present, and in which legislative body it is controlled. The drug analyst, as a forensic scientist, is also able to express *evidence of opinion* (unlike other witnesses in court) and hence can express a view on whether two or more samples were related, how many doses a certain amount of drug might form, etc. What should always be remembered, however, is that the expert witness should never stray outside his own particular area of expertise.

The report may, or may not, contain a materials and methods section – opinion is currently divided on this point. Certainly, the technical section (materials and methods) should be at the end of the report, as this will mean very little to a lawyer unless the latter is well trained in science. It is therefore better to present such information at the end where interested parties can read the details should they desire. In terms of content, it is common, where such sections are included in reports, to simply list common or widely accepted methods that are used while at the same time detailing new methods, or variations on an accepted method, in some depth, so that another scientist may repeat the work.

Finally, before presentation of the report, the format should be checked – double spacing (to allow annotation), wide left-hand margins (to allow binding into thick documents), and single-sided printing (to facilitate reading) should all be ensured. Every page should be contiguously numbered and each page should be signed and dated by the person preparing the report – even if it is only a proforma with check boxes, as used in some jurisdictions.

1.7 Quality Assurance in the Drugs Laboratory

In order for the report and evidence presented in court to be of value, a regular programme of quality assurance must be entered into by the analyst and his laboratory. Records of the methods used should be available, along with documented assessments of the performances of each of the tests and instruments used. Such records are essential should the functionality of the tests or equipment be challenged.

Any new method to be used in the laboratory should be rigorously tested, to ensure that reproducibility, repeatability and robustness comply with internationally

accepted standards. It should also have been through a peer-reviewing process and ideally be widely accepted by the relevant scientific community.

In terms of ensuring that performance standards are met, it is preferable for the laboratory to participate in proficiency tests – both declared and undeclared. There are a number of these commercially available, or they may be prepared in-house, although this latter approach is always open to accusations of 'results fixing' and bias. While many analysts are understandably nervous about such tests, when properly handled they can be used to improve the performance of the laboratory.

1.8 Presentation of Evidence in Court

The job of the drug analyst would not be complete without the *presentation of a report*. On occasion, this may be in verbal (in addition to written) form in the witness box. The processes which occur will vary with where the evidence is being given, but certain guidelines will make the situation less traumatic. The analyst should be well prepared and know the case. The documentation should be complete and preferably bound in a file, and again, the analyst should know this file intimately. Many of the common questions can be anticipated once experience is gained, but these can be guessed at in an educated way at an early stage. It is advisable to have as much experience as possible prior to giving evidence in court and to have observed lawyers and scientists in action, either for real, or in a moot court.

At court, be smartly dressed and be punctual. Adopt a good posture in the witness box. In giving the answers to the questions, be precise and accurate, without being technical. If the answer is not known, this should be stated. If there are attempts by the legal practitioners to mislead, confuse or misstate your evidence, remember that the judge is there to correct these misconceptions. With diligent application in the laboratory and in the courtroom, the materials will have been correctly analysed and the findings successfully reported.

Summary

There is now a considerable body of evidence that the problem of drug use is increasing. Attempts to control drug use and abuse are made at the international level through United Nations legislative documents, which are mirrored in signatory states by legislation at the national and sub-national levels.

In the UK, the principle legislative documents are the Misuse of Drugs Act, 1971, plus its amendment orders, and the Misuse of Drugs (Regulations), 2001. In the United States, drugs are controlled at the Federal level by the Controlled Substances Act. Control also exists at the State and County levels. An analogous

position is found in Australia, where drugs are controlled at both Commonwealth and Territory levels.

The role of the forensic scientist within this legal framework is to assist the court in deciding whether or not a drug offence has been committed. This is achieved by establishing whether or not a controlled substance is present, how much is present and, on occasion, the relationship (or otherwise) of the material being considered to other drug samples. A scheme of work should be followed, depending upon whether the material is a trace or a bulk sample and quality assurance measures should always be rigorously followed.

Findings should always be reported in a clear and concise manner, which can be understood by the layman. This is particularly important when oral evidence is presented in court, although the same principles also apply to written evidence. Technical evidence should sometimes be included, but not at the expense of clarity.

References

1. Drugscope, *Annual Report on the UK Drug Situation, 2001* [www.drugscope.org/druginfo/drugreport.asp].†

† Accessed, November 2002.