

DTCB Service User's Guide

3rd Edition

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Foreword

In November 2005 we published our first Laboratory Service Users Guide. The demand for copies of this document was high and the feedback from our customers was very positive. The second edition was published in May 2007. As we are committed to continual improvement we are now publishing this third version.

Some of the topics which have been updated include:

- Testing for 'Headshop' products (New Psychoactive Substances)
- Electronic reporting of laboratory results
- Cross reactivity information
- Information on ISO/IEC 17025: accreditation

Generally, we have tried to make the guide as clear and concise as possible.

I welcome the third publication of this user guide and I commend the hard work of our laboratory team for its compilation and distribution.

Sheila Heffernan
General Manager

December 2010

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Introduction

This toxicology laboratory guide has been written for medical, nursing and support staffs who avail of The Drug Treatment Centre Board (DTCB) drug analysis service. It provides general information on how to access this service and details the range of tests available.

The Drug Analysis Laboratory is the leading centre for drugs of misuse testing in Ireland. It provides a national drug analysis service to the HSE Addiction Services, general practitioners, hospitals (general, psychiatric and maternity), juvenile detention centres, voluntary organizations, the Dublin Drug Court and the Probation Services.

The laboratory has a full-time staff of twelve, including Biochemists, Laboratory Aides and an administrative assistant.

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General Information

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Trinity Court, 30-31 Pearse St.,
Dublin 2.

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General Manager: Ms. Sheila Heffernan

Clinical Director: Dr. John O'Connor

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Opening Hours of Laboratory: Mon – Fri
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Samples used in Drug Analysis

Suitable samples for drug testing include urine, blood, hair and oral fluid.

Urine:

Urine is the most commonly used specimen due to its ease of collection and long window of detection (drugs can be detected for a number of days, and in some cases, weeks, after last use). It is the universally preferred sample when testing for the presence or absence of drugs. However, urine is unsuitable for determining drug levels due to the many factors which influence the composition and concentration of urine.

Samples should be collected under supervised conditions where appropriate.

Blood:

Blood is more difficult to obtain especially from intravenous drug users and the time during which the drug can be detected after use is in the order of hours, as opposed to days. However, it is more suitable than urine for determining drug levels.

Hair:

Hair is easily collected and, depending on the length, can demonstrate a historical record of the client's drug use. However, analysis is very time consuming, highly specialised and there can be issues such as external contamination of the hair.

Oral fluid (Saliva):

Sampling may be time consuming with some collection devices and the volume of saliva is usually small, thus placing limitations on the number of analyses which can be carried out. Drug levels saliva are also small compared to levels which can be found in urine. Testing of oral fluid is not as well developed and validated as urine testing and it has a short window of detection.

Hair and oral fluid are not routinely tested by this laboratory.

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Consent

The DTCB Drug Analysis Laboratory does not take responsibility for obtaining "consent to test" for samples received for drug testing.

Consent should be obtained by the doctor or organisation requesting the test, prior to sending samples to the laboratory. If the client is under 18 years old, consent should be obtained from a parent or guardian.

Packaging and Transport

The laboratory will only accept samples packaged according United Nations (UN) regulations. Under these regulations samples are divided into two groups, Diagnostic and Infectious.

A diagnostic sample is defined as a specimen collected for the purpose of diagnosis.

An infectious sample is defined as a specimen containing a viable microorganism that is known, or reasonably believed, to cause disease.

UN approved packaging for diagnostic and infectious samples are a triple packaging system consisting of:

- **Primary receptacle** – the urine bottle. This must be leak-proof, clearly labeled and wrapped in enough absorbent material to absorb all fluid in case of breakage.
- **Secondary receptacle** - used to enclose the primary receptacle. This must be durable and leak-proof. Several primary receptacles may be placed in one secondary receptacle. Sufficient additional absorbent material must be used to cushion multiple primary receptacles.
- **Outer packaging** – the secondary receptacle is placed in an outer package which protects it and the contents from outside influences such as physical damage and / or water while in transit.

This type of packaging is available commercially or through the HSE Eastern Region Shared Services, Procurement and Materials Management division.

Most urine samples are generally considered to be diagnostic, however if you are unsure, please contact the laboratory for advice. It is the responsibility of the sender to ensure the correct designation, packaging, labeling and documentation of all infectious and diagnostic specimens.

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Sample Collection

Urine samples should be of approx. 20mls to 30mls in volume, collected in a clean plastic container without preservative. Care should be taken to ensure that the sample is authentic i.e. it has been freshly voided by the patient under supervision and not subsequently adulterated or substituted for a "drug free" specimen. It should then be sent as soon as possible to the Laboratory. Samples received more than 14 days after the collection date will not be tested due to the possibility of breakdown products generated on prolonged storage, which could result in false results.

In the absence of direct supervision, a temperature strip on the collection bottle can help determine if a sample is genuine. The temperature of urine should be between 34°C - 39°C when freshly voided.

If blood is the required matrix, then ideally 10mls of blood is required, collected in a serum tube. Standard precautions and procedures should be followed when sampling.

Information on the collection of hair or oral fluid samples can be obtained from Laboratory Customer Services.

Sample Information

The following information must be included on the sample container and request form when submitting a sample for analysis.

- Patient's full name*
- Date of birth*
- Name of clinic or hospital*
- Date of sample collection*
- Name of Doctor
- Sample type
- DAIS code (where appropriate) *Mandatory

Failure to include the above information could hinder the processing of a sample.

Non-Compliant Samples

Non-compliant samples are samples which do not demonstrate the mandatory information required to identify a particular sample, i.e. full name, date of birth, sample date and location from which the sample was sent. Samples missing any of the aforementioned data may not be analysed. The laboratory will make every effort to obtain the correct sample identification in order to proceed with analysis.

Leaking samples are also considered to be non-compliant samples. Leaking samples will not be analysed and the sample will be disposed of immediately.

Notification of non-compliant samples will be sent in writing to the sender by means of a non-compliance form detailing the nature of the non-compliance and requesting the correct information, before analysis can take place.

Request Forms

Request forms for routine screening, confirmatory analysis and serum methadone levels are available on our website www.addictionireland.ie or from Laboratory Customer Services.

Range of Testing

Testing can be divided into the following categories:

1) *Routine screening analysis*

The laboratory uses an immunoassay technique to routinely screen for drugs such as Opiates, Benzodiazepines, Cannabis, Cocaine, Amphetamines, Alcohol and EDDP (the primary metabolite of methadone).

2) *Testing for adulterants*

Creatinine levels will give an indication of the attempted dilution of a urine sample. Abnormal pH readings will indicate tampering of a sample by the addition of, or substitution by, another substance or liquid.

3) *Confirmatory analysis*

This type of analysis is performed to confirm the presence of a drug detected during a routine screening analysis, e.g. opiates or benzodiazepines. Methods used include Gas Chromatography Mass Spectrometry (GC-MS) and Liquid Chromatography Mass Spectrometry (LC-MS).

4) *Therapeutic drug monitoring*

This type of testing refers to the quantitative analysis of a drug in a blood sample.

5) *Non routine testing*

A number of tests fall into this category, e.g. 6-Acetyl morphine (6-AM) the primary metabolite of Heroin, Buprenorphine, Head Shop products (New Psychoactive Substances), Zopiclone, Substance identifications, Glucose and Pregnancy testing. Methods used include Gas Chromatography Mass Spectrometry (GC-MS) and Liquid Chromatography Mass Spectrometry (LC-MS).

6) *Subcontracted testing*

If a request is received for a test which is not normally performed, the laboratory may subcontract testing as a service to the customer, if required. In this instance, the laboratory will endeavor to subcontract the testing request to a competent external laboratory which complies with ISO/IEC 17025 or equivalent. The Laboratory does not subcontract tests within the scope of its accreditation.

Routine Screening Analysis

The majority of drug testing performed by the laboratory falls into this category. Routine screening is carried out by immunoassay, enzyme assay or chemical assay. These are rapid methods used for screening drugs of misuse. A routine screen includes testing for opiates, benzodiazepines, EDDP (the primary metabolite of methadone), cannabis, cocaine, amphetamines, alcohol and creatinine.

Immunoassay is a qualitative method which indicates only the presence or absence of a drug/drug class in a sample.

Each test by immunoassay has a defined cut-off level, above which the test is deemed positive indicating that the presence of a drug/drug class was detected above the cut-off level. If a test result falls below the cut-off level, the result is deemed negative indicating that the drug/drug class was not detected above the cut-off.

Ct- off levels are detailed on every test report

With the exception of alcohol, the current format used does not give any information about the level or concentration of the drug present.

It should be noted that all analytical results are subject to some Uncertainty of Measurement (UOM)*. The performance of qualitative test results around the cut-off concentration is routinely monitored by the use of Quality Controls which are run with every batch of samples. Clinical consideration and judgment should be applied to all immunoassay test results. Confirmatory analysis may be requested for a positive drug screening result if required.

'True and 'False' positives:

Care should be taken when interpreting immunoassay screening results, as some over the counter drugs will give 'true' positive results. An example of this is Solpadeine® which will give a positive opiate result because it contains codeine, which is also classified as an opiate type drug.

Some drugs and medications can also produce 'false' positive results when tested using immunoassay, due to cross reactivity and further confirmatory analysis may be necessary. This cross reactivity occurs most commonly with opiate and amphetamine drug classes. However, benzodiazepine, cannabis, cocaine and EDDP immunoassay tests are relatively specific and rarely produce false positive results. *See Appendix 1 for Table of Cross Reactivities.*

Because of this phenomenon, screening results by immunoassay alone are not legally defensible and further confirmation of the test result may be required depending on the purpose of the testing.

*** see section on Uncertainty of Measurement.**

Testing for Adulterants

Adulteration testing refers to tests carried out to determine whether a sample is genuine or if it has been tampered with. Methods of urine adulteration include dilution with, addition of, or substitution by, a drug-free substance or solution. Dilution is probably the most common method of adulteration used by drug users to evade detection of misuse. Creatinine levels in urine can indicate the extent of this dilution, therefore all samples received for analysis are tested for Creatinine.

'Normal' urine should have a Creatinine concentration in the range 80-200mg/dL.

'Dilute' urine is indicated by a Creatinine reading of less than 20mg/dL.

'Abnormal' urine is indicated by a Creatinine reading of <2mg/dL.
No other test results will be reported on these samples

Confirmatory Analysis

Confirmatory analysis is carried out using gas chromatography mass spectrometry (GC-MS) and liquid chromatography mass spectrometry (LC-MS). Confirmatory test results are legally defensible provided the sample integrity can be proven (see Sample Collection and Chain of Custody information).

All confirmatory testing (with the exception of chain of custody samples) should be specifically requested in writing by a doctor.
See Table (1) and Appendices (2) & (3) for further details.

Therapeutic drug monitoring of Methadone

Therapeutic drug monitoring of methadone is performed to identify rapid Methadone metabolisers and can help with titrating Methadone dosages, provided other factors are considered when interpreting the result, e.g. sex, weight, time of dose, time of sampling etc. (It is always important to treat the patient, not the level!).

Blood samples should only be submitted for serum Methadone level testing if the following criteria have been adhered to:

- A minimum of 3 days supervised Methadone consumption prior to the day of blood collection.
- The time of dosing on each day should be the same +/- 30 minutes.
- The blood sample must be taken immediately before the next dose on day 4.
- The time must be the same as the previous 3 days +/- 30 minutes.
- Samples must be collected into a serum tube.
- The sample must be accompanied by a request form/ letter which includes time of dose on previous day, time of dose on day of sampling and time of blood collection.

Failure to adhere to these guidelines will result in unreliable data and defeat the purpose of carrying out the procedure.

Therapeutic levels of Methadone:

'With chronic administration of 100-200 mg daily oral doses to tolerant subjects, the plasma concentration peaked at 4 hours, with an average value of 0.83ug/ml (range, 0.57 -1.06) and declined to 0.46mg/L (range, 0.28-0.79) 24 hours after last dose (average plasma half life of 25 hours).'

'It has been estimated that trough plasma methadone levels should be at least 0.05 - 0.10 mg/L to prevent withdrawal systems in narcotic maintenance patients (i.e. 50-100ng/ml).'

[Basalt 2004, Disposition of Toxic Drugs and Chemicals in man, 6th edition, p. 642 – 643]

Non Routine testing

Non routine tests include 6-Acetylmorphine (6-AM) the primary metabolite of Heroin, Zopiclone, Buprenorphine, 'Headshop' drug analysis (New Psychoactive substances, see *Appendix 4*), pregnancy testing, pH, and glucose. These tests are carried out on request only.

The full range of analyses available is indicated in Table1.

Subcontracted testing

Tests are subcontracted only on request by the customer.

Testing which may be subcontracted include:-

- Hair testing for drugs
- Testing for Carbohydrate Deficient Transferrin (CDT) and Ethyl Glucuronide (EtG), these are metabolites of alcohol which indicate recent consumption of alcohol even when all of the alcohol has been metabolized.
- Confirmatory analysis for drugs not routinely analysed in the DTCB Laboratory.

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Table 1: Range of Testing

Test	Method	Sample Type	Test Type	Levels	Window of Detection	Turnaround time**
*Opiate	IA	Urine	Screen	n/a	3-10 days	48 hrs
Opiate	LC-MS	Urine	Confirm	n/a	3-10 days	10 days
*6-AM	IA	Urine	Screen	n/a	24 hours	48 hrs
*Benzodiazepine	IA	Urine	Screen	n/a	2-28 days	48 hrs
Benzodiazepine	GC-MS	Urine	Confirm	yes	2-28 days	10 days
*EDDP	IA	Urine	Screen	n/a	Unknown	48 hrs
Methadone level	IA	Blood	Screen	yes	n/a	Contact Lab
*Cannabis	IA	Urine	Screen	n/a	2-28 days	48hrs
*Cocaine	IA	Urine	Screen	n/a	2-4 days	48hrs
*Amphetamine	IA	Urine	Screen	n/a	1-2 days	48hrs
*Alcohol	Enzymatic	Urine	Screen	yes	1-2 days	48hrs
Zopiclone	LC-MS	Urine	Confirm	n/a	Unknown	10 days
Burprenorphine	LC-MS	Urine	Confirm	n/a	2-4 days	Contact Lab
*Creatinine	Chemical	Urine	Screen	yes	n/a	48hrs
Pregnancy	Enzymatic	Urine	Non-Routine	n/a	n/a	48hrs
*pH	Chemical	Urine	Non-Routine	n/a	n/a	48hrs
Glucose	Chemical	Urine	Non-Routine	n/a	n/a	Contact Lab
'Headshop' products (New Psychoactive Substances)	LC-MS	Urine	Non-Routine Confirm	n/a	n/a	10 days

** Please Note: Turnaround time is measured from time of receipt of sample at the laboratory

* These tests are accredited under ISO/IEC 17025. See Accreditation

Abbreviations:

6-AM: 6- acetylmorphine, primary metabolite of heroin

Benzo: Benzodiazepines Chemical: Chemical Assay Confirm: Confirmatory Test

EDDP: 2-ethylidine-1,5-dimethyl-3,3-diphenylpyrrolidine, primary metabolite of methadone

GC-MS: Gas Chromatography Mass Spectrometry

LC-MS: Liquid Chromatography Mass Spectrometry

IA: Immunoassay

Screen: Screening Test

Chain of Custody

In order for test results to be defensible in a court of law or professional hearing, chain of custody procedures must be followed. Chain of custody involves fully documenting who donated, collected and handled the sample thereafter. The DTCB laboratory can provide information on chain of custody collection kits and sampling procedures. All positive immunoassay screening test results must be confirmed by a second analysis using a confirmatory analytical method. For further information please contact Laboratory Customer Services.

Storage and Retention of Samples

Samples should be sent to the laboratory at the earliest opportunity. If there is any delay, it is recommended that samples are stored in a refrigerator at 4°C or in a cool dark place, if refrigeration is not available. Post analysis, the laboratory will retain samples for 14 days, after which they will be disposed of safely. Should further testing be required outside of this period samples will be frozen.

Unless otherwise agreed, all positive Chain of Custody samples will be frozen and retained for 36 months. All negative Chain of Custody samples will be frozen and retained for 3 months.

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Reporting of Results

The front page of each report details the customer name and address, drug cut-off concentrations (above or below which samples are deemed positive or negative), date on which each report is generated and scope of INAB accreditation.

Each patient is identified by name, date of birth, clinic code and chart number.

Each sample is identified by a unique barcode and sample date.

If a drug/drug class is detected in a sample, the result will appear as a "+" (positive), indicating the presence of the drug.

When no drug/drug class has been detected, it will be reported as a "-" (negative), indicating that the drug/drug class has not been detected above the cut-off level or concentration.

A blank space indicates that no test was carried out. Screening results will be available within 24-48 hours of receipt of samples in the laboratory. Confirmatory testing usually takes longer to perform due to the complexity of the methodology.

Mode of reporting

The method of report transmission used must be agreed in advance with Laboratory Customer Services. Routine modes of reporting available are post, fax or electronically.

Post:

Reports sent by post will be dispatched as soon as possible after completion of analysis.

Fax:

Sample results will be faxed as soon as possible after completion of analysis.

To ensure the confidentiality of the information transmitted, faxing of reports will only occur if the laboratory has been provided with a written and agreed secure fax number.

Electronic Reporting:

DAIS: HSE Addiction Service users may be able to access results via the Drugs Aids Information System (DAIS). Sample results will be transmitted to the system as soon as possible after completion of analysis.

Laboratory Electronic Reporting (LER):

The LER is a web-based system developed for DTCB customers which allows authorised users to access results electronically. Sample results are available in the system as soon as the analysis is complete.

Verbal reporting:

Verbal reporting can only be accommodated in the case of an emergency.

Uncertainty of Measurement

When interpreting laboratory reports, consideration should always be given to the Uncertainty of Measurement (UOM) associated with the test result, because no measurement is absolutely exact.

When a quantity is measured, the outcome depends on the measuring system, e.g. test procedure, environmental conditions, volumetric effects, reference values, sampling matrix, operator etc. Therefore all measurements are subject to uncertainty and this should be taken into account in the interpretation of laboratory results. This can have a bearing on immunoassay test results which are close to their cut-off point and therefore within the range of measurement uncertainty for the test cut-off. Details of Uncertainty of Measurement applicable to tests carried out in the laboratory are listed in Appendix 5.

Clinical consideration and judgement should be applied to any immunoassay test result. Repeat testing or confirmatory analysis may be requested if required.

Quality Control and Quality Assurance

To ensure the highest confidence in test results, the laboratory adheres to strict quality control (QC) and quality assurance (QA) standards. (Approx. 3% of all samples run are quality controls).

In order to assess performance, the laboratory is involved in two external Quality Assurance schemes, the United Kingdom National External Quality Assessment Scheme (UKNEQAS) and the Australian Urine Toxicology Proficiency Programme (AUSTOX).

Viewing of quality control data, proficiency testing data, and testing procedures will be accommodated on request by arrangement with the laboratory.

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Accreditation

Our laboratory is accredited by the Irish National Accreditation Board (INAB) to ISO/IEC17025. ISO/IEC 17025 is the main standard used by testing and calibration laboratories.

The ISO/IEC 17025 standard is a quality system aimed at improving the ability to consistently produce valid results. The two main aspects of ISO/IEC 17025 Accreditation are Management and Technical Requirements. Management requirements are primarily related to the operation and effectiveness of the quality management system within the laboratory, while technical requirements address the competence of staff, methodology and test/calibration equipment.

In order to maintain this high standard, our laboratory is assessed annually by a team of Irish and international external auditors.

The scope of our accreditation can be viewed at www.inab.ie/pdf/169T.pdf

Membership and Representation

To ensure best practice and to keep up to date with the latest developments and trends in drug misuse, laboratory staff have professional membership and attend meeting of various international societies, these include:-

ACBI – Association of Clinical Biochemists of Ireland

TIAFT- The International Association Forensic Toxicologists

SOFT- The Society of Forensic Toxicologists

UK and Ireland Association of Forensic Toxicologist (UKIAFT)

The laboratory is also represented at the Early Warning and Emerging Trends (EWET) committee of the National Advisory Committee on Drugs (NACD).

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Appendix 1

Cross Reactivity Table (i) [This list is not exhaustive]

Drugs producing false positive results, tested at concentrations (ng/ml) as shown in brackets

Amphetamine <i>cut-off conc. 1000 ng/ml</i>	Benzodiazepine <i>cut-off conc. 200 ng/ml</i>	Cannabis <i>cut-off conc. 50 ng/ml</i>	Cocaine <i>cut-off conc. 300 ng/ml</i>
Benzodioxazolyl-butanamine (BDB) (1320)	Oxaprozin (Duraprox)	Flufenamic acid (500,000)	Cocaethylene (526)
1-Benzylpiperazine (BZP) (150 000)		Efavirenz (Sustiva)	Quinine HCl (200 000)
Bupropion (Zyban) (18 000)		Isoflavones	Quinine Sulphate (300 000)
Ephedrine (250 000)			
Fenfluramine (3000)			
Fenofibrate (150 000)			
Mebeverine (3000)			
Mephentermine (1500)			
N-Methylbenzodioxazolylbutanamine (MBDB) (900)			
Phenmetrazine (2500)			
B-Phenylethylamine (10 000)			
d-Pseudoephedrine (160 000)			
N-Piperazine HCl (25 000)			

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Appendix 1

Cross Reactivity Table (ii) [This list is not exhaustive]

Drugs producing false positive results, tested at concentrations as shown in bracket

Ethyl Alcohol (mg/dL)	EDDP cut-off conc. 100 ng/ml	Opiate cut-off conc. 300 ng/ml	
n-Propanol (2000)	α-Levo-acetylmethadol (1000 000) α-Levo-noracetyl methadol (1000 000) α-Levo-dinoracetyl methadol (1000 000)	Clomipramine HCl (500 000) Cyclazocine (500 000) Cyamemazine (31 125) Imipramine (20 000) Levorphanol tartrate (100 000) Meperidine (150 000) Nalorphine HCl (100 000) Naloxone (6000) Naltrexone HCL (50 000) Ofloxacin (100 000) Oxycodone (10 000) Pholcodine (500) Rifampin (65 000) Thebaine (1250)	

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Appendix 2

Interpretation of Benzodiazepine Identifications

The metabolic pathways of benzodiazepines can often result in common metabolites (the most significant being Oxazepam). Therefore it can be difficult to unambiguously identify which parent drug(s) was originally consumed.

The routine immunoassay screening method for benzodiazepines is unable to distinguish between metabolites, therefore urinary benzodiazepine evaluations are carried out using more sophisticated techniques which can specifically target and identify these metabolites. See Table 2 below.

Parent Drug	Target Metabolite
Valium /Diazepam	Nordiazepam; Oxazepam; Temazepam
Normison	Temazepam
Dalmane	2-hydroxy Flurazepam
Librium	Chlordiazepoxide

Table 2: Common Benzodiazepine Metabolites

There is no international data regarding benzodiazepine levels in urine. In 1999, a small study was carried out by our laboratory to monitor urinary benzodiazepines from detoxifying patients in a closed ward setting. This study suggested that urinary levels of < 3ug/ml Oxazepam and/or <3ug/ml Temazepam were frequently seen in cases of some commonly prescribed therapeutic dose benzodiazepines.

Studies have also shown that urinary levels of >10ug/ml Oxazepam and/or >10ug/ml Temazepam are frequently found in cases of suspected benzodiazepine abuse.

However, many factors influence the dilution of a urine sample and consequently the drug concentration, therefore urinary levels reported should be interpreted with caution.

Appendix 3

Interpretation of Opiate Identifications

Heroin is metabolised in the body, firstly to 6-acetylmorphine (6-AM) and then to Morphine.

HEROIN → 6 Acetyl Morphine (6-AM) → Morphine

The presence of 6-AM proves the use of Heroin. However, 6-AM has a short half-life of approx. 24 hours in urine after last use, and therefore Morphine is the most commonly detected metabolite in Heroin abuse, due to its longer window of detection.

Morphine in urine can also result from the metabolism of Codeine, which is included in many 'over the counter' painkillers.

CODEINE → Morphine

To add to the complexity, Acetylcodeine is an impurity often detected in Heroin. Acetylmorphine also metabolises to Codeine.

**HEROIN containing impurity Acetylcodeine → Codeine
and
HEROIN → 6 Acetyl Morphine (6-AM) → Morphine**

Because of these similar metabolic pathways, it can be difficult to distinguish between the use of Heroin, Morphine or Codeine, or, the use of a combination of more than one of these, because both Morphine and Codeine may be present after Heroin use, Morphine use, or after Codeine use.

The routine immunoassay screening method for opiates is targeted to detect Morphine, Codeine and Dihydrocodeine (or their metabolites) but it cannot distinguish between them.

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Procedure for Opiate Identification:

A positive opiate result by immunoassay will be obtained if any one, or a combination of the above, is present above the cut-off concentration of 300ng/ml.

In order to identify which opiate is present in a sample, further testing is required.

Firstly, a 6-Acetylmorphine (6-AM) test is carried out and if positive, Heroin use is strongly indicated.

If negative, further confirmatory testing must be performed. Because of the common metabolites, it may not always be possible to unambiguously differentiate between Heroin, Morphine and Codeine use (even using sophisticated confirmatory analysis techniques). See Table 3 below.

Immunoassay Result	Result Confirmatory analysis	Interpretation
6-AM	n/a	Heroin misuse
Opiate	Morphine	Use of Morphine or Heroin or Codeine or a combination of these
Opiate	Codeine	Confirmation of Codeine use
Opiate	Dihydrocodeine	Confirmation of Dihydrocodeine use

Table 3: Interpretation of Opiate ID results

Appendix 4

'Legal highs', 'Head Shop' products, New Psychoactive substances

The terms 'Legal highs', 'Head Shop products' or 'New Psychoactive Substances' refer to a number of drugs with stimulant effects being sold in so-called 'Head Shops' in Ireland and via the internet.

These substances are often sold under the pretense of being a legitimate product e.g. 'bath salts' or 'plant food'. One of the first of these products to come onto the market was Benzylpiperazine (BZP), which was sold as 'party pills'. On 31 March 2009, 1-benzylpiperazine (BZP) was declared a controlled drug by the Irish government under the Misuse of Drugs Act 1977 and its possession or sale became a criminal offence.

After the BZP ban, drugs in the Cathinone class started to appear, with Mephedrone being the most prevalent. New brands of products regularly appeared and constituents of products varied from one day to the next, making detection and identification of these products very difficult.

In May 2010, following numerous reports of concern over adverse effects caused by these products, the Irish Government made an order declaring a number of substances, collectively known as 'legal highs', to become controlled drugs under the Misuse of Drugs Act 1977, with immediate effect. These substances by common name included: Synthetic Cannabinoids, Benzylpiperazine, Piperazine derivatives, Mephedrone, Methyldone, Methedrone, Butylone, Flephedrone, and MDPV, GBL and 1,4 BD.

Following a high number of hospital attendances, the HSE issued a health warning in June 2010, about use of a product called 'Whack' which caused severe and difficult to treat psychoses. The product reportedly contained Fluorotropacocaine.

In July 2010, the HSE launched a National Drugs Awareness campaign focusing on the dangers of Psychoactive Substances available through "Head Shops".

The Criminal Justice (Psychoactive Substances) Act 2010 came into effect on

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Monday 23rd August 2010. This Act makes it an offence, punishable by up to five years imprisonment, to sell or supply for human consumption, substances having psychoactive effects which are not specifically proscribed under the Misuse of Drugs Acts.

The legislation is under regular review and it is understood that an order banning a further range of 'head shop products' will be brought in to enact further controls and be proactive in preventing more substitutes emerging.

The Laboratory will endeavor to provide analysis for these substances as required and as reference standards become available.

For the latest information on these products and the legislation relating to them refer to www.drugs.ie

Journal articles

1. "1-Benzylpiperazine (BZP) Abuse Amongst Attendees of The Drug Treatment Centre Board"; McNamara, S. The Drug Treatment Centre Board, 30-31 Pearse St, Dublin 2., The Irish Medical Journal, June 2009; Vol. 102, No. 6.
2. "Head Shop" Compound abuse amongst attendees of The Drug Treatment Centre Board; S McNamara, S Stokes, N Coleman; The Drug Treatment Centre Board, 30-31 Pearse St, Dublin 2., The Irish Medical Journal, May 2010 Vol. 103, No. 5

Posters

1. **Head Shop 'Legal Highs' Active Constituents Identification (May 2010, pre-ban), Dr Pierce Kavanagh¹, Jayant Sharma¹, Sinead Mc Namara², Daniel Angelov³, Sean Mc Dermott¹, Daniel Mullan¹ and Sheila Ryder³**
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2. Head Shop 'Legal Highs' Active Constituents Identification (June 2010, post-ban)

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3. Head Shop 'Legal Highs' Active Constituents Identification Chart (June/July 2010 post 511), Dr Pierce Kavanagh¹, Jayant Sharma¹, Sinead Mc Namara², Daniel Angelov³, Sean Mc Dermott¹, Daniel Mullan¹ and Sheila Ryder³

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4. Head Shop 'Legal Highs' Active Constituents Identification Chart (July-August 2010, '714'-'823'), Pierce Kavanagh¹, Paul Spiers¹, John O'Brien², Sinead Mc Namara³, Daniel Angelov¹, Daniel Mullan¹, Brian Talbot⁴ and Sheila Ryder⁴

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Appendix 5

Uncertainty of Measurement 2010/2011

Test	Cut-off	Calculated Uncertainty
Opiates	300ng/ml	42.4ng/ml
Benzodiazepines	200ng/ml	29.8ng/ml
Cocaine	300ng/ml	39.3ng/ml
Cannabis	50ng/ml	9.6ng/ml
Creatinine 2mg/dL	2mg/dL	0.3mg/dL
Creatinine 20mg/dL	20mg/dL	2.3mg/dL
6-Acetyl Morphine	10ng/ml	1.7ng/ml
EDDP	100ng/ml	13.2ng/ml
Amphetamine	1000ng/ml	175.3ng/ml
Alcohol	30mg/dL	14.5mg/dL
pH 3.0	3.0	0.4 pH units
pH 11.0	11.0	1.3 pH units