FORENSIC TOXICOLOGY: FROM CRIME SCENE TO VIRTUAL LAB

MODULE 2
Chapter 4:
Interpretation & Reporting

TABLE OF CONTENTS

Modernizing the Transportation Provisions of the *Criminal Code* - Discussion Paper

In an impaired driving case where the prosecution is relying on the BAC reading, the issues at trial are:

- Was the accused in care and control of the vehicle within the three hours preceding the breath test demand?
- Did the investigating police officer have reasonable and probable grounds to demand that the accused provide a breath sample on an approved instrument?
- Were the breath tests carried out on an approved instrument?
- Was the approved instrument operated by a qualified technician?
- Did the qualified technician ensure that the approved instrument was operating properly?
- Did the qualified technician operate the approved instrument properly?
- Were there 15 minutes between breath tests?
- Were both BAC readings over 80?
- Was the lower BAC reading over 80?

01. R v Nguyen, 2021 ABPC 214 (CanLII)

01.

R.v. Nguyen

Ms. Elizabeth Hird is a Forensic Toxicologist Specialist.

Ms. Hird is qualified to give expert testimony in the toxicology of drugs, specifically regarding the analysis of exhibits for drugs and/or alcohol, and pharmacology of drugs and/or alcohol, including the effects of drugs and/or alcohol in humans.

01.

R.v. Nguyen

Ms. Elizabeth Hird is a Forensic Toxicologist Specialist
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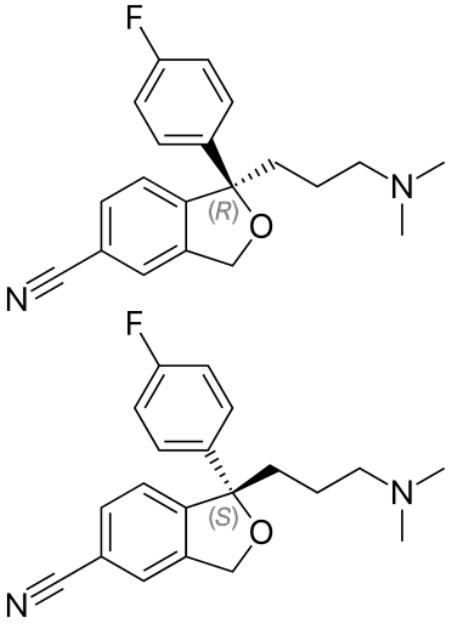
She analyzed two biological samples taken from the complainant: a blood and a urine sample

01.

R.v. Nguyen

Blood sample analysis:
Citalopram or Escitalopram, Tramadol and 7-aminoclonazepam (breakdown product of Clonazepam)

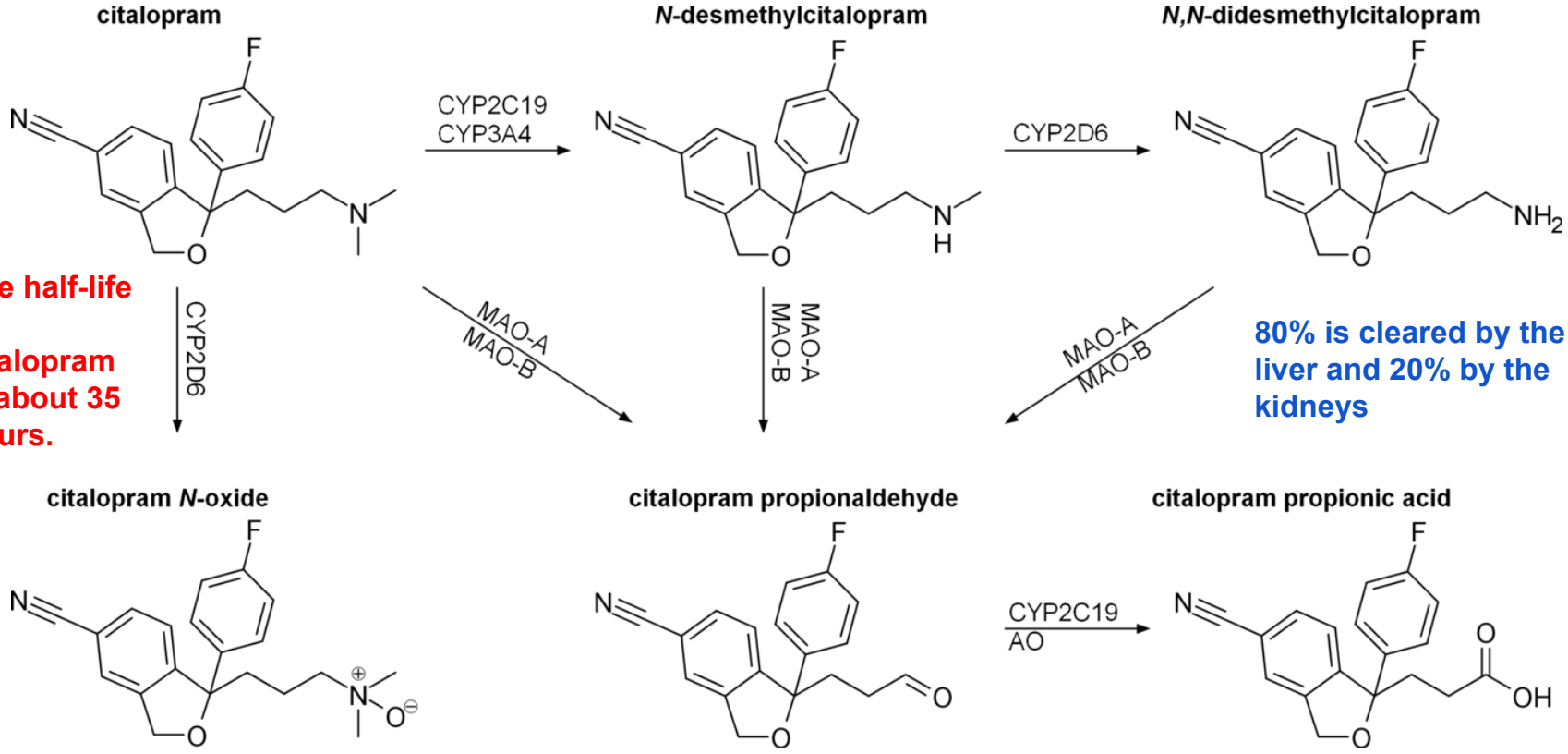


Citalopram:
sold under the brand name **Celexa** among others, is an antidepressant of the selective serotonin reuptake inhibitor (SSRI) class

Blood or plasma concentrations:
50-400 µg/l therapeutic,
1000–3000 µg/l acute overdosage and
3–30 mg/l acute overdosage and death

01.

Metabolism of citalopram

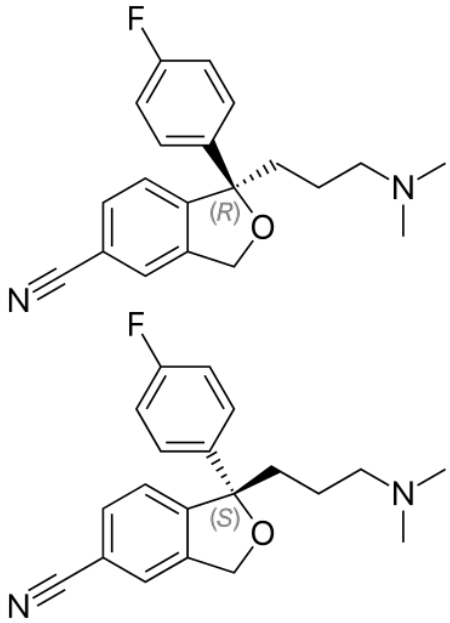


The half-life of citalopram is about 35 hours.

80% is cleared by the liver and 20% by the kidneys

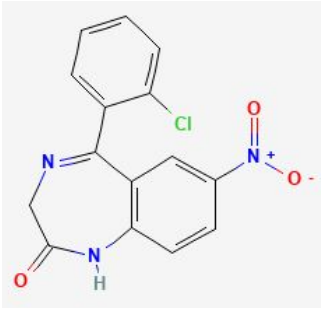
01.

R.v. Nguyen



Citalopram

Clonazepam

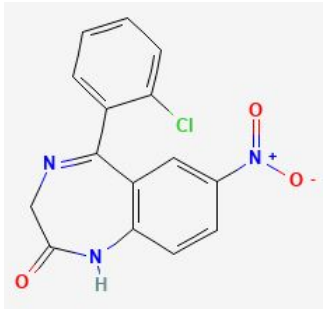


Under cross-examination Ms. Hird testified that a side effect with Citalopram in a naïve user and usually a minor effect can include confusion and impaired concentration.

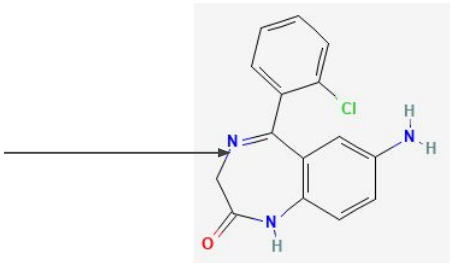
This can also occur with therapeutic use of Benzodiazepine drugs including Clonazepam. Alcohol could add to those effects.

01.

R.v. Nguyen
Metabolism of Clonazepam



Clonazepam



7-aminoclonazepam

- Clonazepam is a drug used to treat seizures
- 7-aminoclonazepam is an **inactive metabolite** of the drug Clonazepam

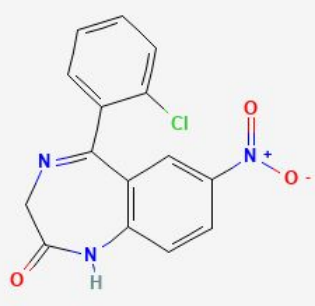
Impaired memory can be a side effect of Clonazepam, but not usually with the other drugs. Because only the metabolite was present, Ms. Hird stated she could not say for certain that Clonazepam was not present when the sample was collected as it could have broken down during storage.

- Because **only the metabolite is present**, it can mean that **Clonazepam was not used recently,** although Ms. Hird states she could not say with certainty that Clonazepam was not present when the sample was collected as it could have **broken down during storage**

01.

R.v. Nguyen

Interpretation of Clonazepam



Clonazepam

Impaired memory can be a side effect of Clonazepam, but not usually with the other drugs.

Because only the metabolite was present, Ms. Hird stated she could not say for certain that Clonazepam was not present when the sample was collected as it could have broken down during storage.

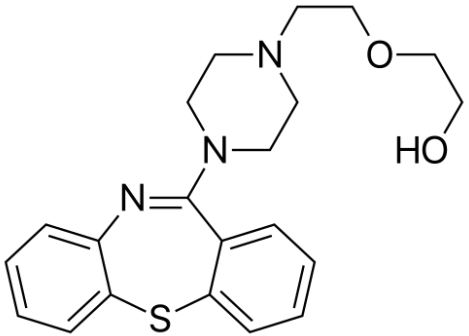
01.

R.v. Nguyen

Urine sample analysis:
Citalopram or Escitalopram, Tramadol, 7-aminoclonazepam, Norquetiapine (a breakdown of the drug Quetiapine)

Norquetiapine (a breakdown of the drug Quetiapine) was not in blood!!

Norquetiapine is a unique metabolite found in urine!



QUETIAPINE: sold under the brand name **Seroquel** among others, is an atypical antipsychotic medication used for the treatment of schizophrenia, bipolar disorder, and major depressive disorder.

Serum or plasma quetiapine concentrations:

- **1–10 mg/L range in overdose survivors**
- **postmortem blood levels of 10–25 mg/L in fatal cases.**

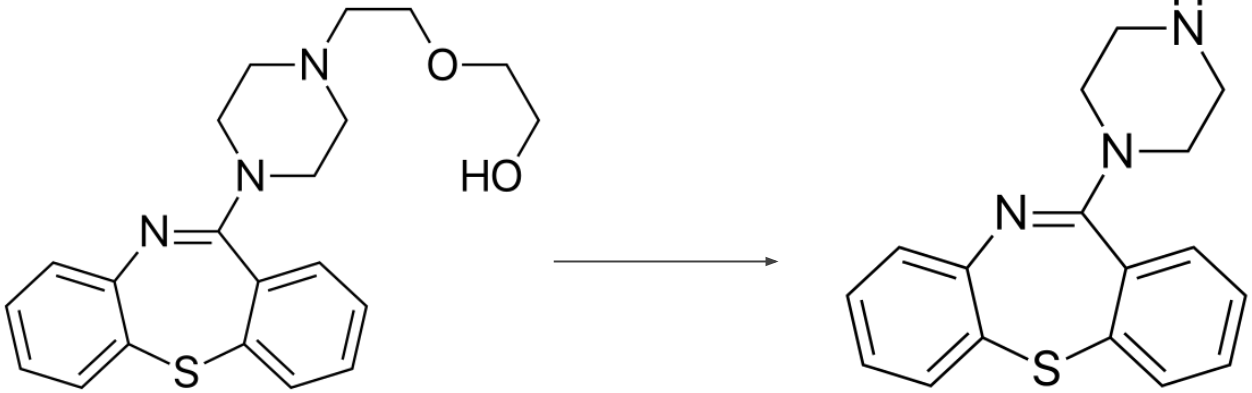
01.

Metabolism

Peak levels of quetiapine occur 1.5 hours after a dose

Quetiapine has an elimination half-life of 6 or 7 hours

Quetiapine is excreted primarily via the kidneys (73%) and in feces (20%)



Quetiapine

Norquetiapine

Norquetiapine, has a half-life of 9 to 12 hours

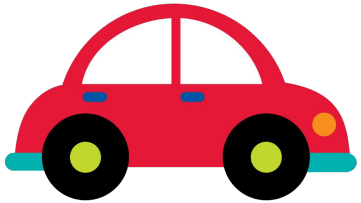
Ms. Hird stated, however, that one does not see too many side effects of this drug. If alcohol is used with Quetiapine (Seroquel), the side effects are additive.

02. R. v. Vanlerberghe, 1993 CanLII 231 (BC SC)

02.

R. v Vanlerberghe

The accused, Mr. Vanlerberghe, was charged with criminal negligence causing death after he struck a pedestrian while driving



02.

R. v Vanlerberghe

A blood sample was taken from Mr. Vanlerberghe approximately two hours after the incident.

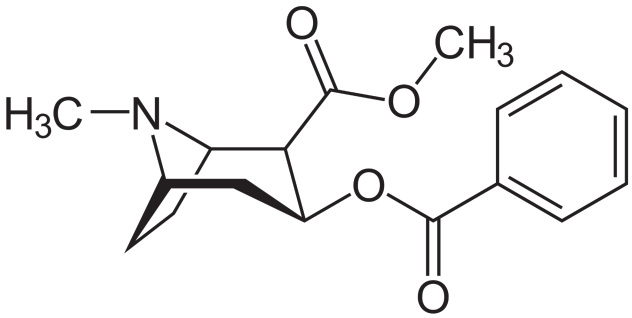
The sample was subsequently analyzed by Jeffrey D. Caughlin, a forensic toxicologist.

02.

R. v Vanlerberghe

The blood was found to contain .03 ug/mL cocaine and 2.75 ug/mL benzoylecgonine.

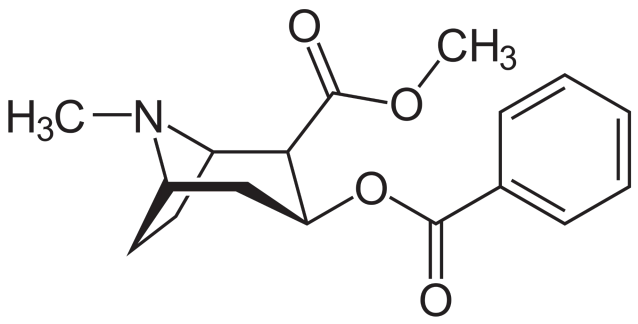
Methylecgonine was also present.



cocaine

02.

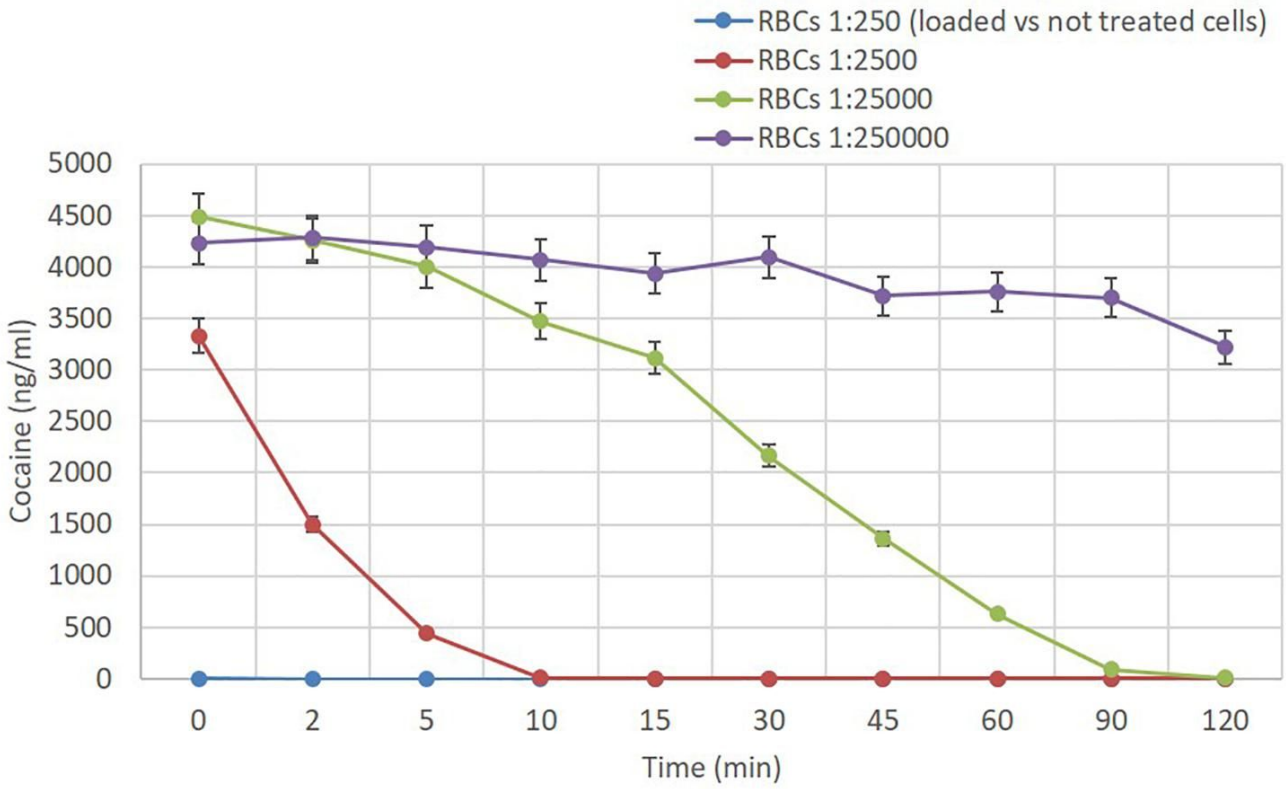
Cocaine



- **Cocaine concentration in the blood of addicts is in the 0.5–1.0 µg/ml range ($t_{1/2}$ of approximately 0.5–1.0 h)**
- **comatose-fatal dose is from 4 µg/ml.**

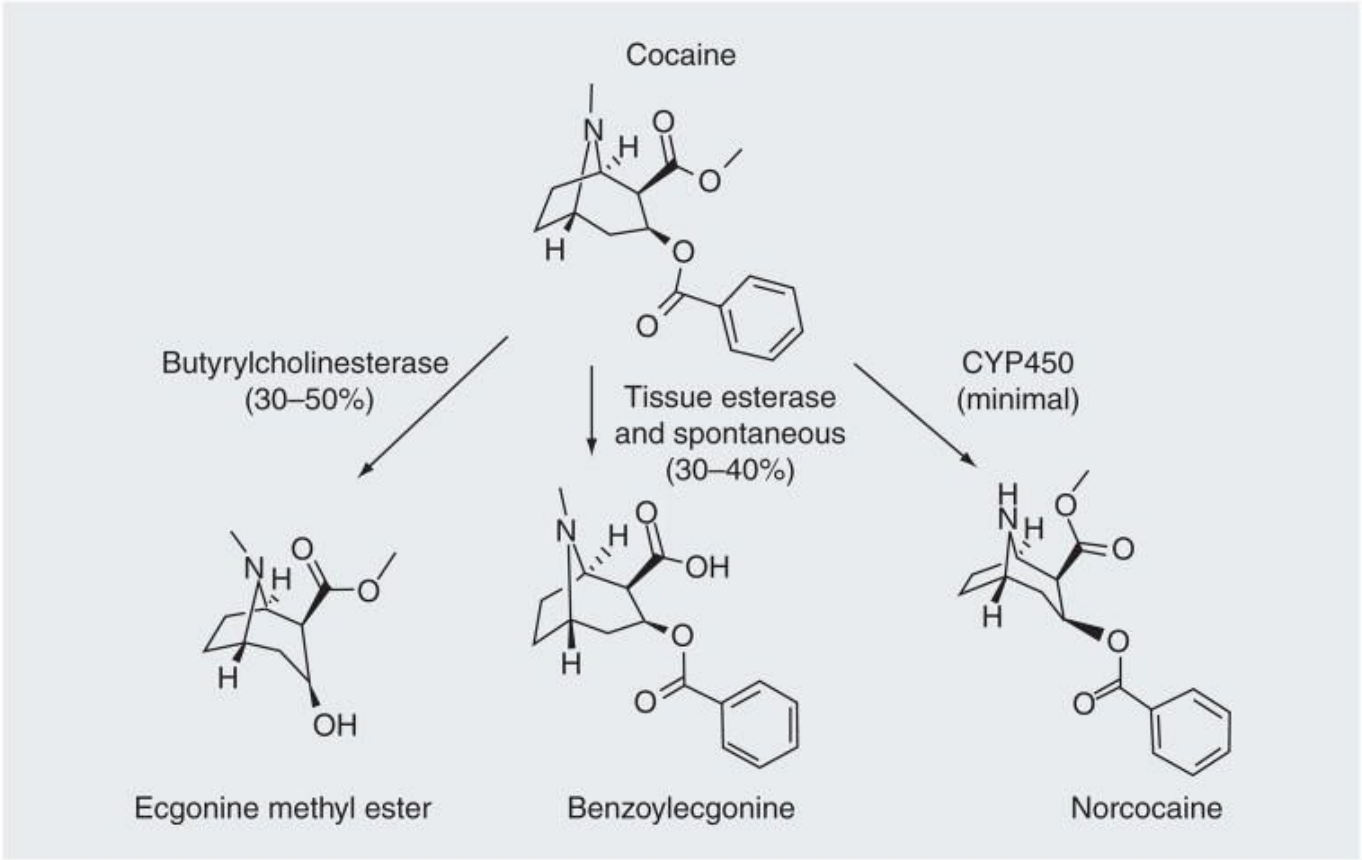
02.

Cocaine degradation by the body!



02.

Metabolism of cocaine



02.

R. v Vanlerberghe

Testimony of Jeffrey Caughlin

1. Peak blood levels after intranasal or intravenous injection range from **90 to 470 ng cocaine per mL blood**
2. Cocaine disappears from blood **within 3 to 10 hours** depending on the dose
3. Cocaine may **break down upon storage after sampling**
4. Therefore, blood cocaine levels **reported may be lower than those present at the time of sampling**
5. Benzoylecgonine arises in the body from **metabolism of cocaine** as well as upon **storage from the decomposition of cocaine**
6. Methylecgonine arises in the body from the **metabolism of cocaine**
7. Neither is pharmacologically active
8. Eithers' presence indicates **prior use of cocaine**, but it is not possible to accurately say at what time or to what extent based on their presence alone

03. R. v. Sukhdeo, 2019 ONCJ 150 (CanLII)

03.

R. v. Sukhdeo, 2019 ONCJ 150 (CanLII)

Mr. Palmentier:

-has worked at CFS for more than 18 years as a forensic scientist in toxicology.
-was qualified as an expert to provide testimony in relation to the absorption, distribution and elimination of alcohol and drugs in the human body, the pharmacological and toxicological effects of alcohol and drugs on the central nervous system, and the isolation, detection and quantitation of alcohol and drugs from biological and non-biological samples

03.

Reporting in this case

Mr. Palmentier:

- processed the urine sample and produced a report which outlined the toxicology findings related to the presence of drugs or the metabolites of drugs.

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03.

Toxicological reporting in this case

What was present in the urine sample?

Ethanol
Cocaine
Benzoylecgonine
Cocaethylene
Levamisole

Cannabis was not detected!

03.

Interpretations from the case

Some drugs are not eliminated from the body through urine.

Mr. Palmentier testified that given the process of drug elimination from the body, drug concentrations in the body change over time.

Drugs present earlier may not be present or detectable at the time of sample collection.

Some drugs are more volatile, and may be eliminated from the body very quickly, before a toxicological sample has been gathered.

The situation depends upon the drug, the concentration of that drug, and the type of sample collected from the subject.

The longer the period of time between the incident and sample collection, the more likely these effects are to be present.

03.

Interpretations from the case

Scientifically validated methods testing for specific drugs may not be available at the time of testing.

Screening methods for some drugs may not be sufficiently sensitive at the time of testing.

The concentration of a drug may decrease between the time of collection of the sample and the time that the analysis was performed.

In addition, the type and volume of the sample may limit possible analyses.

Mr. Palmentier testified that once collected, drug concentrations in samples can change over time.

03.

Interpretations from the case

Any confirmation of the presence of a drug in the urine sample of an accused is relevant, but of limited utility in determining whether that individual's ability to operate a conveyance was impaired at the relevant time.

The presence of a drug in the sample is simply confirmation that an accused has been exposed to that drug.

04. REFERENCES

04.

REFERENCES

1. R v Nguyen, 2021 ABPC 214 (CanLII)
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7. Accelerating cocaine metabolism as an approach to the treatment of cocaine abuse and toxicity