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Analytical Testing for Marijuana
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Disclosures

I have no actual or potential conflict of interest in relation to this program/presentation.

I provide medicolegal consultation on opioid safety
Objectives

Objective 1: To describe essential cannabis pharmacokinetics
Objective 2: To describe the potential uses and pitfalls of drug testing in OUI cases
Definitions

• Cannabis
• Marijuana
• Cannabinoids
• Delta-9-tetrahydrocannabinol (THC)
Delta-9-tetrahydrocannabinol (THC)

Delta-9-tetrahydrocannabinol \( \rightarrow \)

11-hydroxy-delta-9-tetrahydrocannabinol (11-OH-THC) \( \rightarrow \)

11-nor-9-carboxy-THC (THC-COOH)
- Inactive
- May persist in urine for weeks
Pharmacokinetics

Highly variable between individuals

Differences between smoked, vaporized, and ingested forms

Smoked marijuana: peak concentration in 3-10 minutes

Less predictable after ingestion

Chronic use causes THC deposition in fatty tissues
Testing Methods

Blood/Serum

Oral fluid

Urine
Blood/serum THC

Tetrahydrocannabinol concentrations are only measurable within the first 2 h of smoking marijuana, while the psychomotor effects may last 8 h or more.

An undetectable THC concentration does not rule out driver impairment due to marijuana consumption.
Blood/serum THC

Even short delays can alter results (leading to zero-tolerance laws)

Unlike alcohol, no back extrapolation of concentrations

Serum THC concentration 7–10 ng/ml is equivalent to a blood alcohol concentration of 0.05 g/dL

Some authors recommend lowering cutoffs if alcohol also present
Evaluating THC to THC-COOH ratios (CIF)

In six volunteers, peak serum THC concentrations occurred at 8 minutes (range, 6–10 minutes) after onset of smoking, peak 11-OH-THC at 13 minutes (range, 9–23 minutes), and peak THC-COOH at 120 minutes (range, 48–240 minutes).

Approximately 1 hour after beginning to smoke a marijuana cigarette, the THC to 11-OH-THC ratio is 3:1, and the THC to THC-COOH ratio is 1:2.

At approximately 2 hours, the ratios are 2.5:1 and 1:8, respectively.

At 3 hours, the ratios are 2:1 and 1:16, respectively.
Oral Fluid Testing
Cannabidiol concentrations do not correlate with level of impairment
Cannabinoid glucuronide measurements
THANK YOU!

Dr. Jennifer Whitehill
Dr. Peter Friedmann
Dr. Mark Neavyn
Dr. James Carroll
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