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## Analytical Testing for Marijuana

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**UMASSTOX**

at UMass Memorial Medical Center



# 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

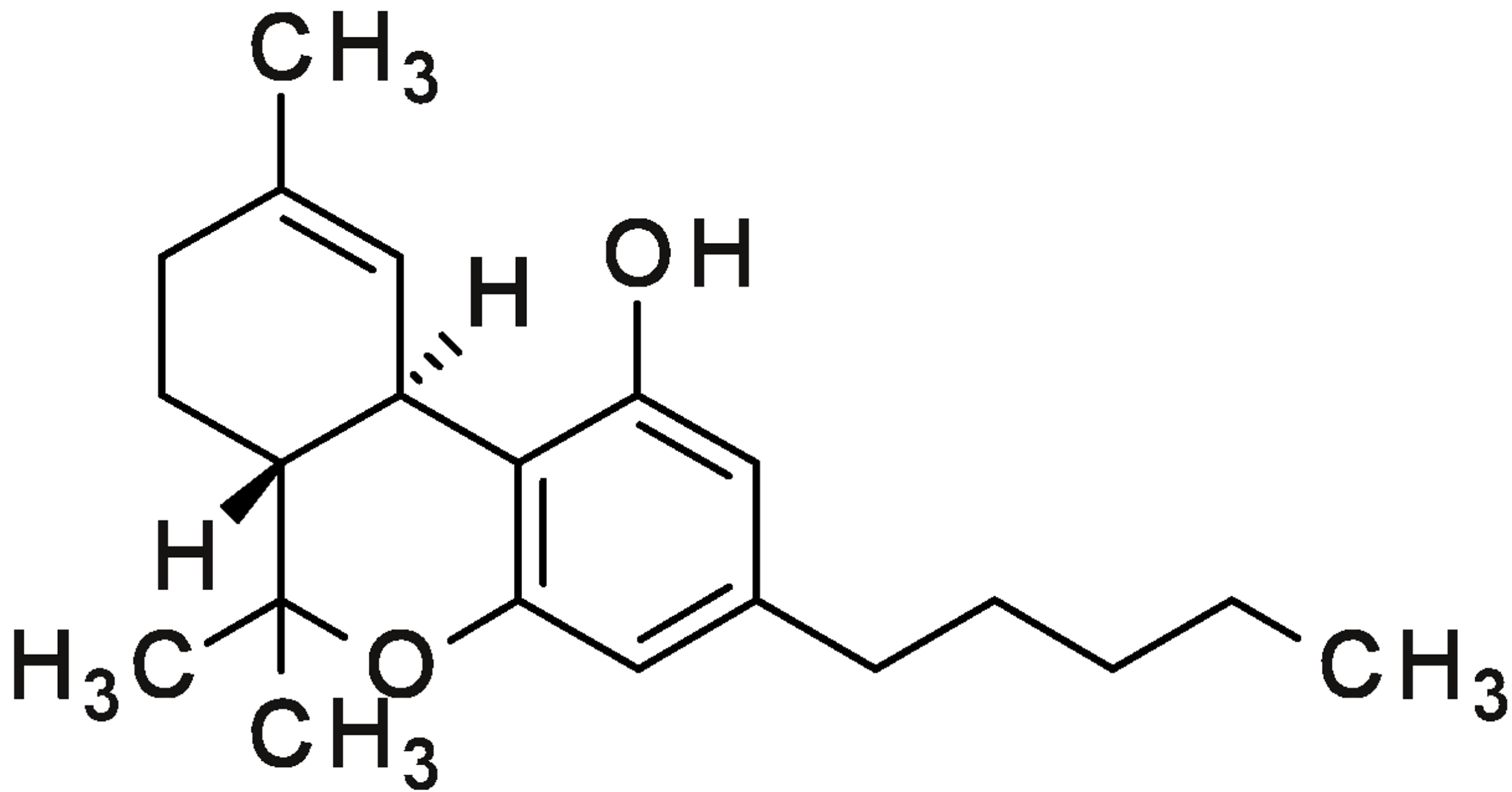
- Cannabis
- Marijuana
- Cannabinoids
- Delta-9-tetrahydrocannabinol (THC)















# Delta-9-tetrahydrocannabinol (THC)

Delta-9-tetrahydrocannabinol →

11-hydroxy-delta-9-tetrahydrocannabinol (11-OH-THC) →

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



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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