

# *Toxicology and the Courts: Legal Obstacles to Scientific Evidence*



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# *Science and Law*



## **Scientific World-View**

The data is what it is.

*R.A. Ludwig*

## **Legal World-View**

It depends on what the definition of “is” is.

*W. Clinton*

# *Science in Court*



## **Legal acceptance of scientific data:**

Science must be proven to be reliable before it can be used as evidence.

## **What standard to apply to prove “reliability?”**

Expert opinion?

Past practice?

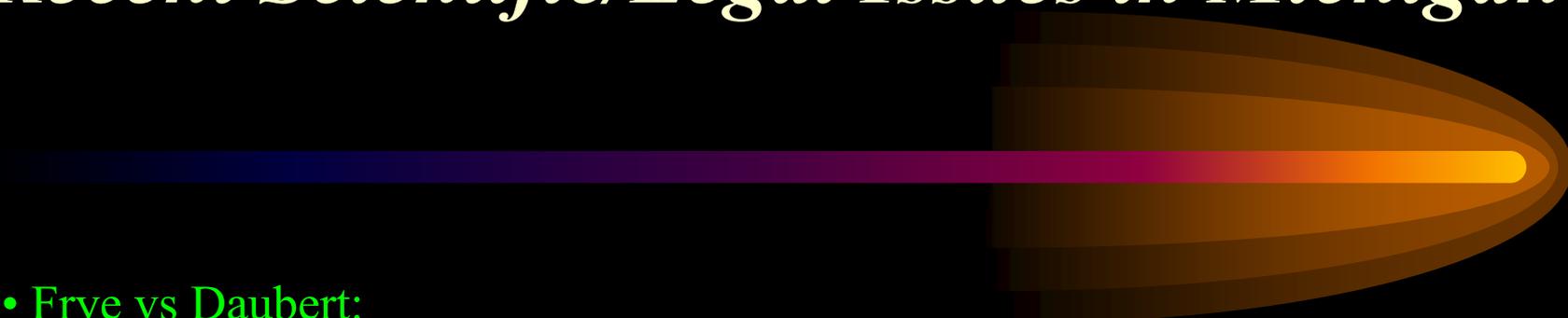
General acceptance?

What about novel techniques?

Differences in expert opinion?

Legal requirements that are impossible to meet?

# *Recent Scientific/Legal Issues in Michigan*



- **Frye vs Daubert:**

Changing standard for reliability of scientific evidence

- **Datamaster** (breath alcohol testing device):

How far do you have to go to show the instrument works as intended?

- **Cannabinoids:** What do THC metabolites show about ingestion of controlled substances?

# *Deciding Reliability*



## **Usual Sequence of Events:**

- Defendant charged
- Challenges the reliability of the evidence against him; OR
- Is convicted, appeals, challenges the reliability...
- Hearings held as to whether the evidence is reliable. Often the losing party will appeal to a higher court.
- Once a higher court (Court of Appeals in MI) decides the issue, that generally decides it for the whole state.

*How to decide if evidence is reliable?*

# *Older Standard: Frye-Davis*

**Frye (known as Frye-Davis in MI)**

**Standard for Admissibility of Novel Scientific/Medical Evidence**

- Frye vs United States (1923, US Supreme Court)
- People vs Davis (1955, Michigan Supreme Court)

*Frye*: admissibility of unigraph (precursor to polygraph) test, which measured cardiovascular activity. Defendant Frye, on trial for homicide, passed the test, moved to admit results.

*Decision*: too experimental, no published studies, not widely accepted, therefore inadmissible. Conviction upheld.

# *Older Standard: Frye-Davis*



## **Frye-Davis**

### **Standard for Admissibility of Novel Scientific/Medical Evidence**

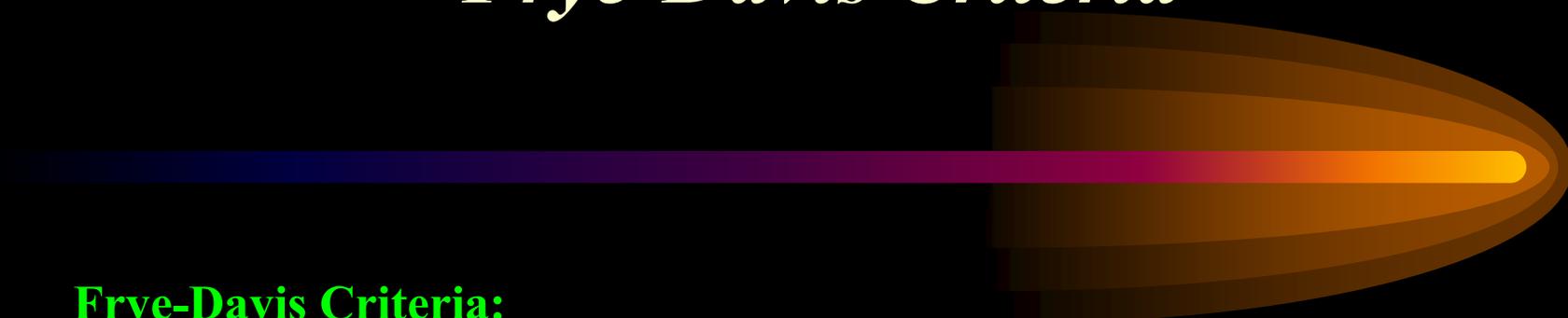
- Frye vs United States (1923, US Supreme Court)
- People vs Davis (1955, Michigan Supreme Court)

***Davis:*** admissibility of polygraph tests in a homicide trial.

Expert testimony, scientific literature: error rate 10 – 25%.

***Decision:*** error rate too high; technique not generally accepted as reliable, therefore not admissible. Conviction upheld.

# *Frye-Davis Criteria*

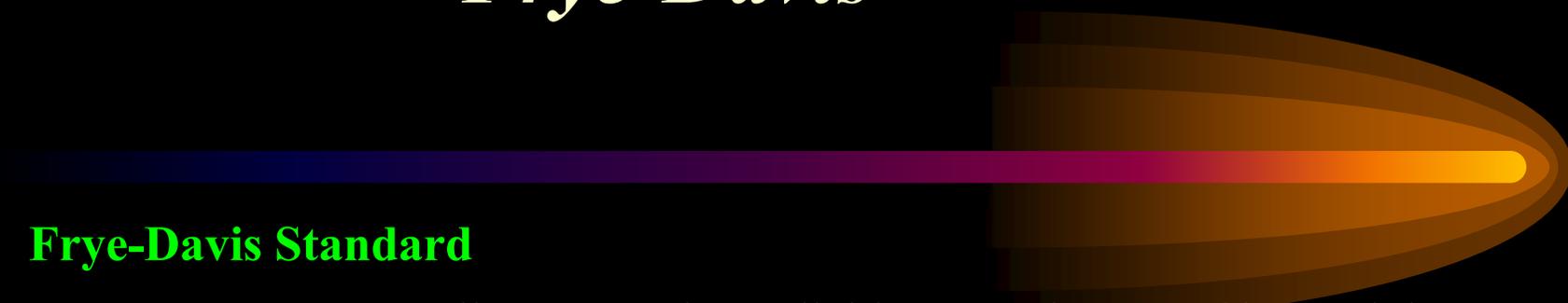


## **Frye-Davis Criteria:**

- If the technique is generally accepted, it's admissible.
- If it has been admitted in any other jurisdiction, admissible.
- If it is a new application of an existing technique, admissible.

*Only if the technique is completely novel may there be a challenge to its reliability.*

# *Frye-Davis*



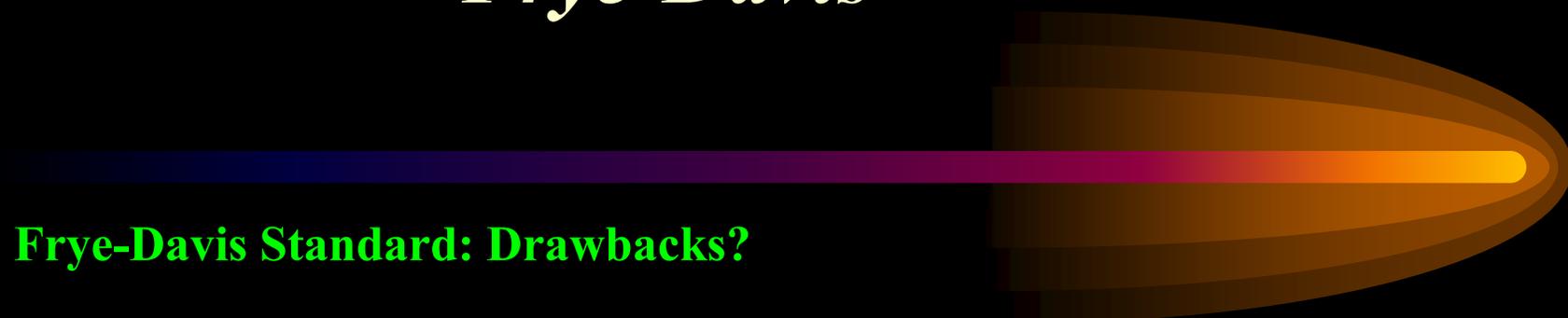
## **Frye-Davis Standard**

How to prove “generally accepted as reliable”? Testimony of impartial experts. Impartial experts (according to the court) are those who:

- Do not use the technique full-time
- Are not members of an organization that promotes the procedure
- Have no financial interest in the technique
- Do not derive more than 10% of their income from the technique
- Have no practical experience in the procedure

*(Editorial comment: experts???)*

# *Frye-Davis*



## **Frye-Davis Standard: Drawbacks?**

- Novel techniques, which are valid but not yet widely known, may not be acceptable in court because they cannot meet the “generally regarded as reliable” standard.
- In practice: Forensic science is mostly conservative; most new applications are based upon pre-existing techniques, so this has not been an issue in the author’s experience.
- Judges allowed to defer to the opinions of experts: Battle of Experts?

# *Newer Standard: Daubert*

## **Daubert**

### **Standard for Admissibility of Novel Scientific/Medical Evidence**

- Daubert vs Merrill-Dow Pharmaceuticals (1993, US Supreme Court)

*Daubert:* A woman sued Merrill-Dow, claiming their drug Benedictin was responsible for her child's birth defects. Experts for the plaintiff testified that animal studies showed teratogenic effects, and also recalculated data from previously published epidemiological studies to show that the drug was a human teratogen. Experts for the defense testified that clinical trials and epidemiological studies supported the contention that the drug was safe.

# *Newer Standard: Daubert*

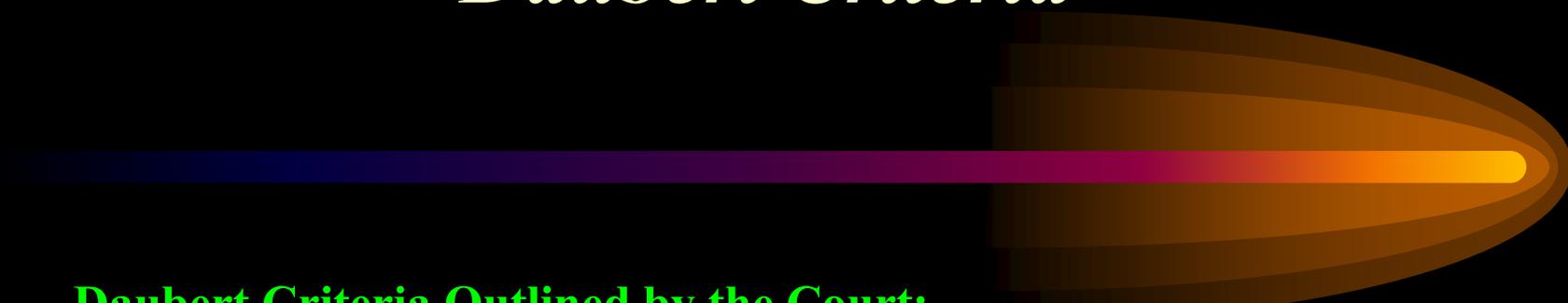
## **Daubert Standard for Admissibility**

*Daubert Decision:* Case dismissed.

Court determined that plaintiff's experts' animal evidence was not admissible as it was not generally acceptable for predicting human effects. Further, their recalculations were based on their own procedures, and were not published or subjected to peer review.

- Case remanded back to trial court, where the court found for the defendant.

# *Daubert Criteria*



## **Daubert Criteria Outlined by the Court:**

- Has the technique been tested?
- Has it been subjected to peer review and publication?
- Does it have a known rate of error?
- To what degree has it been accepted in the scientific community?

*This list is meant to be flexible and non-exclusive.*

# *Daubert Standard Con't.*

## **Kumho Tire**

Kumho Tire Co. vs. Patrick Carmichael (1998, US Supreme Court)

*History:* Driver Carmichael's tire blew; the vehicle overturned, one passenger died and others were injured. Carmichael sued the tire manufacturer (Kumho), claiming the tire was defective. Plaintiffs intended to introduce evidence of tire expert Dennis Carlson Jr. who was to testify that his inspection of the tire showed the failure was caused by manufacturing defect. They further claimed the Daubert standard did not apply to Carlson because he was not a professional scientist.

# *Newer Standard: Daubert*



## **Kumho Tire**

Kumho Tire Co. vs. Patrick Carmichael (1998, US Supreme Court)

*Decision:* The court excluded Carlson's testimony, judging that it did not meet the Daubert standard for relevance and reliability, and that Carlson's methods did not have sufficient indications of reliability. This decision enlarged the Daubert standard to apply to engineers and other experts who were not professional scientists.

# *Frye vs Daubert*

*Daubert* said (by lawyers!) to be more lenient than *Frye*. But instead of showing 1 thing, you have to show 4 things:

## *Frye*

Generally accepted

## *Daubert*

Tested?

Published?

Error rate?

Degree of acceptance?

# *Frye vs Daubert: Role of Experts*

The role of experts is significantly different under **Daubert** and **Frye**, and also under the US Rules of Evidence:

## *Frye*

Expert opinion accepted.

*“The discourses of experts have thrown so much darkness on this subject that if they continue as such, we shall soon know nothing at all about it.”*

*Mark Twain*

## *Daubert*

Expert must show opinion is based on a reliable foundation and is both scientifically valid and relevant. Also that experts did not develop their testimony exclusively for the case at hand, and applied the same considerations to the case as they would to their normal work.

# *Frye vs Daubert: Role of Judges*



The role of judges has changed:

## *Frye*

Keep out pseudoscience.

## *Daubert*

Must determine if techniques are scientifically valid and data is obtained in a scientifically defensible manner. Rehnquist and Stevens, in dissent with the majority in Daubert, expressed concern that judges were being asked to be “amateur scientists” and that this was not their proper role.

# *Daubert vs Frye-Davis by State*

## **Daubert States**

Connecticut  
Indiana  
Kentucky  
Louisiana  
Massachusetts  
Michigan  
Missouri  
New Mexico  
Oklahoma  
South Dakota  
Texas  
West Virginia

## **Frye States**

Alaska  
Arizona  
California  
Colorado  
Florida  
Illinois  
Kansas  
Maryland  
Nebraska  
New York  
Pennsylvania  
Washington

*Others have their own standards, typically an expanded version of Frye.*

# *What's in a Daubert Hearing?*

## In Theory:

- The prosecution must show the 4 prongs of testability, peer review, rate of error, general acceptance/reliability, and that its expert's opinion is scientifically valid. Introduction of scientific literature reviewing the technique and its use in the field should satisfy all requirements, and give the expert's opinion a scientific basis.
- “Junk” science and ridiculous opinions by experts (*examples furnished upon request*) should be subject to scrutiny and demand for supporting evidence.

# *What's in a Daubert Hearing?*



## *In Practice:*

- Testability/peer review: Defense demands ALL literature EVER published on a given technique.
- Error rate/reliability: Defense claims that if a technique is not 100% accurate in all circumstances, it is not reliable.
- Scientific Opinion: Defense demands ALL treatises ever read by a prosecution expert in any area to support any statement made on the stand.

*Prosecutors must object, and judges must uphold, the contention these demands are unreasonable and not required by Daubert.*

# *What's in a Daubert Hearing?*



## *In Practice:*

- Prosecutors have not generally given the same scrutiny to defense expert opinions, probably due to lack of time, lack of experience, or they don't think it necessary. Result: "junk" science still makes it into the courtroom, but long-established scientific techniques have to be justified.

*"If I claim to be a wise man, it surely means that I don't know."*

# *Daubert by Discipline*

## Discipline

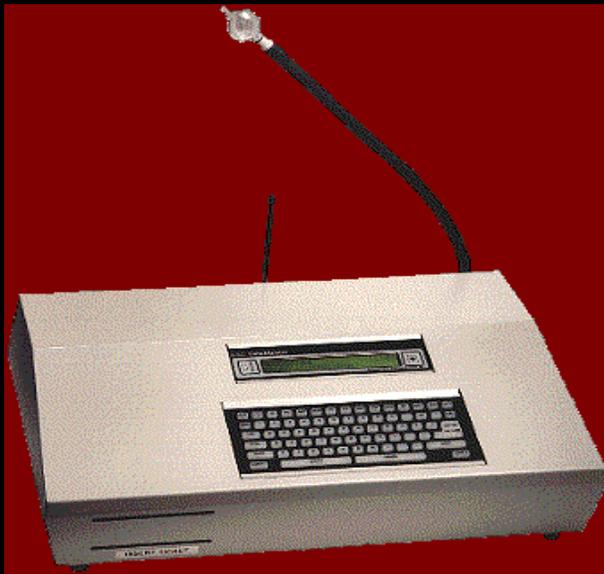
Breath Alcohol  
Blood Alcohol/Drugs  
Ballistics  
DNA  
Latent Prints  
Polygraph  
Psychiatric Evaluations  
Questioned Documents  
SFSTs  
Social Science Evidence  
Trace Evidence

## Outcomes

Passed (outside MI)  
No challenge yet  
Generally fails  
Passed  
Passed (but close!)  
Generally fails  
Mixed  
Passed  
Challenges scheduled in MI  
Generally fails  
No challenge yet

# *Daubert in Michigan: Toxicology*

## **Breath Alcohol Testing: Datamaster (National Patent Analytical Systems, Mansfield, OH).**



- Measures alcohol in breath sample
- Infrared spectroscopy
- 2100:1 blood:breath ratio used (population average ~ 2300)
- Breath alcohol testing since the 1940's.
- Infrared breath testing since the 1970's.
- Used worldwide, extensively tested and researched.

*Latest Defense Challenge: Daubert!*

# *Daubert in Michigan: Toxicology*

## **Datamaster Daubert Challenges**

### **Wayne County (Detroit):**

Judge dismissed the Datamaster as unreliable after a 15-month hearing because:

- (a) Prosecution's expert (the author) was not an impartial witness because she works for the State. The defense expert, although paid, was specifically qualified as impartial.
- (b) The Datamaster underestimates the blood-breath ratio for most defendants, therefore it underestimates the alcohol content of most defendants, therefore it is not reliable.

The judge ignored the bulk of the evidence presented by the prosecution as to the technique being tested, peer-reviewed, etc., and substituted her own opinion for that of the scientific community. *Decision being appealed.*

# *Daubert in Michigan: Toxicology*

## **Datamaster Daubert Challenges**

### **Marquette County (Upper Peninsula):**

Ongoing. Defense has no expert, no scientific counterclaims and no rebuttal. Their claim is largely the fact that the prosecution's experts are not impartial:

- (a) The author works for the State.
- (b) The author once said a certain defense expert is boring.
- (c) The owner of National Patent, although knowledgeable about the Datamaster, has a financial stake in the procedure.
- (d) The prosecution has not produced ALL papers ever published or read, etc.

*At least 2 more pending in the Detroit area and 2 others outstate.*

# *What About the Source Code?*

## *Breath Alcohol Challenges Continued: Source Codes*

- In Florida, defense experts are demanding the computer source code for the Intoxilyzer breath alcohol analyzer.
- Claim: you can't prove the instrument properly measures alcohol without analyzing the code.
- Caveat: "Analyzing the source code" requires computer programming expertise.
- CMI, Inc., which makes the Intoxilyzer, refuses to release the code on the grounds that it is proprietary.
- One judge has thrown out all Intoxilyzer tests as **unproven or unreliable**.

# *What About the Source Code?*

## *Breath Alcohol Challenges Continued: Source Codes*

- National Patent Analytical Systems has agreed to release the Datamaster source code, provided (i) defense attorneys pay for it and (ii) they sign a non-disclosure agreement.
- Only one attorney has pursued it. The rest have dropped their challenge.
- Experts hired to examine the code needed NPAS engineers to interpret it for them.
- **Issue:** This challenge completely and improperly ignores all other standards, controls and verification tests routinely used by police agencies, and should not be the sole standard applied by a court.

# *Cannabinoid Issues*



- When is someone physically impaired by cannabinoids?
- When is someone legally impaired by cannabinoids?
- What is required to prove it?

# *Impairment and Controlled Substances*

- Impairment by CS not nearly as well characterized as with alcohol.
- Threshold levels for impairment difficult to define.
- Metabolic profiles not always well defined.

*But...*

Many courts have an “alcohol” mentality with respect to drugs:  
How impaired was the subject? How many joints gets you to that blood cannabinoid level? When did he smoke them? How many drinks is one joint equivalent to? etc.

# *Impairment and Controlled Substances*



**Shepler v. State, 2001 WL 1468867 (Ind. App).**

It is unknown how much drug will impair a given individual. Therefore, it is reasonable to prohibit driving with any controlled substances present in the body.

# *Impairment From Drugs (Michigan Pre-2003)*



## **Michigan Vehicle Code 257.625(3):**

“A person shall not operate a vehicle...when, due to the consumption of intoxicating liquor, a controlled substance or a combination of an intoxicating liquor and a controlled substance, the person’s ability to operate the vehicle is **visibly impaired.**”

# *Impairment From Drugs (Michigan Post-2003)*

## **Michigan Vehicle Code 257.625(8):**

“A person shall not operate a vehicle...if the person has in his or her body any amount of a controlled substance listed in Schedule 1 under section 7212....or of a controlled substance described in section 7214(a)(iv) of the public health code 1978 PA 368, MCL 333.7214.”

# *Per Se Impairment*

## **Schedule 1:**

Any drugs listed on CS Schedule 1

Most common: THC, Ecstasy

## **Section 7214(iv)(a):**

Coca leaf extracts and related compounds: cocaine

***So:*** any amount of THC, Ecstasy, cocaine or other Schedule 1 drugs in any body fluid is *per se* evidence of OUID

# *Per Se Drug Use*

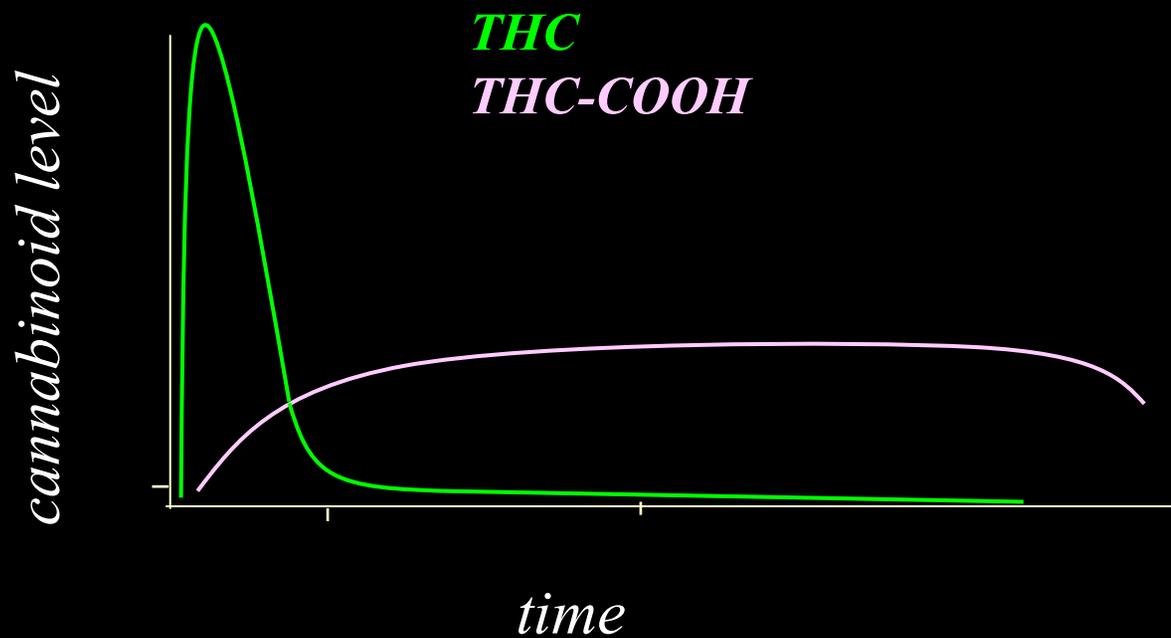


**Pros:** makes debate about levels moot:  
“It was only a little cocaine!”

## **Cautions:**

- Appropriate samples must be collected
- blood best for OWI
  - urine OK for probation, CSC cases

# *Cannabinoid Metabolism*



*Adapted from M. Huestis, For. Sci. Rev., 2002*

# *Are THC Metabolites Controlled Substances?*

## **Michigan Compiled Laws Public Health Code**

### **333.7212(1)(d):**

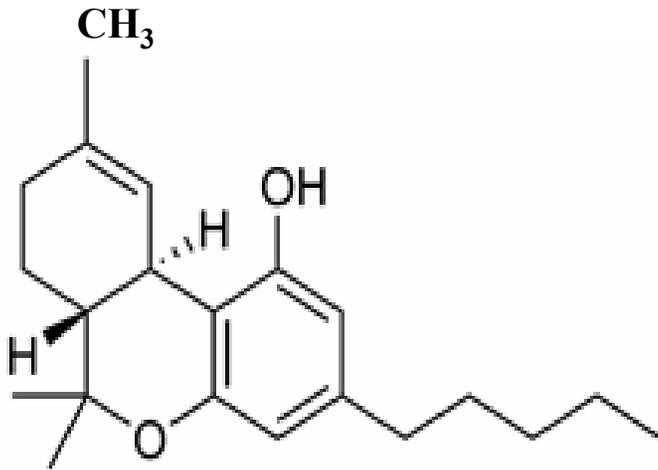
Except as provided in subsection (2), synthetic equivalents of the substances contained in the plant, or in the resinous extractives of cannabis and synthetic substances, **derivatives** and their isomers **with similar chemical structure** or pharmacological activity or both, such as the following are included in schedule 1:

(i)  $\Delta^1$  cis or trans tetrahydrocannabinol... [THC]

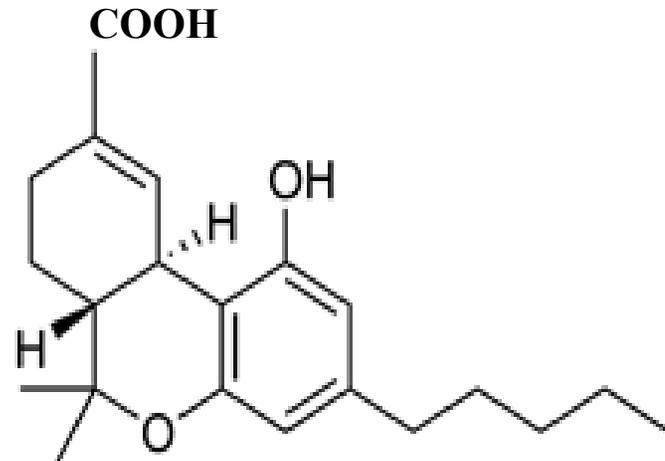
### **333.7212(1)(e)**

**Compounds of structures of substances referred to in (d).**

# *Are THC Metabolites Covered?*



*THC*



*THC-COOH*

*Similar structure.*

*THC-COOH derived from THC.*

*Do not have similar activity.*

# *Michigan Cannabinoid Cases*



- **P vs Dehaan**, 2002. OUID causing death.  
30 ng/ml THC-COOH (no alcohol).  
Challenge: no THC found, lab report should be excluded.  
Judge ruled state of intoxication a question for the jury. Convicted.
- **P vs Monica**, 2004. Possession of a controlled substance.  
8 ng/ml 11-COOH-THC (no alcohol).  
Challenge: THC-COOH not a controlled substance.  
Judge ruled it was.

# *Michigan Cannabinoid Cases*



- **P vs Kurts**, 2004. OWI 3rd.  
8 ng/ml THC-COOH, 0.07 g/dL alcohol.  
Admitted smoking ½ hour before driving.  
Challenge: THC-COOH not a controlled substance.  
Judge agreed; charges dismissed.  
Appealed: appellate court upheld dismissal.
- **P vs Derror**, 2004. OWI causing death, serious injury.  
31 ng/ml THC-COOH (no alcohol).  
Challenge: THC-COOH not a controlled substance.  
District court judge ruled it was.  
Appealed: appellate judge said it wasn't.

# *Cannabinoid Appeals: New Ground!*

*July, 2005: Court of Appeals: P vs. Derror, P vs. Kurts*

- Ruled that THC-COOH is not a controlled substance: agreed that if the legislature had meant metabolites, they would have said “metabolites” in the statute.
- Agreed that THC-COOH is evidence of ingestion of a CS.
- Stated that prosecution has to **prove the presence of a CS in the blood at the time of driving** (and in serious cases, a proximate cause of the adverse event).

# *Appeals: Kurts and Derror*



- **P vs. Derror**

Prosecution has to prove THC was in the blood at the time of driving, and also that it was a cause of the accident.

- **P vs. Kurts**

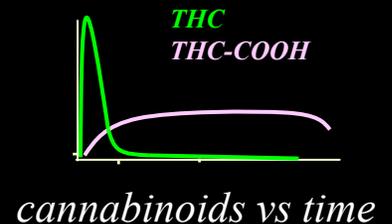
Prosecution has to prove that THC was in the blood at the time of driving, but reinstated charges because there was enough evidence of this to present to the jury (defendant statement).

# *Retrograde Extrapolation: Cannabinoids*

**Alcohol:** Retrograde extrapolation accepted given certain conditions.

## **THC:**

- No method exists to calculate a retrograde level of THC in blood from THC-COOH only.
- No method exists to calculate a blood THC level from a urine or tissue THC-COOH level.
- Little data exists on what form cannabinoids are in once they are removed from the blood into tissue (THC, a conjugate of THC, THC-COOH, some other metabolite), or on a time course of such transformation.



# *Other Compartments?*

## **Could THC Be Present?**

- Blood - may be present below reporting limit
- Urine - won't be present, even if THC still in blood
- Vitreous fluid – usually not available
- Stomach contents – usually not available\*
- Breast milk – usually not available
- Tissue – usually not available
- Fat – usually not available
- Bile – do not test
- Hair – do not test

*THC might be present in any of these, but no way to know without a specimen and an appropriate testing procedure.*

*\* MSP has detected when sample provided*

# *Legal Requirements*

## *(Instructions for Prosecutors)*

- If showing impairment satisfies your court, obtain as many witness statements as possible. If the witness statements are consistent with the effects of the drug, and the lab report shows the drug was present, the likelihood is that the subject was under the influence of the drug.
- If your court requires you to show THC present at the time of driving, the only way to do so is if the subject states when he smoked marijuana. If within 1 – 2 hours of driving, THC probably still present in the blood at the time of driving. If no such statements, no way to determine. No retrograde possible.

# *Possible Directions*



Supreme Court Ruling Pending:

Kurts, Derror arguments made in front of  
the Michigan Supreme Court in January, 2006.

# *Possible Directions*



## Possible Outcomes:

- THC-COOH not a controlled substance: prosecutors must prove impairment (pre-2003 standard).
- THC-COOH not a controlled substance: prosecutors must provide a retrograde analysis for THC levels (usually impossible).
- THC-COOH is a controlled substance: any body content is evidence of impairment. “Zero Tolerance”: not scientifically accurate, but many legal precedents.

# *Who Judges the Science?*



## Observations:

- Science being challenged by people with a vested interest in discrediting it.
- Being judged valid or not by people with no formal background in the techniques or in scientific procedures.

## Consistency:

- Varies court to court, county to county, state to state.
- Depends on the bias of the judge and aggressiveness of defense bar.

# *Who Judges the Science?*



## Problems:

- US Supreme Court ruling on “experts” in Frye, MI Court of Appeals ruling on THC: legal requirement for something not scientifically practical or possible.
- Defense attorneys who make unreasonable demands well beyond the scope of Daubert and judges who allow it.
- Prosecutors who are reluctant to apply the same standards to defense experts.

# *Who Judges the Science?*



## Personal Observations

- Many judges with experience in these areas (e.g. OWI) do not want to conduct these hearings; are already familiar with the techniques and the science behind them. In areas they are not familiar with, it imposes a great burden on them.
- In some cases, neither does the defendant want to go through such lengthy legal procedures (usually for \$ reasons). Often, it is the defense attorney, with his own motives, pursuing the challenge.

# *Who Judges the Science?*



## *Wishful Thinking?*

- Let states convene scientific advisory panels to review the literature and advise the judiciary on whether such techniques as GC/MS, breath alcohol testing, DNA analysis, etc., are scientifically acceptable under the prevailing standard. Allow judges to accept or reject their recommendations as they will.
- More science education in law schools! Not just techniques, but principles, postulates and logical analysis....try to reconcile the legal/scientific world-views.

*See You In Court!*

