

**Cannabis, alcohol and other drugs.
Science behind laws for those
impaired while driving and at work**

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History of impaired driving laws

- In the late 1800's, it was clear that alcohol had a negative effect on psychomotor function.
- The first prototype of a breathalyzer developed in 1870.
- The first laws against drinking and driving were implemented in the early 1900's based on behavioural grounds for impairment.
- The first portable roadside Breathalyzer in 1964 when the first large scale case-control study demonstrated a strong relationship between crashes and BAC concentrations
- For cannabis, new impaired driving laws were implemented in about 6 months.

Questions addressed

Comparisons between alcohol and cannabis

- 1. What are the laws for cannabis and driving?**
- 2. What are the safety risks of cannabis and driving ?**
- 3. What are the pharmacokinetics of cannabis and alcohol and their relationship to performance deficits?**
- 4. Logistic issues for the new cannabis laws?**

**1. What are the laws for
cannabis and driving?**

Old Legislation

Drug Recognition Expert (DRE) - series of physical and psychomotor tests, and concludes with drug testing of a sample of blood, urine or oral fluid to detect prior use. Used for common drugs, such as cannabis, cocaine, amphetamines, opiates.

Limitation: Approach not validated for detecting impairment.

New Legislation

Impaired cannabis driving

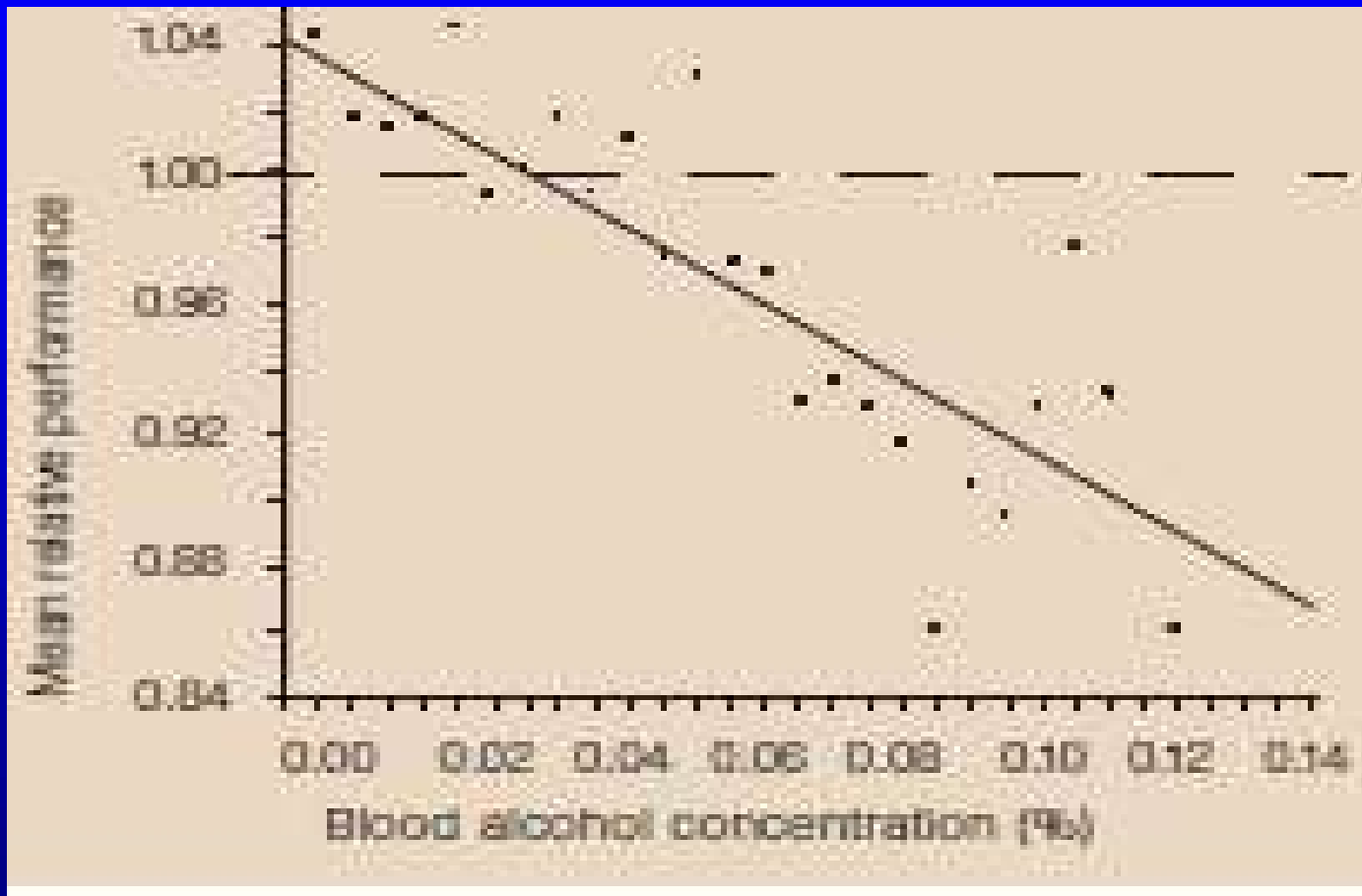
- **A blood test reading of 2 to 5 ng/ml THC in whole blood would be subject to a summary (i.e. less serious) criminal conviction**
- **Reading over 5 ng/ml could be subject to an indictable (i.e. more serious) offence.**

2. What are the safety risks of cannabis of cannabis and driving ?

Acute effects of cannabis on driving

- **Slows reaction times**
- **Reduces performance on divided attention tasks**
- **Reduces psychomotor co-ordination at higher consumption levels (e.g. increases lane weaving)**

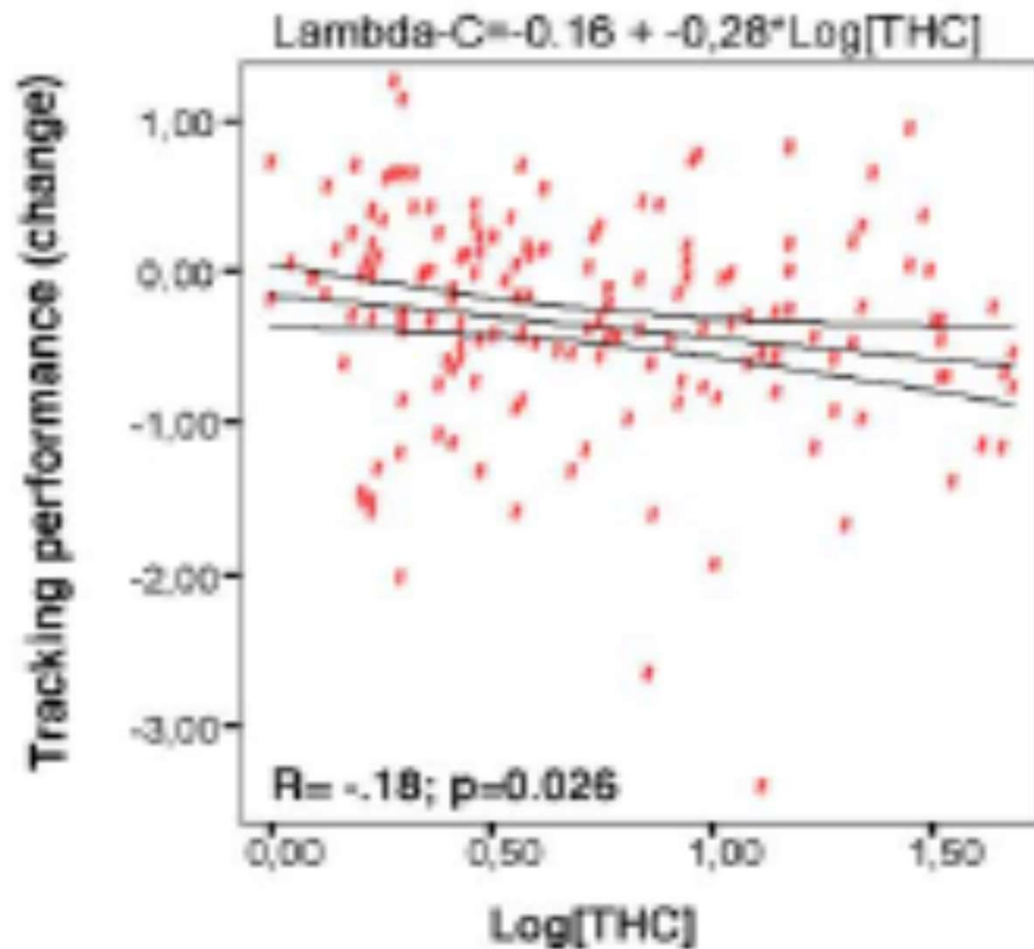
BAC and performance: A strong relationship



**50% of
performance
explained by
BACs**

Dawson and Reid, 1997.

THC in blood and performance: A weak relationship



**3 -10% of
performance
is explained
by blood THC**

Ramaekers et
al., 2006

Cannabis is a harm avoidance drug

- More cautious driving
- Increases distance driving behind cars
- Reduces average speeds

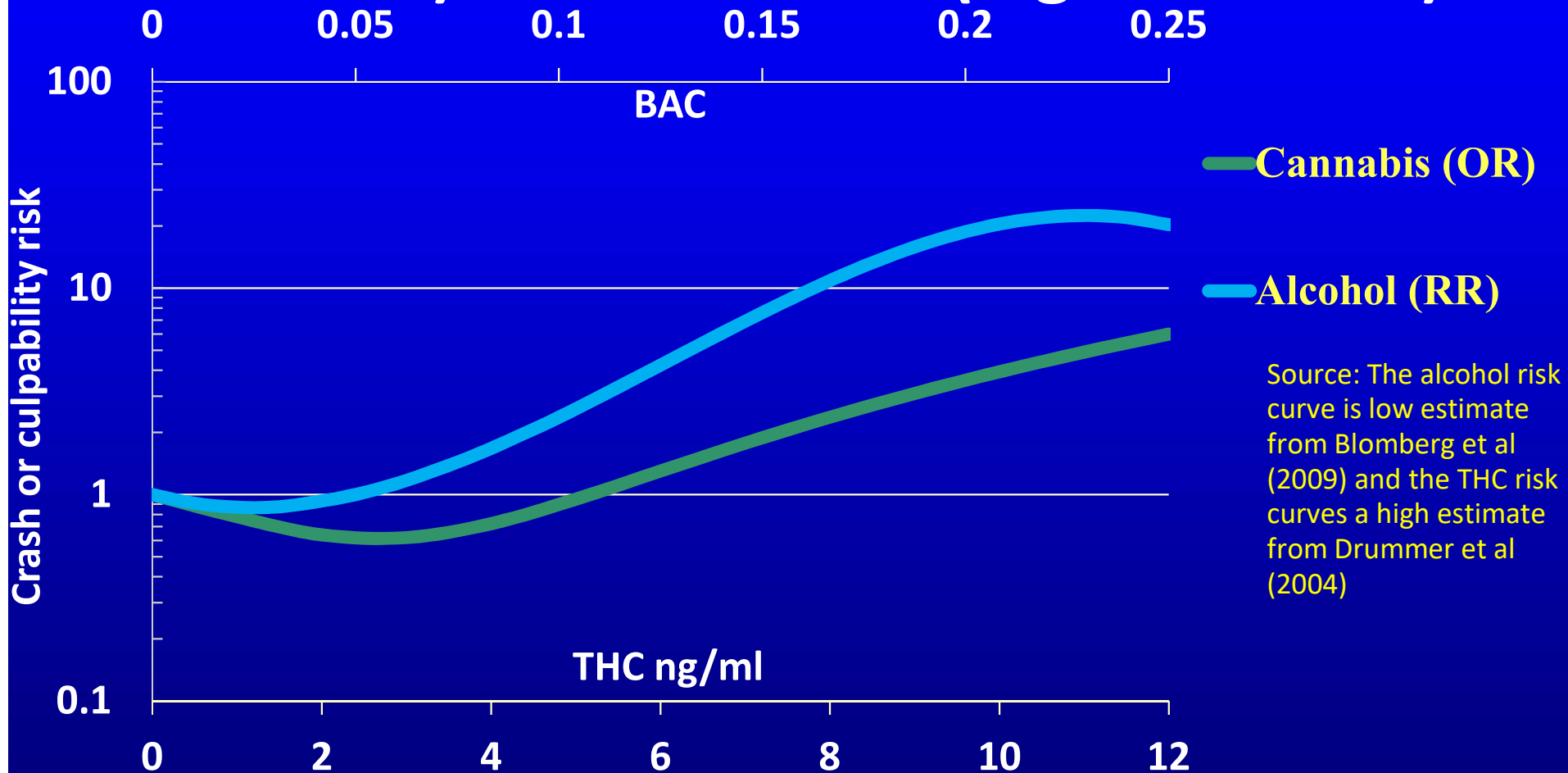
Experiments

How long do performance effects last?

Smoking or vaporizing	Ingestion
5-15 minutes – Peak effects	0-1 hour – modest effects
1 hours modest effects	2 hours - peak effects.
1-2 hours marginal effects	2- 4 hours – modest effects
3- 4 hours no effects	5-7 hours marginal effects
	8+ hours – no effects

Note: Subjective effects last longer than performance effects

Observational research shows Crash risk is much worse for alcohol (low estimate) than cannabis (high estimate)



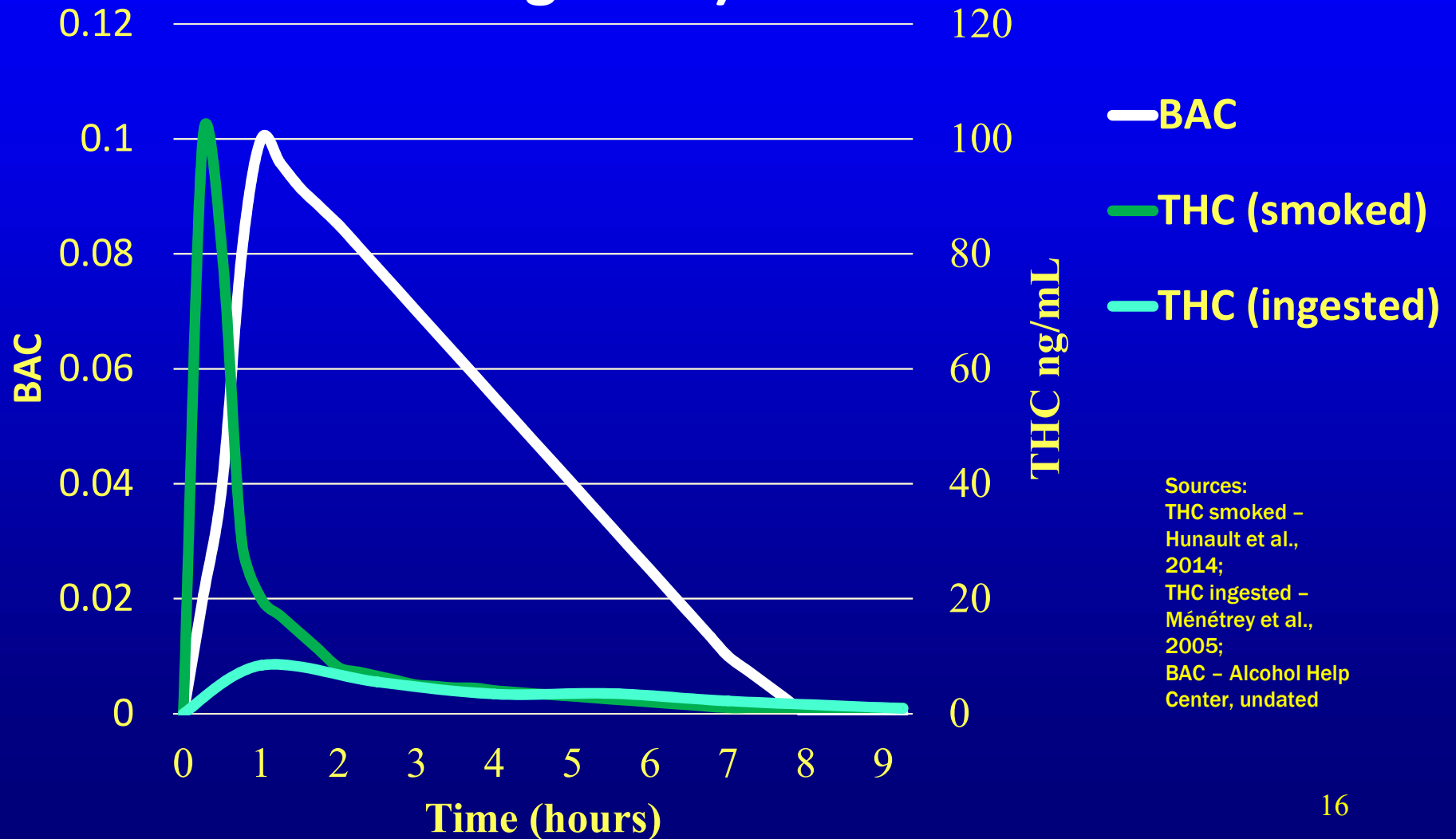
Source: The alcohol risk curve is low estimate from Blomberg et al (2009) and the THC risk curves a high estimate from Drummer et al (2004)

3. The pharmacokinetics of cannabis and alcohol?

THC is fat soluble, whereas alcohol is water soluble. This means

- THC has a long detection period in blood. It is stored in fat cells and released very slowly over time.**
- THC is eliminated from the body at a variable rate**
- The relationship between THC in the blood and effects of the drug are poor.**
- By contrast, alcohol is eliminated quickly at a constant rate and alcohol in the blood is a good measure of performance.**

Absorption and elimination of THC (smoked and ingested) and alcohol



Slide 16

SM1

Note that to be correct, drugs get “into the liver” by way of blood. | The difference is that this is “portal system” blood versus “systemic blood”.

The initial metabolism of drugs in the liver is sometimes referred to a “first pass effect” and explains why some medications have low “bioavailability” when taken orally (i.e. because they are broken down in the liver).

Don’t show THC going from urine to brain.

Both figures need captions.

Scott MacDonald, 2018-09-25

Blood tests for assessing cannabis impairment

- **Blood tests at a cut-off of 20 ng/ml are good at detecting smoked cannabis in the first hour after use – a period that could be considered impairment.**
- **Blood tests are poor at detecting impairment if it occurs after one hour.**
- **Blood tests are very poor at detecting impairment at any time point for ingested cannabis**

Scientific knowledge of harms of alcohol and cannabis

TYPE OF STUDY	ALCOHOL	CANNABIS
Validity studies	BACs over .08% alcohol have excellent validity against behavioural criteria	Validity of THC against behavioural criteria not established
Experimental research	BAC has excellent validity for performance deficits at any time point after drinking.	Blood has good validity within the first hour after smoking and is moderate to poor afterwards.
Observational studies	Strong dose-response rate demonstrated	Weak dose-response rate based on modeled data
Evaluation studies	Per se laws demonstrated effective	Per se laws for THC not shown to be effective.

4. Logistical issues

- **Administration of blood tests by police has challenges.**
- **THC drops rapidly and valid tests need to be conducted nearly instantly.**
- **Blood tests will likely miss those who ingested cannabis.**
- **Blood tests are invasive.**
- **Confirmatory results take days.**

Conclusions

- **The detection of impairment is more valid for alcohol than THC.**
- **Alcohol produces greater harms in terms of traffic crashes than cannabis.**
- **The proposed legislation for per se limits for cannabis is much more stringent than for alcohol.**
- **These differences in policy is likely related to greater relative societal acceptance of alcohol compared with cannabis.**

**Workplace
drug testing
in Canada**

History of Workplace drug testing policies

- In 1986, Regan's executive order mandated drug testing for Federal employees
- Drug testing became legal for virtually any employee in the U.S.
- Mandatory tests were required for Federal employees and then those safety sensitive transportation sector
- International carriers that travelled into the U.S. were required to have a drug and alcohol policy
- Pressure was put on Canada to adopt drug testing

Questions addressed

- 1. What are the characteristics of drug testing programs in Canada?**
- 2. What is the main purpose of workplace drug testing in Canada?**
- 3. What are the limitations of drug tests?**
- 4. How effective are drug testing programs?**

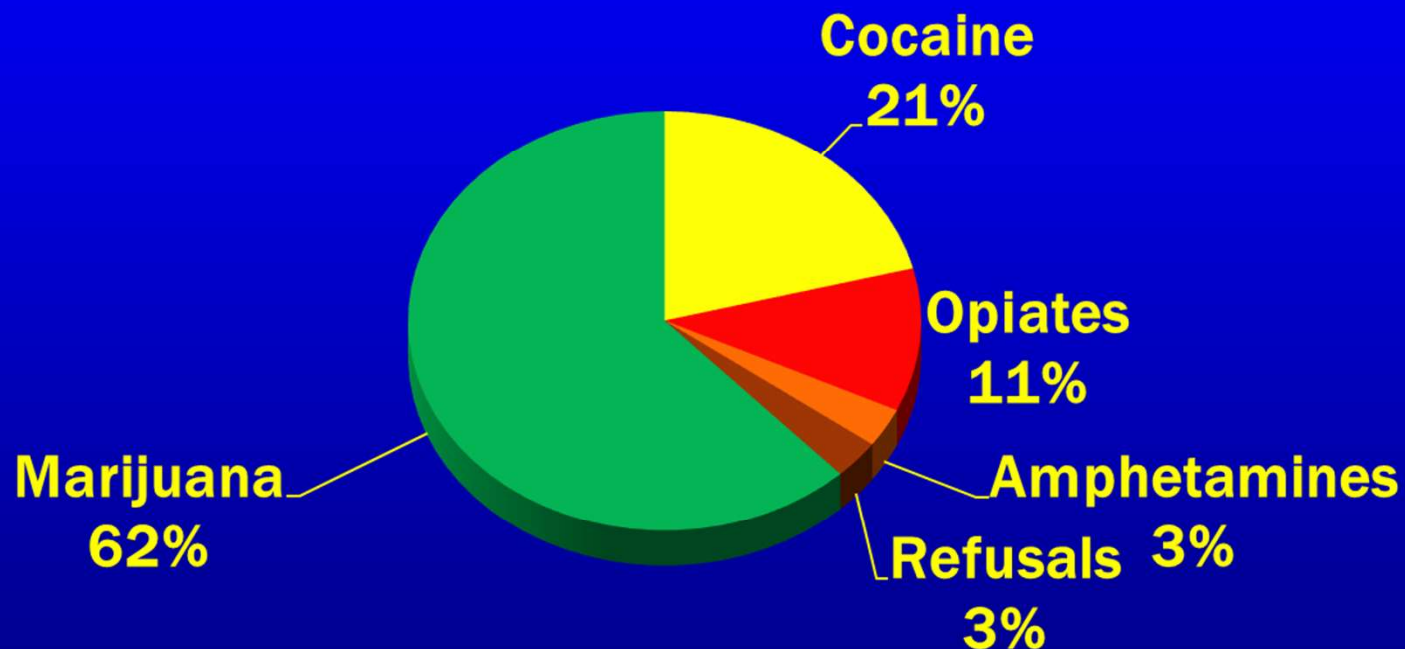
Detection periods vary for different drugs

Type of sample	Blood	Oral fluid	Urine	Hair
Detection Periods	Shortest Hrs Days	Hrs days	Days weeks	Longest Months



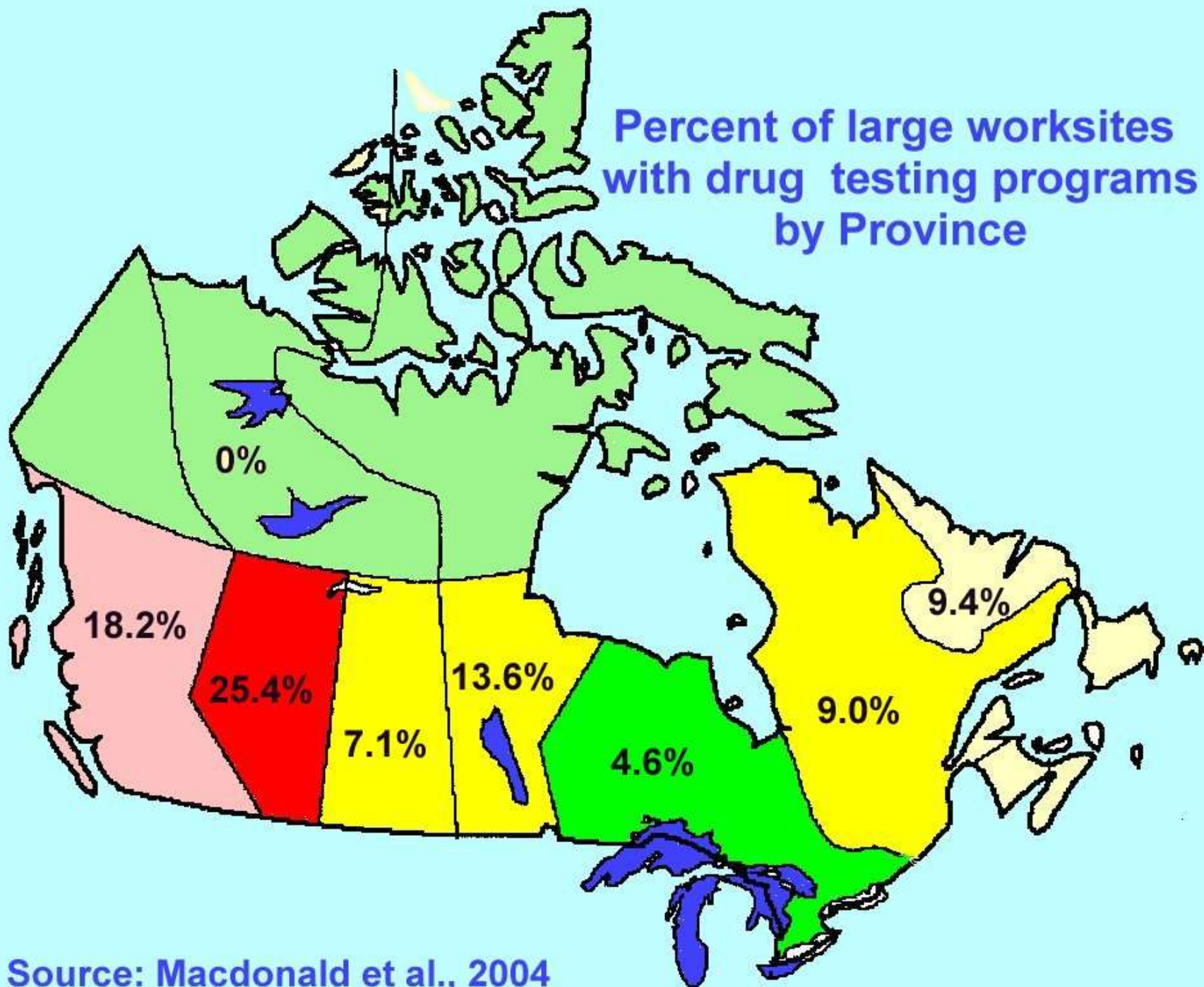
Canadian workplaces use mainly urine and oral fluid tests.

Drugs Detected by Urine Tests: Mainly cannabis



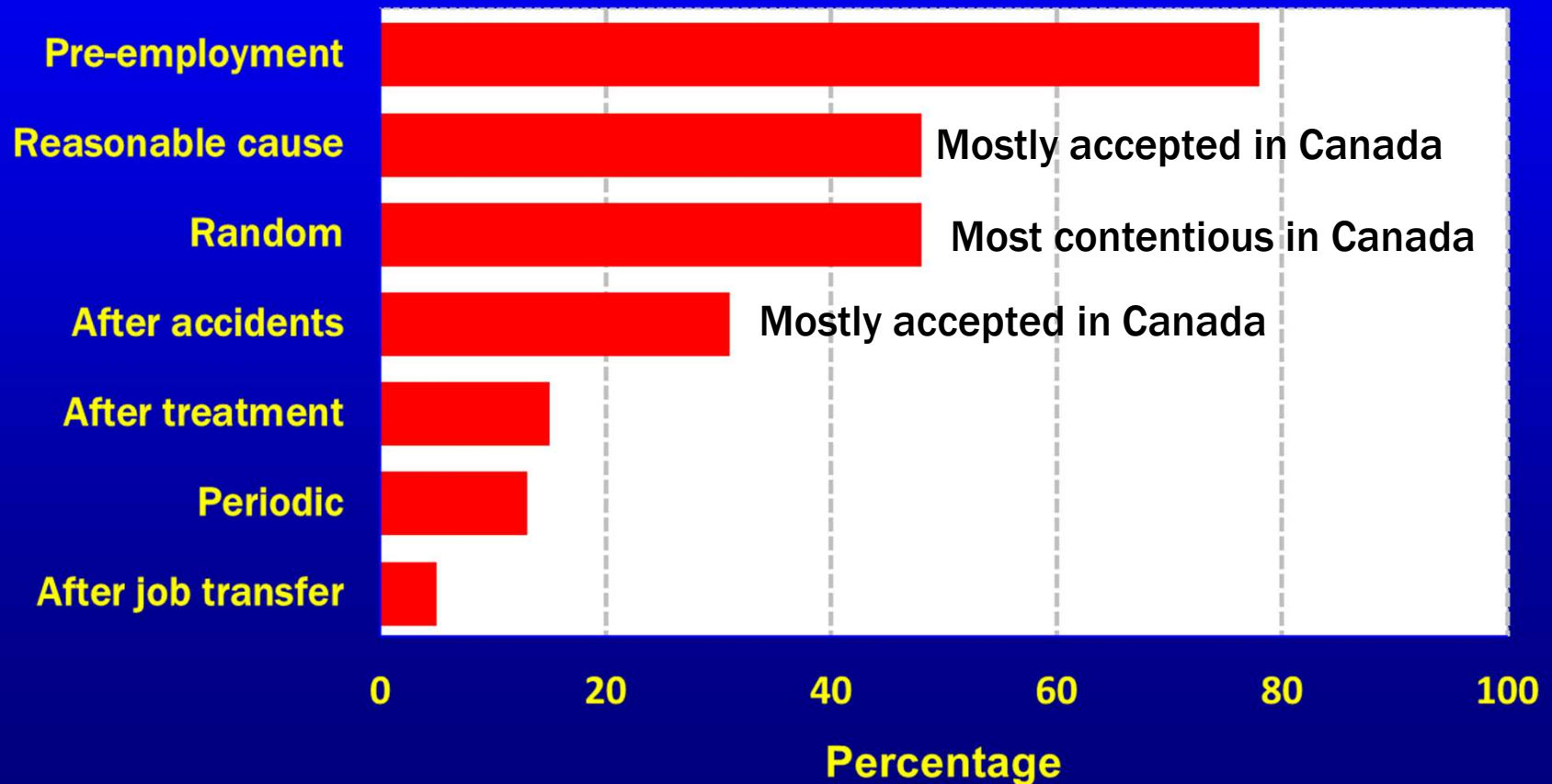
Based on non-regulated Canadian workers. From Butler and Associates Inc. (2012)

Percent of large worksites with drug testing programs by Province



Source: Macdonald et al., 2004

Types of Drug Testing Programs in Companies with Testing



Source: Macdonald et al., 2006

The Consequences to Employees Who Test Positive for Drug Use

Employees are usually:

(1) dismissed (fired), or

(2) offered assessment and treatment.

For pre-employment tests, those who test positive are not hired

**2. What is the main
purpose of
workplace drug
testing in Canada?**

Main Reason that Companies Implement Drug Testing Programs in Canada

- **Reduce industrial accidents**

In the United States, several other reasons have been stated:

- **Deter drug use**
- **Illegal to use drugs**
- **Reduce workplace problems (e.g., low productivity, absenteeism etc.)**

Bona fide occupational requirement

The more an employer can show a connection between drug test results and workplace performance, the more likely it will be supported in law.

Overall, those identified by drug tests must represent an increased safety risk ?

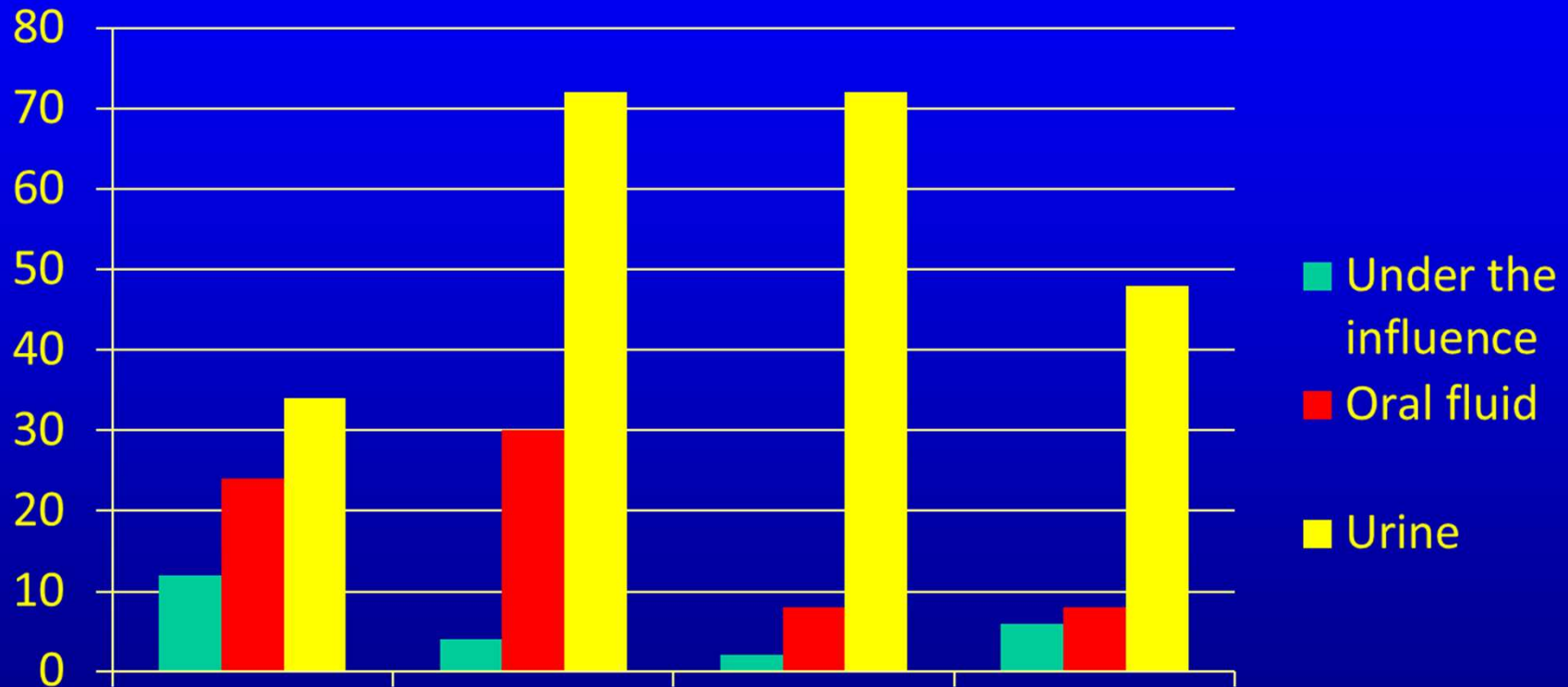
Canadian laws in relation to drug testing

- **Canadian Charter of Rights and Freedoms**
- **Provincial Legislations (Addiction is a disability that must be accommodated in some Provinces)**
- **Employment laws**
- **Collective bargaining allows for greater leeway in terms of workplace programs**

**3. What are the limitations
of drug tests?**

Poor relationship between drug test and the acute effects

Hours



Based on single use

Urine and oral fluid tests cannot detect when or how much of a drug was used

- No indication of impairment
- No indication of dependence
- No indication of:
 - frequency
 - amount used

Direct (acute) effects of drugs on performance vary considerably

TYPE OF DRUG	DEGREE OF IMPAIRMENT
Alcohol, barbiturates, hallucinogens	Most impairing
Benzodiazepines, cannabis	Less impairing
Narcotics, nicotine	Least impairing
Amphetamines, cocaine	Fatigue reducers

Note: These studies lack external validity because doses and patterns may not be reflective of experimental conditions (i.e addiction, poly substance use etc.)

Drug testing is justified by the Indirect effects: Comparison of alcohol and cannabis

Type of effect	Alcohol	Cannabis
Hangover	Yes	No
Withdrawal	Yes	Yes, similar to nicotine
Cognitive deficits	Yes, can be extreme	Possibly but not shown to affect work performance

Note: Occasional and lighter users would not experience any of these effects

Studies do not show drug testing improves safety

Those testing positive from urine or oral fluid tests are no more likely to be in crashes than those testing negative based on 7 high quality studies

**How effective are
drug testing
programs?**

How effective are drug testing programs?

- Evaluation studies have not shown drug testing improves safety
- The tests are not shown to be related to safety risk
- Drug testing is not evidence based in relation to principles of Canadian laws.
- Most legal challenges in Canada have been against drug testing.