ORAL FLUID
IMPACT IN DUID INVESTIGATIONS

AN AUSTRALIAN EXPERIENCE, 2004 –

MOVING FORWARD IN CALIFORNIA, 2018 –

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California Impaired Driving Task Force – September 27, 2018
Official Disclaimer

The opinions expressed here are the opinions of the speaker and do not reflect any view, position or opinion of the San Francisco Office of the Chief Medical Examiner.
Victoria, Australia
Victorian Institute of Forensic Medicine (VIFM)

- Population > 6.4 million (CA ~40 million)
- 6000 coroners cases
- Forensic Pathology/Autopsy
- Forensic Odontology, Anthropology etc…
- Histopathology
- Molecular Biology/DNA
- National Coroners information System
- Clinical Forensic Medicine
- Department of Forensic Medicine (Monash University)

- Forensic toxicology (total 20,000+ cases)
  - 4,500 PM comprehensive testing
  - 400 DFSA
  - 100+ Hair
  - Private Casework
  - 6,000 Injured Drivers, passengers or pedestrians (Blood collected from hospital)
  - **10,000 + Oral Fluid**

- Early acknowledgement - Prof. Olaf Drummer & Dr. Dimitri Gerostamoulos
Oral Fluid

- OF is a mixture of fluids excreted Parotid, Sublingual & Submandibular glands

- It is a plasma ultra-filtrate

- Drugs partitioned from blood to OF by extraction & diffusion

- OF offers some advantages over other types of specimens
  - readily accessible
  - less susceptible to adulteration or substitution by the donor
  - Drugs can be detected in oral fluids rapidly
# Oral Fluid Drug Concentrations & Pharmacokinetics studies

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose (mg)</th>
<th>Peak concentration (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methamphetamine</td>
<td>9-18 (SM IV)</td>
<td>Highest ≤1000, median ~ 250</td>
</tr>
<tr>
<td></td>
<td>10 &amp; 20 (PO ss)</td>
<td>100 &amp; 200</td>
</tr>
<tr>
<td>MDMA</td>
<td>100</td>
<td>3400</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>1200</td>
</tr>
<tr>
<td>Codeine</td>
<td>30 (PO)</td>
<td>3500</td>
</tr>
<tr>
<td></td>
<td>60 &amp; 120 (PO)</td>
<td>600 &amp; 1600</td>
</tr>
<tr>
<td></td>
<td>60 &amp; 120 (PO)</td>
<td>≤4000</td>
</tr>
<tr>
<td>THC</td>
<td>2-25 (SM), 20-25 (PO)</td>
<td>70 (SM), 4.0 (PO)</td>
</tr>
<tr>
<td></td>
<td>16 &amp; 34 (SM)</td>
<td>900 &amp; 4200</td>
</tr>
<tr>
<td></td>
<td>16 (SM)</td>
<td>150 - 390</td>
</tr>
<tr>
<td>Cocaine</td>
<td>~40 (IV, SM)</td>
<td>400-1900</td>
</tr>
<tr>
<td>Heroin</td>
<td>12 (IN)</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>2.6-20 (IV, SM)</td>
<td>&gt;3000</td>
</tr>
</tbody>
</table>

IN = intra-nasal, IV = intravenous, PO = oral, SM = smoking, ss = sustained release

Drummer, Forensic Science International : 2005;150:133-42
Window of Detection

• How long after consuming illicit drugs can they be detected?

• THC for several hours after use, depends on:
  • Strength and type of cannabis product
  • Individual pharmacokinetics
  • THC metabolites from previous use increase detection window
  • Prof. Huestis/NIDA

• Methamphetamine & MDMA may be detected for ~ 1 day or more, depends on:
  • Large doses, other drugs taken at the same time
  • Individual pharmacokinetics
  • May affect the duration of the effects of these drugs
Background (DUID Research)

- Research started in 1990s in detection of drugs in OF. Some larger studies:

- Roadside Testing Assessment (ROSITA) study – 1999-2000 (Alain Verstraete)
  - 8 European countries evaluated technologies to detect drugs at roadside

- Roadside Testing Assessment (ROSITA) study – 2003-2005/6 (Alain Verstraete)
  - 6 EU and 4 states in US (funded by NIDA & NHTSA)

- Driving under the Influence of Drugs, Alcohol & Meds (DRUID) study – 2006-2011
  - > 20 European countries
  - New insights to the real degree of drug impairment and their actual impact on road safety

- Need: toxicology in DUID; OF; cut-offs/per se; impairment/DRE; rehabilitation

- Australian studies
Background (DUID Research - Australia)

• The Parliamentary Road Safety Committee examined the issues of drugs other than alcohol in their enquiry in 1994-1996
  • 41 recommendations

• Other committees formed b/w DOJ, VIFM, VicRoads (DMV) & Victoria Police (CHP, DEA, SFPD, LAPD, etc. we have 1)
  • Led to enactment of legislation to detect impaired drivers – December 2000
  • For more effective deterrence Government enact random drug testing legislation – 2003
The Parliamentary Road Safety Committee examined the issues of drugs other than alcohol in their enquiry in 1994-1996. They made 41 recommendations. At the time, other committees formed between DOJ, VIFM, VicRoads (DMV) and Victoria Police such as CHP, DEA, SFPD, LAPD, etc. (we have 1). This led to the enactment of legislation to detect impaired drivers, which started in December 2000. For more effective deterrence, the government enacted random drug testing legislation in 2003.

The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes

Olaf H. Drummer a,*, Jim Gerostamoulos a, Helen Batziris a, Mark Chu a, John Caplehorn b, Michael D. Robertson c, Philip Swann d

a Department of Forensic Medicine, Victorian Institute of Forensic Medicine, Monash University, 37-83 Kavanagh Street, Southbank, Vic. 3006, Australia
b School of Public Health, University of Sydney, Sydney, Australia
c Formerly of Department of Forensic Medicine, Monash University, Melbourne, Australia
d Road Safety Section, VicRoads, Denmark St, Kaw 3101, Australia

Received 29 May 2002; received in revised form 28 October 2002; accepted 25 November 2002
Commissioned Research Studies OF/DUID (Australia)

- A number of studies to support the proposal & to validate road testing devices
  - Early 2000s

- Swinburne University volunteers studies
  - Several for methamphetamine and cannabis
  - Devices tested
  - Blood and oral fluid concentrations
  - Impaired and performance on driving simulator

- Field Studies by Police
  - To determine false positive rate

- VIFM evaluations
  - Cross-reactivity
  - False positive rate on control samples
  - Sensitivity and reproducibility
Outcomes

• Standard doses of cannabis & methamphetamine could be detected in OF
  • Using roadside & standard laboratory techniques

• Selected devices could detect drug for a period after dosing
  • Very low false positive rate
  • Sensitivity was conservative

• Two devices chosen based on police operational requirements & performance
  • DrugWipe II
  • Rapiscan using Cozart collector (3 fold dilution in buffer)

• Laboratory Confirmation required
  • GC/MS & LC-MS/MS
Drug Bus – started in Dec 2004 in Vic

- Meth, MDMA & THC
  - *Road Safety Act 2003*
    - Amended the *Road Safety Act 1986*

- Rationale, drugs selected because:
  - Impairing substances with the highest incidence in the blood of drivers
  - Clear evidence that drivers using these drugs are at increased risk of causing crashes
  - Not found in any prescription medicine (in Aus!)
  - Reliably detected in OF of drivers at the time of adversely affecting to drive safely

1. Drivers stopped at road-block **randomly**
   - Breath alcohol test (if positive no drug test conducted)

2. If BrAC negative, drug test conducted
   - DrugWipe II test – swipe of top of tongue
   - ~ 5 min incubation time

3. If OF drug negative, driver can proceed;
   - if positive driver is escorted to “drug bus”
   - Cozart Rapiscan OF tests for drugs again
   - ~ 10-15 min incubation time

4. If OF drug negative, driver can proceed;
   - if positive, 1 month suspended license

5. OF analyzed & confirmed by LC-MS/MS in lab
   - If confirmed positive, driver will be prosecuted
Victoria Police Testing Protocol – Observed impairment

1. Drivers stopped once **impairment is observed**
   - Breath alcohol test (if positive no drug test conducted)

2. Can test both Breath alcohol and/or drug testing
   - Alcohol – BrAC (if positive, driver will be prosecuted)
   - Drug – Blood to lab

1. **Blood analyzed for (any) drugs by LC-MS/MS in lab**
   - if positive, driver will be prosecuted
Double Bus - TAC Drug Driving Campaign

https://www.youtube.com/watch?v=3TT_G1rc2pA
False positive rate

• Drug wipe
  • Very few in early pre-trial tests
  • None in 220 measurements using drug-free oral fluid

• Cozart Rapiscan
  • Very few in early pre-trial tests
  • One in 400 measurements
  • FP was negative on re-test.

• Cut-offs were high to avoid false positives

• Of course improved since 15 years ago…
2004 to 2005 - Device Performances

- 750 cases submitted to laboratory for analyses
- 38 cases with inconsistent readings
  - 0.01% of screened drivers
  - Cases dropped at roadside
- 9 cases both devices positive & drugs not confirmed
  - 8 to MA, 1 to THC
  - 99% cases confirmed positive
- 12 % (n=86) of cases req collection of blood
  - no OF
  - 83 confirmed positive to drugs (98%)
  - 2 cases not confirmed positive (2%)
2004 to 2005 - Summary

- Victorian random drug testing program for 3 drugs
  - Unique approach in using 2 screening devices in series
  - Over 30,000 screened drivers

- Over 700 confirmed positive cases
  - Mainly younger male drivers
  - MDMA often associated with MA (75%)

- Prevalence of drugs 2.4%
  - MA 2.0%, MDMA 1.1%, THC 0.7%

- Program expanded to NSW, South Australia & Tasmania
  - (all states followed in subsequent years)
DRUGS IN ORAL FLUID AS4760

Standards Australia
AS 4760:2006

Australian Standard®

Procedures for specimen collection and the detection and quantitation of drugs in oral fluid

First published as AS 4760—2006.
Applications of Oral Fluid testing

• All Australian states screen OF at roadside for methamphet, MDMA & THC
  • Over 100,000 tests per year
  • Positive rate 2-4% drugs and 1% alcohol

• However, not just in DUID…

• Also in other industries
  • Australia saw a huge increase in the use of OF for drug detection for illicit drugs
  • In workplaces (e.g. aviation, mining, petrochemical and trucking industries)
  • Unions prefer OF to urine testing
  • Focus on safety rather than private time drug use
Need for Oral Fluid Standard

• The increasing awareness and use of oral fluid for drug detection led to the initiation of a committee to produce an Australian Standard in 2005
  • “procedures for the collection, detection and quantitation of drugs in oral fluid”

• Recognition that OF drug testing would not replace urine testing (AS4308), rather
  • Enable detection of drugs used more recently
  • Better to show impairment at a workplace or driving a motorized vehicle

• AS 4760:2006
LAB CONFIRMATION ANALYSIS
Victoria / VIFM
Oral Fluid Collection (Victoria)

• Dec 2004 – Begin OF testing
  • Methamphetamine/THC/MDMA
  • ~3,000 roadside screens / 200 lab confirmations
    • 2 x GC-MS methods

• 2007
  • ~26,000 roadside screens / 400 lab confirmations
    • 1 x LC-MS/MS method
2007 Beyer et al.

- 32 basic & neutral drugs
- 20 minutes
We were happy…

2007 Beyer et al.
- 32 basic & neutral drugs
- 20 minutes

The incidence of drugs of impairment in oral fluid from random roadside testing

Mark Chu a,*, Dimitri Gerostamoulos a,b, Jochen Beyer a,b, Luke Rodda a,b, Martin Boorman c, Olaf H. Drummer a,b

a Victorian Institute of Forensic Medicine, Monash University, Australia
b Department of Forensic Medicine, Monash University, Australia
c Road Policing Traffic Drug and Alcohol Section, Victoria Police, Australia
However - More and More…

- 20% increase each year
- 2014 ~4,000 confirmations
- MAX ~80 confirmations/week with LC-MS/MS
Police to double roadside drug testing in Victoria as state road toll increases

Updated 1 Jan 2015, 3:26pm

Roadside drug testing will more than double in Victoria in 2015 as the state road toll rises for the first time in eight years, police say.
2015...

60% increase
~7,000 samples
~135 samples/week
New method required

- Robust
- Fast
- Efficient
UHPLC

5 minutes
40 drugs
Different classes
Column Technology Advancements

New
50mm / 2.6μm

Old
150mm / 5μm
MS speed

- Aim $\geq 12$ data points above half peak height
<table>
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<tr>
<th>Scope</th>
<th>EDDP</th>
<th>Morphine</th>
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<td>Nitrazepam</td>
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<td>MDA</td>
<td>Oxazepam</td>
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<td>MDMA</td>
<td>Phentermine</td>
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<tr>
<td>Clonazepam</td>
<td>C¹³-MDMA</td>
<td>Pseudoephedrine</td>
</tr>
<tr>
<td>Cocaethylene</td>
<td>MDPV</td>
<td>Pyrovalerone</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Zolpidem</td>
</tr>
</tbody>
</table>
Methamphetamine

Transition
150→119 m/z
Methamphetamine

C\textsuperscript{13}-Methamphetamine

Transition 150→119 m/z

Transition 151→120 m/z
Validation Parameters (Peters et al. ABC 2007)

- **Selectivity**
  - 20 OFs, ~300+ drugs from other methods (+ synthetic oral fluid)

- **Matrix Effects/Ion Suppression & Enhancement**

- **Processed Sample Stability**
  - 24 hours and 7 days

- **Linearity**

- **Carryover**

- **Freeze/Thaw Stability**
  - 8 cycles

- **Accuracy and Precision**
  - 8 consecutive assays

- **Long Term Stability**
  - 12 weeks at -60°C, -20°C, +4°C, RT
## Method results (4497 cases - 9 month period in 2015)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methamphetamine</td>
<td>3304</td>
<td>73.5%</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>3195</td>
<td>71.0%</td>
</tr>
<tr>
<td>Tetrahydrocannabinol</td>
<td>2422</td>
<td>53.9%</td>
</tr>
<tr>
<td>Pseudoephedrine</td>
<td>1185</td>
<td>26.4%</td>
</tr>
<tr>
<td>MDMA</td>
<td>462</td>
<td>10.3%</td>
</tr>
<tr>
<td>MDA</td>
<td>371</td>
<td>8.2%</td>
</tr>
<tr>
<td>Codeine</td>
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<td>7.7%</td>
</tr>
<tr>
<td>Morphine</td>
<td>263</td>
<td>5.8%</td>
</tr>
<tr>
<td>Nordiazepam</td>
<td>260</td>
<td>5.8%</td>
</tr>
<tr>
<td>Cocaine</td>
<td>219</td>
<td>4.9%</td>
</tr>
<tr>
<td>Diazepam</td>
<td>203</td>
<td>4.5%</td>
</tr>
<tr>
<td>6-monoacetylmorphine</td>
<td>192</td>
<td>4.3%</td>
</tr>
<tr>
<td>Methadone</td>
<td>154</td>
<td>3.4%</td>
</tr>
<tr>
<td>Benzoylecgonine</td>
<td>150</td>
<td>3.3%</td>
</tr>
<tr>
<td>EDDP</td>
<td>125</td>
<td>2.8%</td>
</tr>
<tr>
<td>Tramadol</td>
<td>118</td>
<td>2.6%</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>92</td>
<td>2.0%</td>
</tr>
<tr>
<td>Ecgonine methyl ester</td>
<td>90</td>
<td>2.0%</td>
</tr>
<tr>
<td>Buprenorphine</td>
<td>71</td>
<td>1.6%</td>
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<td>THC-COOH</td>
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<tr>
<td>Lorazepam</td>
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<tr>
<td>Zolpidem</td>
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<td>0.02%</td>
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</tr>
<tr>
<td>Pyrovalerone</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>MDPV</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Flunitrazepam</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>7-aminoflunitrazepam</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
Method results (4497 cases - 9 month period in 2015)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
</table>
| Methamphetamine      | 3304   | 73.5%
| Amphetamine           | 3195   | 71.0%
| Tetrahydrocannabinol  | 2422   | 53.9%
| Pseudoephedrine       | 1185   | 26.4%
| MDMA                  | 462    | 10.3%
| MDA                   | 371    | 8.2%
| Codeine               | 347    | 7.7%
| Morphine              | 263    | 5.8%
| Nordiazepam           | 260    | 5.8%
| Cocaine               | 219    | 4.9%
| 6-monoacetylmorphine  | 192    | 4.3%
| Methadone             | 154    | 3.4%
| Benzoylcegonine       | 150    | 3.3%
| EDDP                  | 125    | 2.8%
| Tramadol              | 118    | 2.6%
| Oxycodone             | 92     | 2.0%
| Ecgonine methyl ester | 90     | 2.0%
| Buprenorphine         | 71     | 1.6%
| Ketamine              | 68     | 1.5%

<table>
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| Oxazepam              | 63     | 1.4%
| Alprazolam            | 59     | 1.3%
| Norbuprenorphine      | 43     | 1.0%
| THC-COOH              | 38     | 0.8%
| Hydromorphone         | 21     | 0.5%
| Temazepam             | 21     | 0.5%
| Cocaethylene          | 13     | 0.3%
| Phentermine           | 12     | 0.3%
| Fentanyl              | 10     | 0.2%
| Clonazepam            | 10     | 0.2%
| 7-aminoctizapam       | 9      | 0.2%
| Nitrazepam            | 6      | 0.1%
| Mephedrone            | 6      | 0.1%
| 7-aminoctizapam       | 4      | 0.1%
| Lorazepam             | 2      | 0.04%
| Zolpidem              | 1      | 0.02%
| Pyrovalerone          | 0      | 0%
| MDPV                  | 0      | 0%
| Flunitrazepam         | 0      | 0%
| 7-aminoctizapam       | 0      | 0%
Ultra-rapid targeted analysis of 40 drugs of abuse in oral fluid by LC-MS/MS using carbon-13 isotopes of methamphetamine and MDMA to reduce detector saturation

Matthews Ti Raggi 1,2, Mark Chu 1, Luke N Rodda 1,2, Elizabeth Jenkins 1, Alex Kotos 1, Dimitri Gerostamoulos 1,2

Received: 26 November 2015 / Revised: 14 February 2016 / Accepted: 1 March 2016
Improvements
## Improvements

<table>
<thead>
<tr>
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<th>New</th>
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<tbody>
<tr>
<td>Time:</td>
<td>10 injections/hour</td>
<td>2.5 injections/hour</td>
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## Improvements

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<tr>
<td><strong>Eluent:</strong></td>
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<td>2500mL</td>
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<tr>
<td>Instrument:</td>
<td>7 hours</td>
<td>2 days</td>
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<tr>
<td>Instrument:</td>
<td>7 hours</td>
<td>2 days</td>
</tr>
<tr>
<td>Efficiency:</td>
<td>~80% savings</td>
<td>$80,000/year</td>
</tr>
</tbody>
</table>
More and More… & More!

Confirmations per year

- 2012 = ~2,000 confirmations
- 2014 = ~4,000 confirmations
- 2017 = >10,000 confirmations
Double Bus - TAC Drug Driving Campaign

https://www.youtube.com/watch?v=VcAsqk6McKI
AND - other MVA (VIFM)

- Injured Drivers, Passengers, Pedestrians, Cyclists etc.
  - In 2010 started performing full toxicology on injured drivers.
  - If hospitalized, blood mandatory collected
  - 6,000 cases per year

- Deceased Drivers, Passengers, Pedestrians, Cyclists etc.
  - Postmortem toxicology on Coroners cases
  - 200 cases per year

- Provide comprehensive testing for all MVA in the state
  - Show prevalence of drugs in driving studies
  - Demonstrate cost-effective measures
    - i.e. decrease in hospital admission and deaths
ROAD FATALITIES

Why target DUI/ID
Victorian Road Deaths & Road Safety Initiatives

- 1976: Random breath testing introduced.
- 1985: Small number of mobile speed cameras introduced on a trial basis.
- 2001/02: New default urban speed limit lowered to 50km/h and new 40km/h limit introduced for school and strip shopping zones. 50% increase in mobile camera hours and speeding tolerance reduction.
- 2000: First fixed digital safety cameras began operation on CityLink.
- 1989/90: Covert operation of mobile cameras commenced. Thirteen RBT booze buses and penalties introduced for BAC exceeding 0.05.
- 2006: Random drug testing and vehicle impoundments introduced.
Road Deaths – Country Comparison 1960-2008

Road Fatalities per 100,000 population

- Australia
- Canada
- Germany
- Japan
- New Zealand
- Sweden
- United Kingdom
- U.S.A.
Road Deaths – Country Comparison 2013

Road traffic deaths in the US and other high-income countries.

Motor vehicle crash deaths in 10 comparison high-income countries, 2013

- United States: 10.3
- New Zealand: 5.6
- Canada: 5.4
- France: 5.1
- Japan: 4.5
- Germany: 4.0
- Spain: 3.6
- Switzerland: 3.3
- United Kingdom: 2.8
- Sweden: 2.7

Countries with the highest and lowest reductions in crash deaths, 2000-2013

- Spain (highest): 75%
- Average of 19 high-income countries: 56%
- United States (lowest): 31%

Deaths per 100,000 people

CALIFORNIA

Future?
Why?

• Shorten times for blood collections?

• Lead to finding more drugs on board?

• Random roadside testing?
  • Or at least easier warrant for biological sample

• Decrease overall DUID impact on roads
  • Decrease MVA associated costs
  • Decrease injury
  • Decrease deaths
How testing regime may look in California?

- Dual Roadside Tests
- Lab Confirm Test
- Dual Roadside Tests
- Lab Screen & Confirm Tests
How testing regime may look in California?

- Dual Roadside Tests → Lab Confirm Test
- Dual Roadside Tests → Lab Screen & Confirm Tests
- Single Roadside Test → Lab Confirm Test
- Single Roadside Test → Lab Screen & Confirm Tests
How testing regime may look in California?

Balance of risk

With no immediate suspension of license, the low likelihood of initial false positive might be okay for Single Roadside Test.
Oral Fluid Roadside Device Options (not exhaustive)

Cutoff values (ng/mL) for selected devices & for typical laboratory

<table>
<thead>
<tr>
<th>Device &amp; Laboratory</th>
<th>THC</th>
<th>COCAINE</th>
<th>AMPHET</th>
<th>MAMP</th>
<th>OPIOIDS</th>
<th>BENZO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alere DDS 2</td>
<td>25</td>
<td>35*</td>
<td>50</td>
<td>35</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Dräger DrugTest 5000</td>
<td>3</td>
<td>20</td>
<td>30</td>
<td>35</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Securetec Drugwipe 6S</td>
<td>10</td>
<td>10</td>
<td>60</td>
<td>60</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Laboratory</td>
<td>0.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2</td>
<td>1.5</td>
</tr>
</tbody>
</table>

*Note: The values marked with an asterisk (*) indicate a detection limit rather than a cutoff value.

Oral Fluid testing in CA

- Collaborate between CA & decide (i.e. Impaired Driving Task Force)
  - Share knowledge
  - Develop and agree on a CA Oral Fluid DUID model and possibly standard
    - Start small and target certain drugs?

- Pilot programs
  - Show prevalence/problem (what are we missing? Prop 64/THC?!)  
  - Show procedures (DRE, dual roadside, lab confirm?)  
  - Deterrent or prosecution?  
  - Show cost effective – reduction in MVA mortality & morbidity  
  - Publish studies!

- Involvement between stakeholders
  - Laboratories  
  - Law Enforcement Agencies  
  - District Attorneys, Defenders & Courts  
  - Political support  
  - Society

- It is not about ‘if’ OF testing works, it is how it will work in each jurisdiction
Driving is a Privilege, Not a Right
Acknowledgements & RoundTable Discussion

San Francisco Office of the Chief Medical Examiner

Victorian Institute of Forensic Medicine (Matthew Di Rago)