Oral Fluid Testing for DUID

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Impaired Driving

• Under-reported statistics
  ▪ Laboratory cancellation policies when BAC = threshold
  ▪ Need more training for law enforcement (DRE, ARIDE)

• Need for more information related to traffic incidents
  ▪ Crashes

• Improved scope of testing in laboratories

• LE education for DUID stops

• Rehabilitation of drivers using illegal drugs

• Education of drivers using prescription drugs
  ▪ Over dosing
  ▪ Diversion
Why Use Oral Fluid?

• Drugs accumulate in saliva by diffusion from the blood
  ▪ Drug dependent, not all accumulate the same
• Easy, rapid collection
• Can be taken proximate to traffic event
• Non-invasive and observed
• Identification of active compound may provide information on recent drug use
• 2007, 2013 large scale NHTSA roadside studies included oral fluid and blood collection
Society of Forensic Toxicologists (SOFT)

- SOFT/AAFS Drugs and Driving Committee
  - Laboratory recommendations workshop, SOFT 2014
  - Oral Fluid subcommittee
    - Oral fluid project guidelines
  - Scientific sessions – DRE related presentations
Oral Fluid Testing

• Becoming more prevalent
  • Consult with stakeholders
  • SOFT/AAFS Drugs and Driving Committee

• Be aware of pros and cons
  • THC
  • Draeger and Alere instruments
VARIOUS PROJECTS ACROSS US

2007: National Roadside Survey
    Blood & oral fluid
2010, 2012: California Roadside Survey (Oral fluid)
2013, 2014: National Roadside Survey (Blood & oral fluid)
2013: Tulsa PD Project
2014: Canadian Roadside Survey, Ontario; (Oral fluid)
2014: Washington State Initiative (Blood & oral fluid)
2016: Wisconsin – Dane Co Pilot Project
US Projects

Several different project plans

All have same goal

- Test validity/accuracy of the roadside devices
- Ease of use of the devices
- Compare oral fluid results from a device to a laboratory test
  - Some confirm with oral fluid, others with whole blood

Outcomes promising

- Categories detected by roadside devices encompass majority of drugs in drivers
WI Dane Co Project

- Identified the need for DUID project
  - Strong DRE program
  - Under-reporting DUID cases
    - Laboratories do not perform drug testing if BAC > 0.10
  - Bureau of Transportation Safety (BOTs) took interest and was willing to fund project
  - Education of LE and stakeholders began in 2015

- Traffic Safety Commission support
WI Dane Co Project

Project plan

- Set up a small group to plan the project
  - Lead LE
  - Toxicology lab
  - Highway Safety
  - TSRP

- Requested demonstrations from two vendors

- Decision to use the Alere DDS2 device
  - Portability
Project plan

- Use the Alere DDS2 device
  - Portability
- Gather 100 samples beginning in March and running through May
  - All subjects must volunteer or no sample is taken
  - Individuals stopped for suspicion of OWI, oral fluid test occurs *post arrest and post blood collection*
- DDS2 devices stationed at hospitals
- Oral fluid results and blood paired and then de-identified by the WSLH
- Collected oral fluid samples even when alcohol considered impairing substance
- WSLH performs testing on all samples collected during project
WI Dane Co Project

25 local LE in Dane Co plus State Patrol in Dane Co
  - Project presented to Chief’s Association to ensure cooperation

48 of the officers involved in the project were ARIDE trained

Training on the DDS2 occurred during the ARIDE training
  - 150 additional officers trained on the DDS2 at the agencies during shift briefings
Successfully collected over 100 samples

- Some samples excluded due to age (<18 yo)
- Invalid oral fluid results not included

WSLH contribution to the project

- Test the blood samples through routine OWI testing process
- De-identify blood samples in which drug testing was cancelled due to BAC and pursued drug testing
- **Once all OF project samples complete, go back and test all OWI blood samples in Dane Co in which drug testing was cancelled due to BAC policy.**
Number of Arrests

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Number of Arrests</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0600-0959</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000-1359</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>1400-1759</td>
<td></td>
<td>24</td>
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<td>1800-2159</td>
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<td>18</td>
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<td>2200-0159</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>0200-0559</td>
<td></td>
<td>27</td>
</tr>
</tbody>
</table>

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Positive Results in Oral Fluid

- THC: 46
- COC: 14
- OP: 6
- BZ: 7
- MAMP: 5
- AMP: 1

Lori Edwards, Ted Savage – WSLH 2017
Drug Categories Detected in Oral Fluid

Number of Observations vs Time of Day

- THC
- COC
- OP
- BZ
- MAMP
- AMP

Lori Edwards, Ted Savage – WSLH 2017
Positive Drug Screening Results: Oral Fluid vs. Blood

Lori Edwards, Ted Savage – WSLH 2017
Positive Oral Fluid vs. BAC

Number of observations

Concentration of alcohol (g/100 mL)

Lori Edwards, Ted Savage – WSLH 2017
## OF Compared to Blood

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Predictive Value</th>
<th>Negative Predictive Value</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>THC</td>
<td>88%</td>
<td>87%</td>
<td>83%</td>
<td>91%</td>
<td>88%</td>
</tr>
<tr>
<td>Cocaine</td>
<td>100%</td>
<td>99%</td>
<td>86%</td>
<td>100%</td>
<td>99%</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>100%</td>
<td>88%</td>
<td>14%</td>
<td>100%</td>
<td>88%</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>N/A</td>
<td>99%</td>
<td>0%</td>
<td>100%</td>
<td>99%</td>
</tr>
<tr>
<td>Opiates</td>
<td>83%</td>
<td>99%</td>
<td>83%</td>
<td>99%</td>
<td>98%</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>45%</td>
<td>99%</td>
<td>83%</td>
<td>94%</td>
<td>93%</td>
</tr>
<tr>
<td>All Drug Categories</td>
<td>82%</td>
<td>96%</td>
<td>70%</td>
<td>98%</td>
<td>94%</td>
</tr>
</tbody>
</table>

Lori Edwards, Ted Savage – WSLH 2017
Drugged Driving in Wisconsin: Oral Fluid Versus Blood
Lorraine D. Edwards
Katherine L. Smith
Theodore Savage
Published:
14 July 2017

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MARIJUANA AND ORAL FLUID
Frequently Asked Question...

What concentration of THC in oral fluid is equivalent to THC in blood?

<table>
<thead>
<tr>
<th>Substance</th>
<th>Cut-off in blood (ng/mL)</th>
<th>Cut-off in OF (ng/mL) 95%CI</th>
<th>Correlation $R^2$</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alprazolam</td>
<td>10</td>
<td>2.8 (1.8 – 4.2)</td>
<td>0.998</td>
<td>106</td>
</tr>
<tr>
<td>AMP</td>
<td>20</td>
<td>290 (84 – 680)</td>
<td>0.993</td>
<td>86</td>
</tr>
<tr>
<td>Clonazepam</td>
<td>10</td>
<td>1.2 (0.2 – 2)</td>
<td>0.962</td>
<td>57</td>
</tr>
<tr>
<td>Cocaine</td>
<td>10</td>
<td>190 (26 – 350)</td>
<td>0.932</td>
<td>112</td>
</tr>
<tr>
<td>Codeine</td>
<td>10</td>
<td>83 (50 – 130)</td>
<td>0.999</td>
<td>92</td>
</tr>
<tr>
<td>Diazepam</td>
<td>50</td>
<td>1.1 (0.3 – 3.6)</td>
<td>0.930</td>
<td>94</td>
</tr>
<tr>
<td>METH</td>
<td>20</td>
<td>630 (120 – 1800)</td>
<td>0.993</td>
<td>55</td>
</tr>
<tr>
<td>Morphine</td>
<td>10</td>
<td>100 (37 – 180)</td>
<td>0.902</td>
<td>76</td>
</tr>
<tr>
<td>Nordiazepam</td>
<td>50</td>
<td>2.2 (1.2 – 4.5)</td>
<td>0.997</td>
<td>130</td>
</tr>
<tr>
<td>Oxazepam</td>
<td>50</td>
<td>12 (4.4 – 34)</td>
<td>0.962</td>
<td>55</td>
</tr>
<tr>
<td><strong>THC</strong></td>
<td>1</td>
<td>44 (27 – 90)</td>
<td><strong>0.991</strong></td>
<td>182</td>
</tr>
<tr>
<td>Tramadol</td>
<td>50</td>
<td>490 (85 – 1500)</td>
<td>0.966</td>
<td>51</td>
</tr>
</tbody>
</table>
1. Gjerde et al. Figure 1. THC (from paper)

2. Bogstrand & Gjerde – added graph (from data in paper)

<table>
<thead>
<tr>
<th>Blood (ng/mL)</th>
<th>Oral fluid (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.21</td>
<td>5</td>
</tr>
<tr>
<td>0.67</td>
<td>25</td>
</tr>
<tr>
<td>1</td>
<td>44</td>
</tr>
<tr>
<td>5</td>
<td>419</td>
</tr>
</tbody>
</table>

\[ y = 44.1x^{1.4} \]

\[ y = 27.2x^{1.39} \]
Contact Information

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