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Forensic Toxicology: the use of toxicology, analytical chemistry, pharmacology and clinical chemistry to aid medical and legal investigation of death, poisoning, and drug use.
Found It!!!

Congratulations, it only took you 65298 seconds
How does the OCCL process a DUID case?

• All blood cases with driving violations are tested for ethanol and other volatiles.
• All blood cases are NOW (8/1/17) screened for drugs.
• All positive screens are confirmed.
• All drug requests are conducted if reasonable and sufficient sample volume is provided.
• All DRE samples are comprehensively tested including all requests regardless of charge.
• All felonies and 23152 (e) and (f) cases are tested for drugs.
FORENSIC VOLATILES

Ethanol
Isopropyl Alcohol (Rubbing Alcohol)
Methanol
Acetone
Anesthetic Gases
Difluoroethane ("Dust Off")
Toluene (Paint Thinner)
The Initial Drug Screen

- Benzodiazepines
- Cocaine and Metabolites
- Methamphetamine and Related Compounds
- Opiates
- Cannabinoids
- Oxycodone/Oxymorphone
- Zolpidem (Ambien)
Benzodiazepines and Z Drugs

Chlordiazepoxide - Librium
Oxazepam - Serax
Nordiazepam
Diazepam - Valium
Midazolam - Versed
Estazolam - Prosom
Zopiclone - Lunesta
Zolpidem - Ambien
Clonazepam - Klonipin
Temazepam - Restoril
Lorazepam - Ativan
Alprazolam - Xanax
Clobazam - Onfi
Flunitrazepam - Rohypnol
Phenazepam
Flurazepam - Dalmane
Etizolam
Triazolam - Halcion
Zaleplon - Sonata
Nitrazepam
Demoxepam

Graph showing the usage of various benzodiazepines and Z drugs from 2010 to 2016 with different bars for each year and drug.
Methamphetamine and Related

- Methamphetamine
- Amphetamine
- MDMA (Ecstasy)
- MDA
- Ephedrine
- Pseudoephedrine
- Methylphenidate
- Phentermine

FIG. 1—Hysteresis plot showing effects of methamphetamine that impact driving performance with respect to blood methamphetamine concentration (mg/L). The figure shows examples of withdrawal effects from (a) low dose and (b) high dose drug use.
# Pain Management & Other Abused Drugs (PAAD)

| 6-MAM (Heroin metabolite)       | Hydromorphone – Diladid   |
| Acetaminophen – Tylenol         | Ketamine                  |
| Acetylfentanyl                  | Meperidine – Demerol     |
| Amitriptyline – Elavil         | Meprobamate               |
| Baclofen - Leoresal             | Metaxalone – Skelaxin    |
| Benzoylcegonine – Cocaine metabolite | Methadone                |
| Buprenorphine – Suboxone        | Methocarbamol - Robaxin  |
| Carisoprodol – Soma             | Methorphan                |
| Cocaethylene – Cocaine metabolite | Mitragynine – Kratom    |
| Cocaine                         | Morphine                  |
| Codeine                         | Oxycodone – Percocet     |
| Cyclobenzaprine – Flexeril     | Oxymorphone – Opana      |
| Dihydrocodeine                  | Pregabalin – Lyrica      |
| EDDP (methadone metabolite)     | Propoxyphene - Darvon    |
| Fentanyl                        | Tapentadol - Nucynta     |
| Gabapentin – Neurontin          | Tramadol - Ultram        |
| Hydrocodone – Vicodin           |
Cannabinoids

- Delta-9-Tetrahydrocannabinol (THC)
- 11-nor-9-carboxy- Delta-9-Tetrahydrocannabinol (THCA)
- 11-hydroxy- Delta-9-Tetrahydrocannabinol (OH-THC)
- Cannabinol (CBN)
- Cannabidiol (CBD)
Additional Testing

- Anti-seizure/Anticonvulsant
- Over the Counter Sleep Medications
- Antidepressant/Antipsychotic Medications
- Antihistamines
- Some Bath Salts
- Fentanyl Analogues
Unable to Test for...

- LSD
- Psilocin/Psilocybin (mushrooms)
- n-BOMe
- Synthetic Cannabinoids
- Bath Salts
- Nitrous Oxide

...For Now
Initiatives - Research

**Drug Prevalence**
- Fentanyl/Synthetic Opioids
- Synthetic Cannabinoids
- Prescription/OTC medications
- THC/Cannabinoids in Fatal Crashes
- THC concentrations in DUI populations (per se)
- Drugs in 0.08% or higher DUI samples
- Routine testing of all DUI samples regardless of BAC

**Drug Stability**
- THC and metabolites in antemortem and postmortem samples
- Benzodiazepines in multiple matrices

**Effectiveness of DRE, SFST**
- A 2 year Study of THC Concentrations in Drivers: Examining Driving and FST Performance
- A 2 year Study of THC Concentrations in Drivers: Physiological Signs on DRE & non-DRE
## OC Fatal Traffic Accidents

<table>
<thead>
<tr>
<th></th>
<th>Used/Exposed to Cannabis</th>
<th>Active THC in their System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2014</strong></td>
<td>19%</td>
<td>13%</td>
</tr>
<tr>
<td><strong>2015</strong></td>
<td>21%</td>
<td>17%</td>
</tr>
<tr>
<td><strong>2016</strong></td>
<td>20%</td>
<td>17%</td>
</tr>
<tr>
<td><strong>2016</strong></td>
<td>20%</td>
<td>19%</td>
</tr>
</tbody>
</table>
DUI cases with BAC >0.08%

38% have drug + alcohol

- Negative: 61%
- Benzodiazepine: 4%
- Cocaine: 3%
- Methamphetamine: 2%
- Opiates: 4%
- Oxycodone: 6%
- THC: 22%
- Zolpidem: 1%
All Driver Testing regardless of BAC

<table>
<thead>
<tr>
<th>Drug</th>
<th>% Prevalence</th>
<th>THC Concentrations</th>
<th>% of Positive Exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>80.4%</td>
<td>1 to 2ng/mL</td>
<td>28.8%</td>
</tr>
<tr>
<td>THC</td>
<td>23.8%</td>
<td>2 to 5ng/mL</td>
<td>39.5%</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>12.5%</td>
<td>Greater than 5ng/mL</td>
<td>31.7%</td>
</tr>
<tr>
<td>Alprazolam</td>
<td>8.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td>3.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cocaine</td>
<td>3.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>1.6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Initiatives - Technology

- Automated Platforms
- Cryo-cooled instrumentation for routine inhalant testing
- Liquid Chromatography – Dual Mass Spectrometry
- Liquid Chromatography – Mass Spectrometry Time of Flight
- Roadside Oral Fluid Testing
LCMS – Time of Flight
Initiatives – Training & Collaboration

- Toxicology Workshops
  - DUID Expert Testimony
  - Method Development and Validation
- Toxicology Stakeholders Meeting
- DRE, SFST, ARIDE support
- Cal State LA
- UCI
- DMV
- Cal OTS Blueprint – Toxicology Co-chair
Training

- Hard Science Degree
- Literature Review
- Hands-on Analytical Experience
- Field Observations
- Pharmacology & Analytical Chemistry Academic Coursework
- Testimony Observation & Moot Court
- SFST & DRE
- Controlled Studies
- Postmortem Case Management