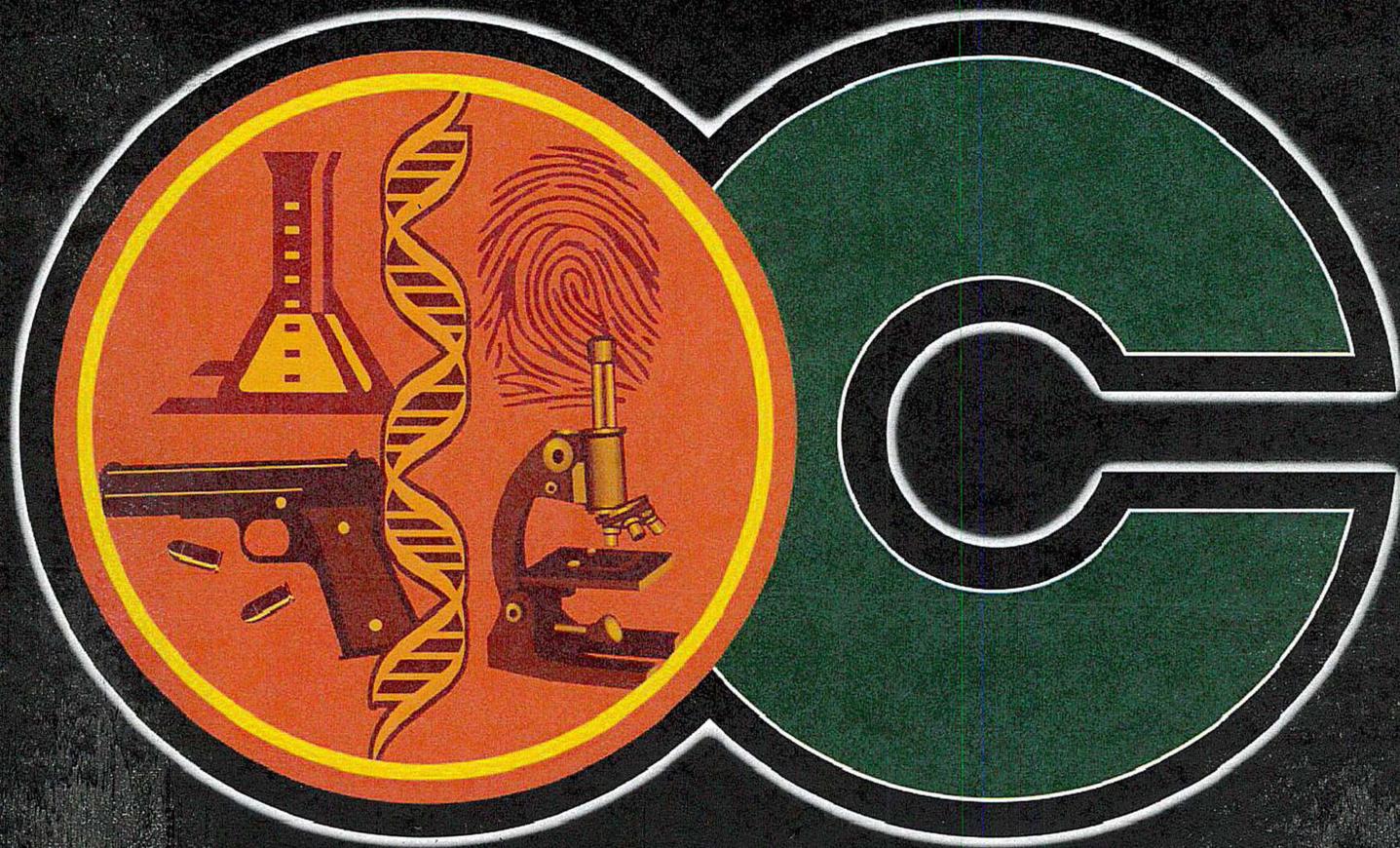
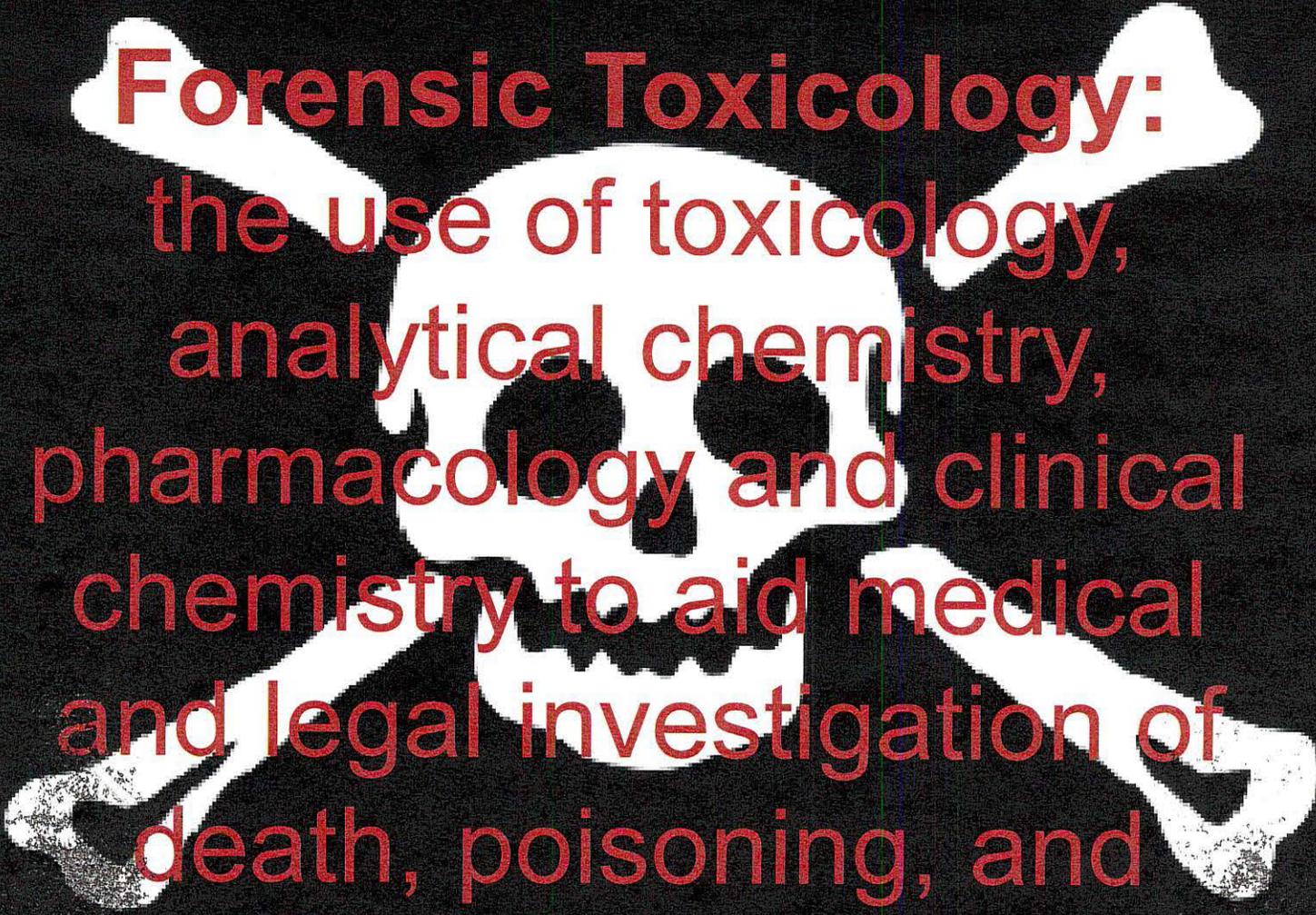


**This PowerPoint and data**  
**contained within CANNOT be**  
**used by any person or entity**  
**without explicit permission of**  
**the Orange County Crime**  
**Laboratory.**



**CRIME LAB**  
**ORANGE COUNTY, CALIFORNIA**



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



## 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)

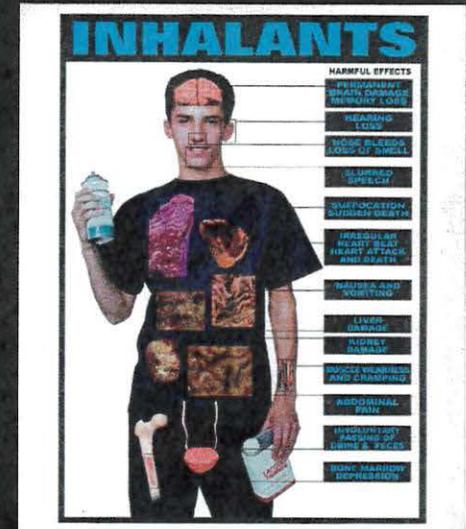
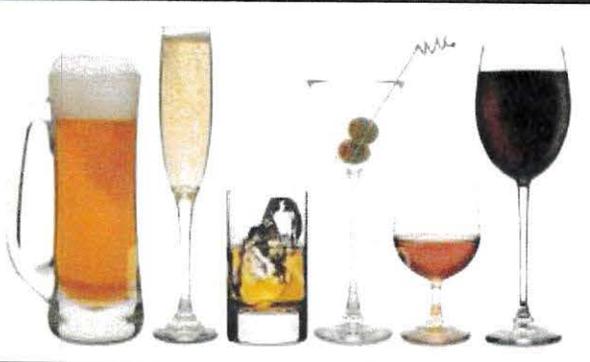
Methanol

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)

MORPHINE

METHADONE CODEINE  
HYDROCODONE OXYCODONE  
DIPHENHYDRAMINE  
COCAINE  
FENTANYL  
ALPRAZOLAM  
LORAZEPAM  
VALIUM  
DIPYRONE  
MORPHINE

ALPRAZOLAM

THC

METHAMPHETAMINE

# Benzodiazepines and Z Drugs

Chlordiazepoxide - Librium

Oxazepam - Serax

Nordiazepam

Diazepam - Valium

Midazolam - Versed

Estazolam - Prosom

Zopiclone - Lunesta

Zolpidem - Ambien

Clonazepam - Klonopin

Temazepam - Restoril

Lorazepam - Ativan

Alprazolam - Xanax

Clobazam - Onfi

Flunitrazepam - Rohypnol

Phenazepam

Flurazepam - Dalmane

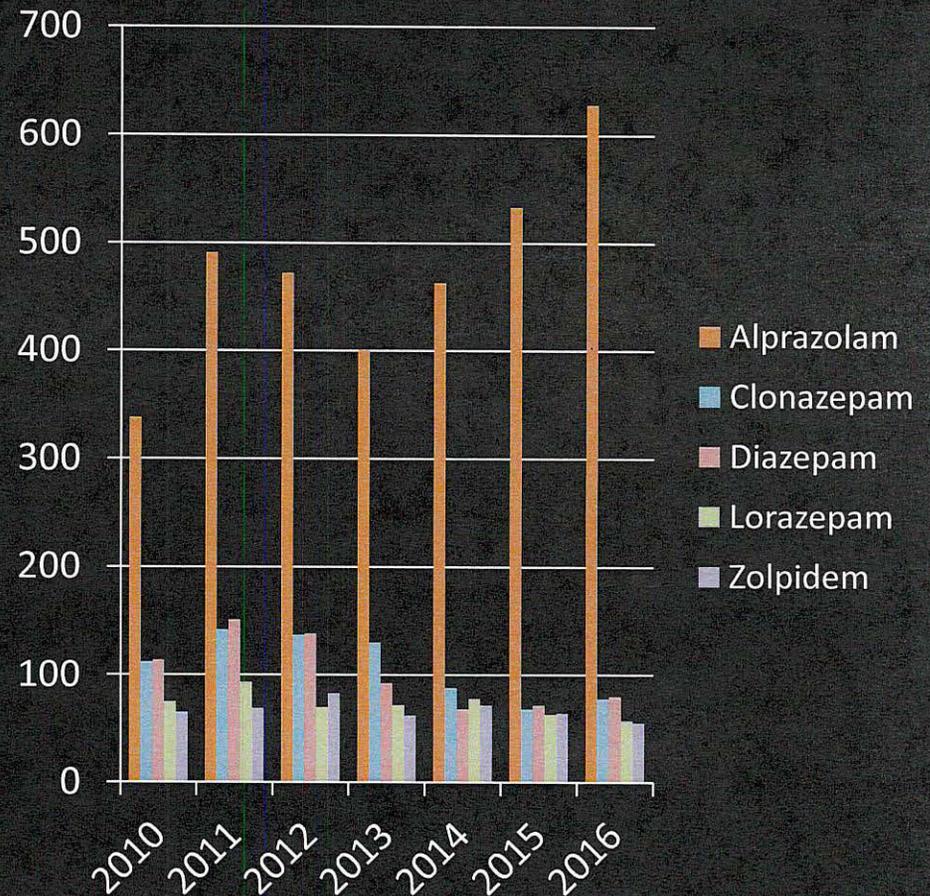
Etizolam

Triazolam - Halcion

Zaleplon - Sonata

Nitrazepam

Demoxepam



# Methamphetamine and Related

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

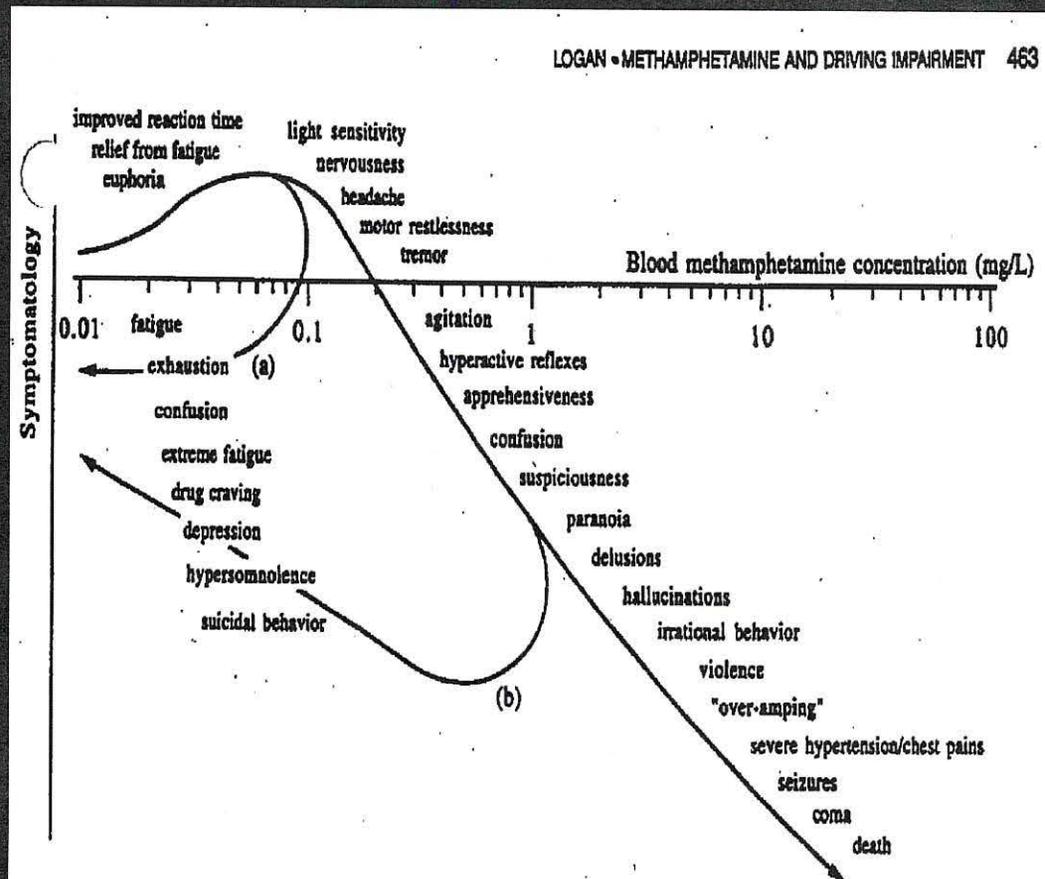


FIG. 1—Hysteresis plot showing effects of methamphetamine that impact driving performance with respect to blood methamphetamine concentration (mg/L). The figure shows examples of withdrawal effects from (a) low dose and (b) high dose drug use.

# **Pain Management & Other Abused Drugs (PAAD)**

6-MAM (Heroin metabolite)

Acetaminophen – Tylenol

Acetylfentanyl

Amitriptyline – Elavil

Baclofen - Leoresal

Benzoyllecgonine – Cocaine metabolite

Buprenorphine – Suboxone

Carisoprodol – Soma

Cocaethylene – Cocaine metabolite

Cocaine

Codeine

Cyclobenzaprine – Flexeril

Dihydrocodeine

EDDP (methadone metabolite)

Fentanyl

Gabapentin – Neurontin

Hydrocodone – Vicodin

Hydromorphone – Diladid

Ketamine

Meperidine – Demerol

Meprobamate

Metaxalone – Skelaxin

Methadone

Methocarbamol - Robaxin

Methorphan

Mitragynine – Kratom

Morphine

Oxycodone – Percocet

Oxymorphone – Opana

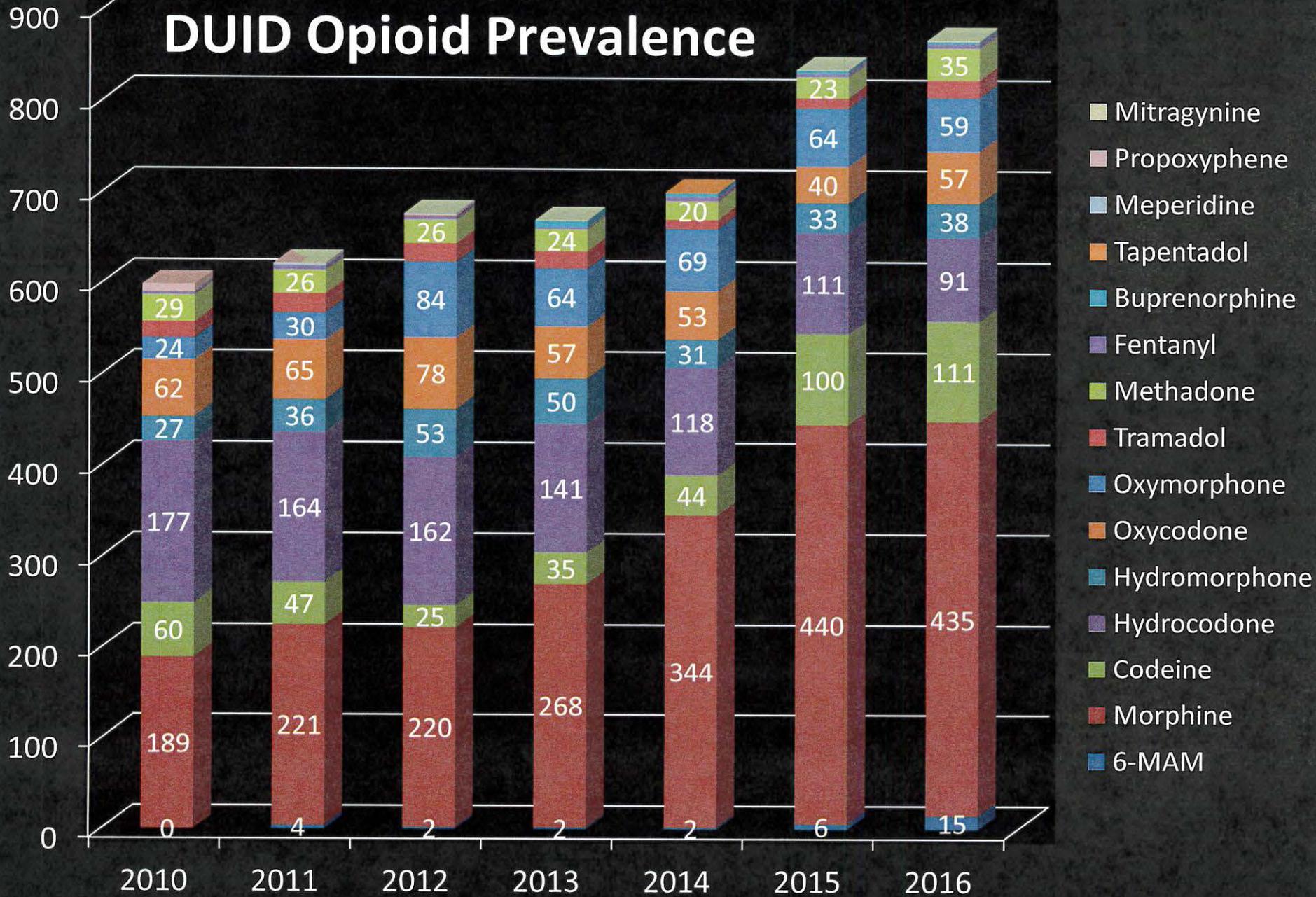
Pregabalin – Lyrica

Propoxyphene - Darvon

Tapentadol - Nucynta

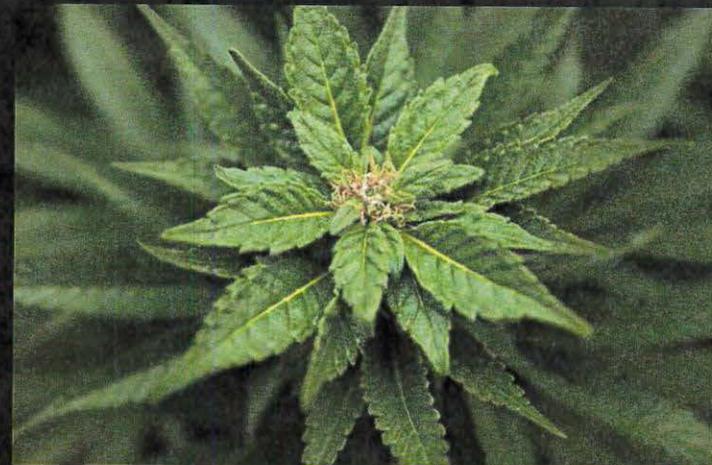
Tramadol - Ultram

# DUID Opioid Prevalence



# Cannabinoids

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



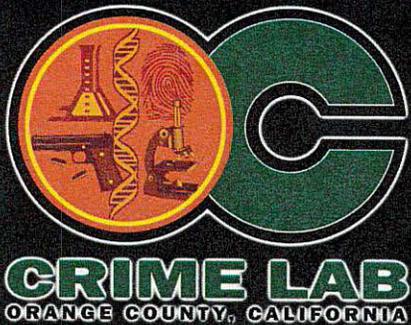
# Additional Testing

- 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

## Used/Exposed to Cannabis

- **2014: 19%**
- **2015: 21%**
- **2016\*: 20%**

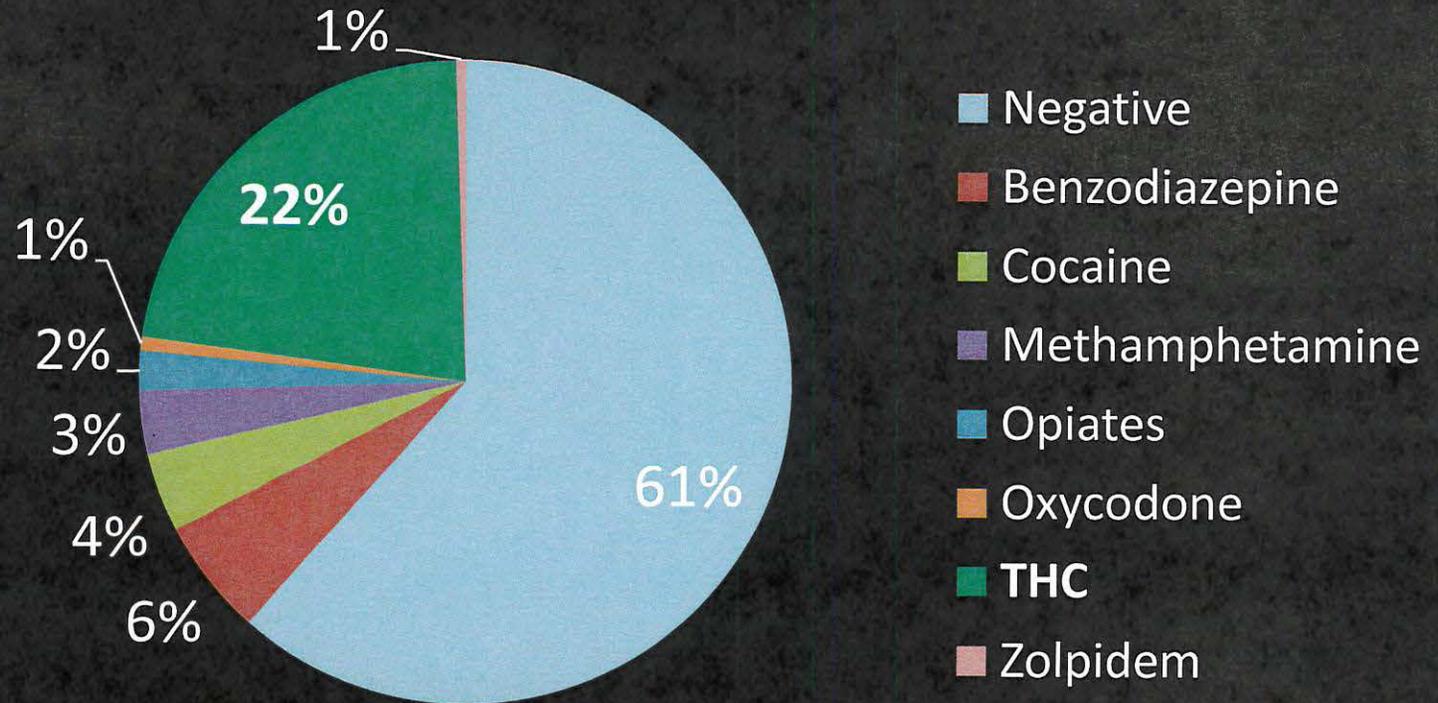
## Active THC in their System

- **2014: 13%**
- **2015: 17%**
- **2016\*: 19%**



# DUI cases with BAC >0.08%

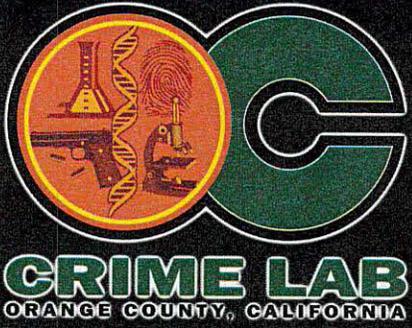
**38% have drug + alcohol**



# All Driver Testing regardless of BAC

Drug	% Prevalence
Ethanol	80.4
THC	23.8
Methamphetamine	12.5
Alprazolam	8.4
Morphine	3.8
Cocaine	3.0
Hydrocodone	1.6

THC Concentrations	% of Positive Exams
1 to 2ng/mL	28.8%
2 to 5ng/mL	39.5%
Greater than 5ng/mL	31.7%



# 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

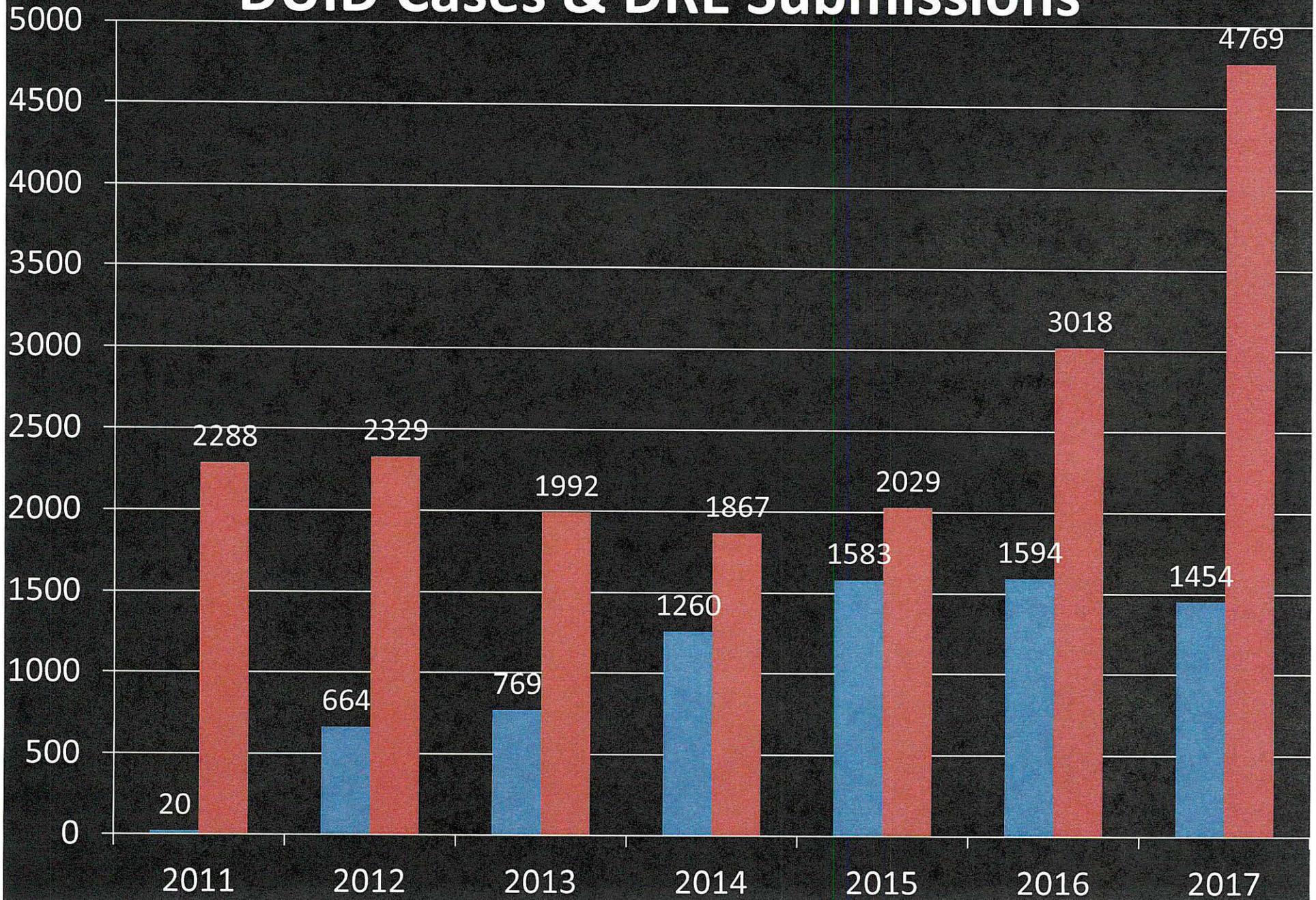




## Initiatives – Training & Collaboration

- 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*

# DUID Cases & DRE Submissions



# 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**

# Total DUI Appearances

