UNDERSTANDING AND CHALLENGING THE DRUGS: CHEMISTRY AND TOXICOLOGY

Presenter:

- Dr. Jasmine Drake, Graduate Program Director and Assistant Professor, Administration of Justice Department, Barbara Jordan-Mickey Leland School of Public Affairs, Texas Southern University

Understanding & Challenging the Drugs: Chemistry & Toxicology

Jasmine Drake, Ph.D.
Graduate Program Director and Assistant Professor
Administration of Justice Department
Texas Southern University

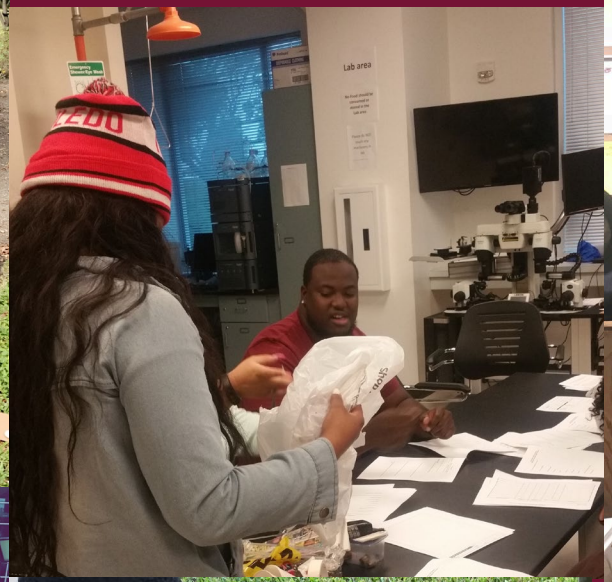
November 6th, 2019

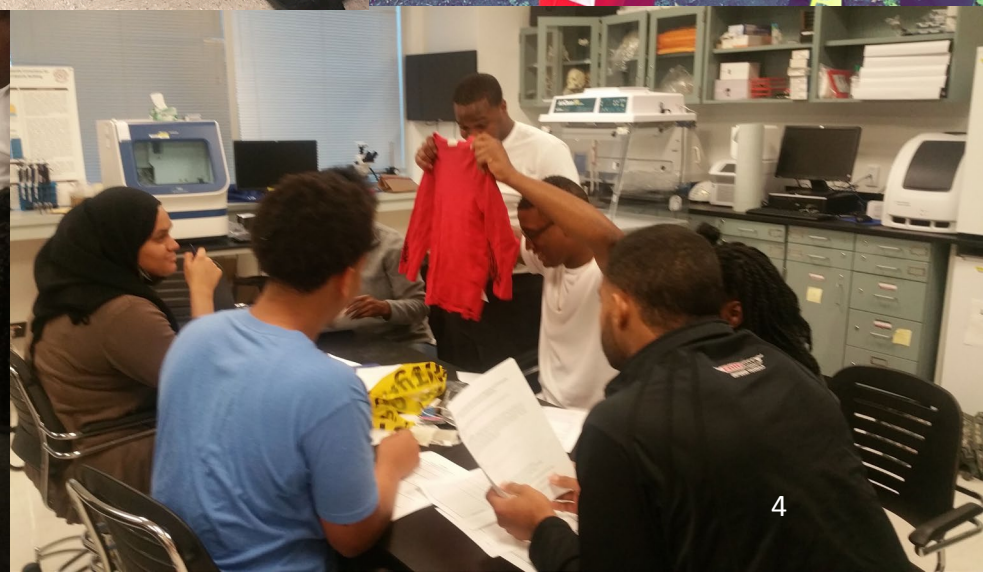
NACDL Training
Defending Drug Overdose Homicides in Pennsylvania
Penn State Harrisburg, Middletown, PA

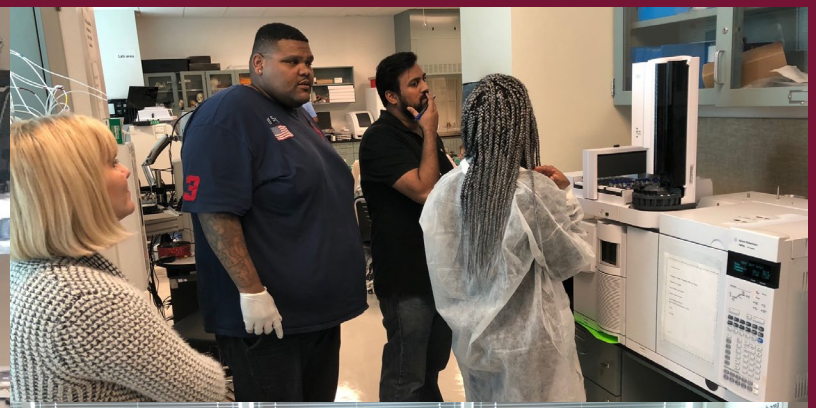
About me

- Education:
  - B.S. in Chemistry, 2002
  - Ph.D. in Chemistry, 2007
- Working Experience:
  - NIST Post-doctoral researcher (2007-2009)
  - Drug Enforcement Administration, Forensic Chemist (2009-2012)
  - Adjunct Professor, Cedar Valley College (2012-2013)
  - Nimitz High School, Teacher (2012-2013)
  - Sam Houston State University (2013-2016)
  - Texas Southern University (2016-Current)
  - Center for Justice Research Fellow
  - Governor-Appointed Texas Forensic Science Commissioner (2016- Current)

Minor in Forensic Science Program







Training Opportunities

Forensic Science Analysis and Testimony Under Scrutiny
PCAST/ NAS Report

Evaluated validity of seven (7) areas:

1) DNA analysis of single-source and simple-mixture samples

2) DNA analysis of complex-mixture samples

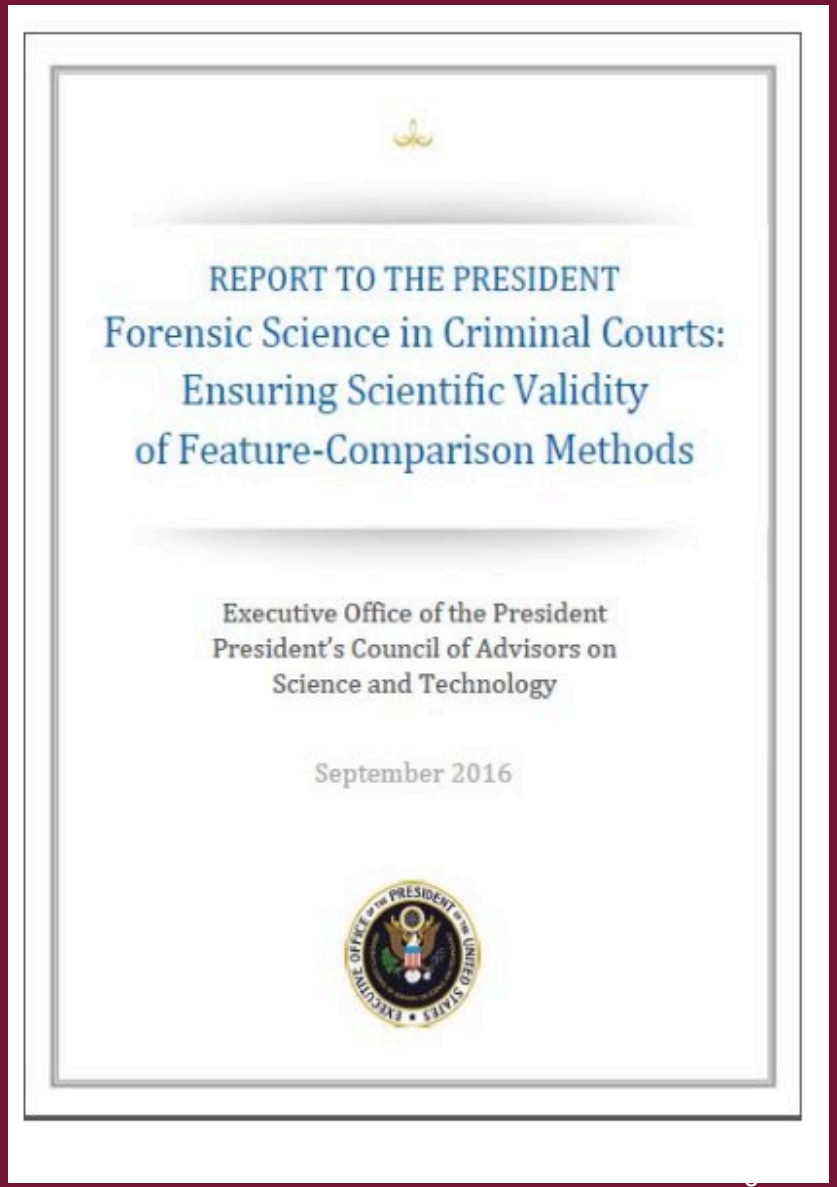
3) Bitemark analysis

4) Latent fingerprint analysis

5) Firearms analysis

6) Footwear analysis

7) Hair analysis



So What the Heck Does This Have to do with me?!!!

- ✓ An attorney can present an effective attack or defense for forensic evidence cases with a basic knowledge of the analysis process and an insistence on documentation of important indicators that may affect results.

- ✓ At the minimum, a technician must process standard samples before and after analyzing a specimen in question.

- ✓ In litigation, an adverse party should seek hard copy output, including system conditions. Finally, no analytical technique produces results that are completely without doubt.

An effective advocate should always seek corroboration of scientific results.

Case-Specific Example

- Erroneous GC/MS results may have been responsible for a criminal defendant receiving a death sentence. John Brown killed a police officer and wounded two bar patrons in a shoot-out on June 7, 1980 in Garden Grove, California. Mr. Brown's diminished capacity defense to capital murder relied on the assertion that Mr. Brown was under the influence of narcotics at the time of the shooting.
- The prosecution introduced GC/MS evidence that showed Mr. Brown's blood to be free of narcotics.
- The California Supreme Court overturned the jury's death sentence because the prosecution never introduced evidence from a radioactive immunoassay ("RIA") test that detected phencyclidine (PCP) in Mr. Brown's blood.
- Obviously, an example like this demonstrates that analytical evidence, including GC/MS, should always be confirmed with another reliable technique.

Schedules of Controlled Substances

Scheduled I-V based on:

1. Potential for Abuse
2. Potential for Dependency
3. Acceptable Medical Use

Classes of Drugs

- **Narcotics – produces a stupor; complete insensibility**
- **Depressants** – substances that slows the CNS
- **Inhalants** – substances that gives off vapors when breathed in thu
- **Stimulants** – substances which accelerate the CNS
- **Hallucinogens** – substances that cause perceptual changes
- **Cannabis** – the hemp plant (Cannabis Sativa) – THC
- **Anabolic Steroids** – drug or hormonal substance that promotes muscle growth
- **Synthetic Drugs-** laboratory (man-made) created chemical substances, which are made to mimic the psychoactive effects of controlled substances.

Opioids And Opiate-Based Drugs

What Is An Opioid?

- Opioids are a family of medications, used primarily for pain relief, that are derived from Opium.

- Legal (prescription) opiates include Oxycontin, Percocet, and Vicodin. Illegal opiates include Heroin. All forms of opiates are dangerous and highly addictive whether they are legal or illegal.

- Opiate use among teens and young adults is increasing at an alarming rate. Teenagers commonly abuse prescription opiates which almost always leads to Heroin abuse and ultimately addiction.

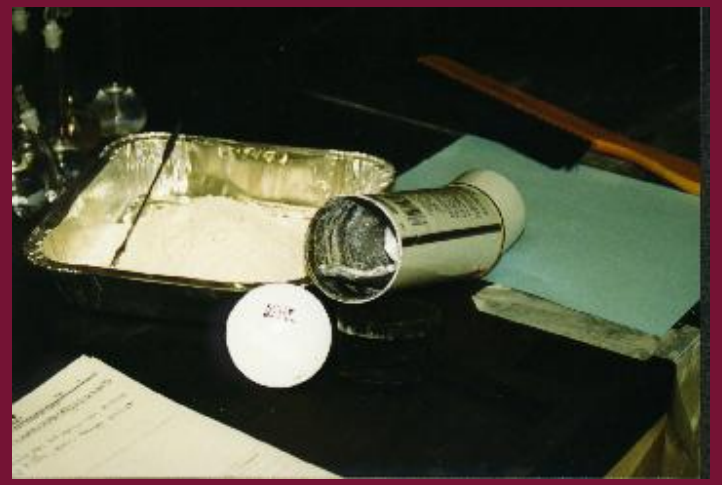
Early References

- Earliest reference to use around 4000 B.C. – also same time as abuse and addiction
- Numerous other historical references
  - Ancient Egyptian writings
  - Hippocrates, the Father of Medicine
  - An excerpt from Homer's Odyssey
  - "Bitter gall" given to Jesus
- People understood opium's ability to take away pain, affect the mind, and even bring about death

Heroin (CSA I)

- Legally manufactured in England, France, Belgium
- Diacetylmorphine
- Opium poppy
- Many different forms
  - Injectable or Smoked

- Powerful RUSH
- Peacefulness, euphoria
- Drowsiness (Nod effect)
- Nausea, vomiting
- Tolerance very important part of the Heroin addict



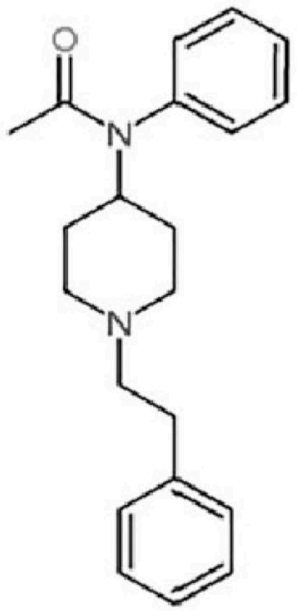
Heroin pressed into hairspray cans which actually sprayed hairspray- travel sized cans attached to the large can.

Designer Opioids

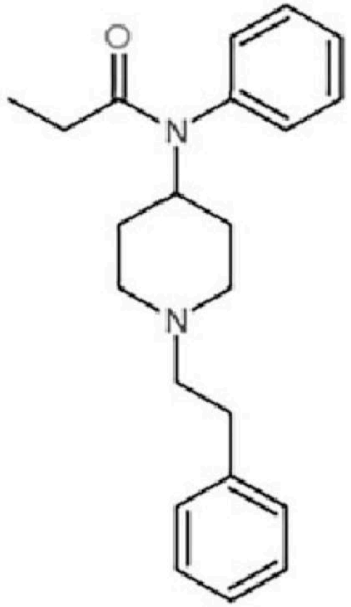
- **Fentanyl analogs:**
- Acetyl-
- Acryl-
- Butyryl-
- Furanyl-
- Carfentanil
- 4-ANPP

- **Designer Opioids:**
- AH-7921
- MT-45
- U-47700 (Pink/Pinky)

Acetylfentanyl



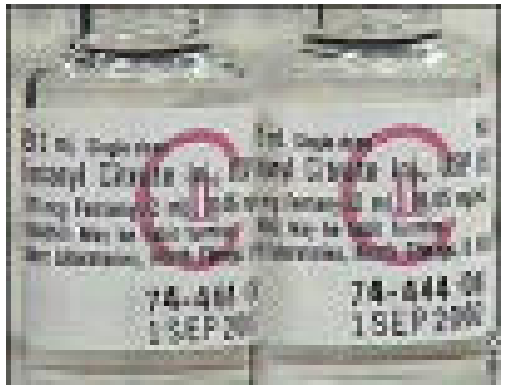
Fentanyl



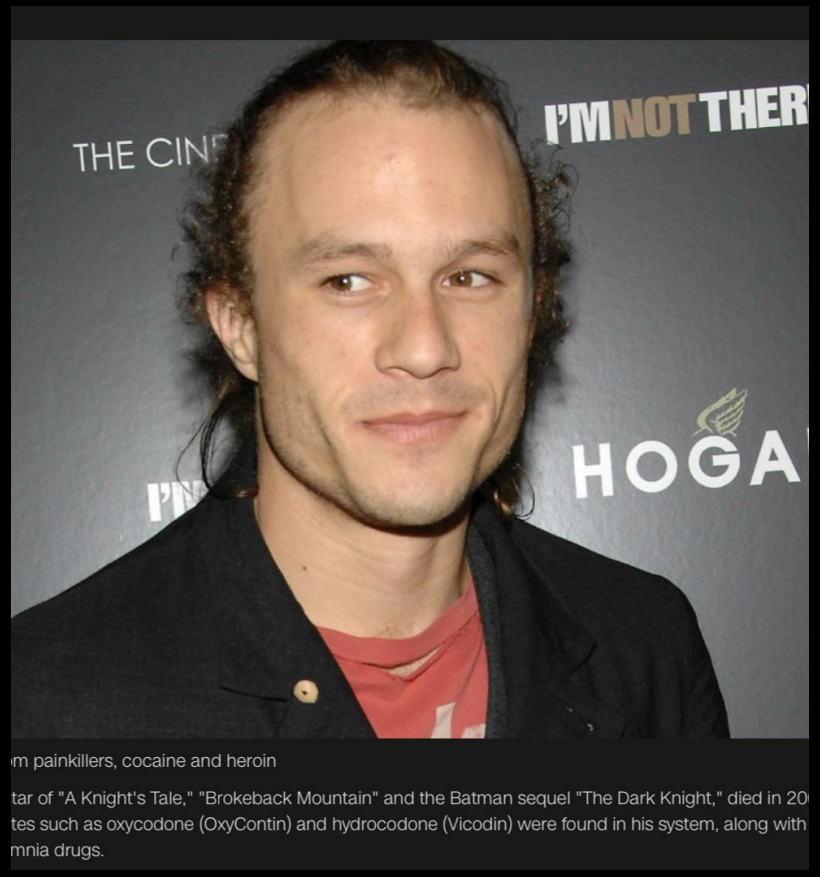
Synthetic Opioids

History of Fentanyl

- *(CSA II)*
- Synthetic drug
- Synthesized by Belgium in 1950s
- Used in medical field in 1960s
  - IV anesthetic
  - Trade name Sublimaze
- Designed to be absorbed by injection, orally, contact with mucous membranes, inhalation, and through the skin
- Deaths caused from “respiratory arrest, cardiac arrest, severe respiratory depression, cardiovascular collapse, or anaphylactic shock”

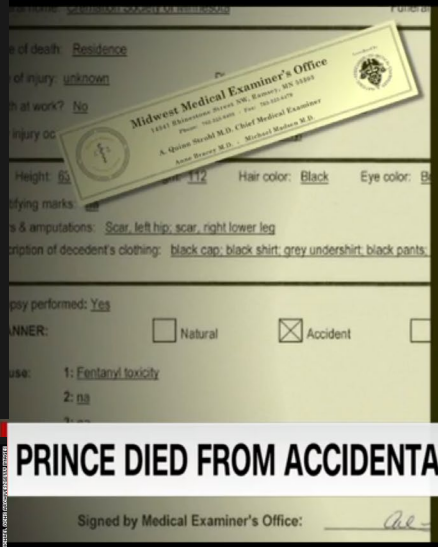


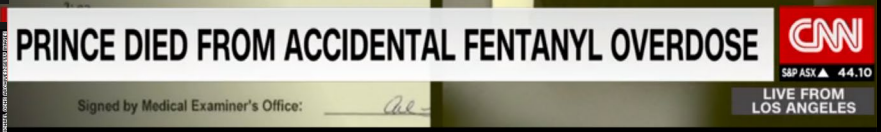
Source of information: Intelligence Center Unit Bulletin, October 6, 2006



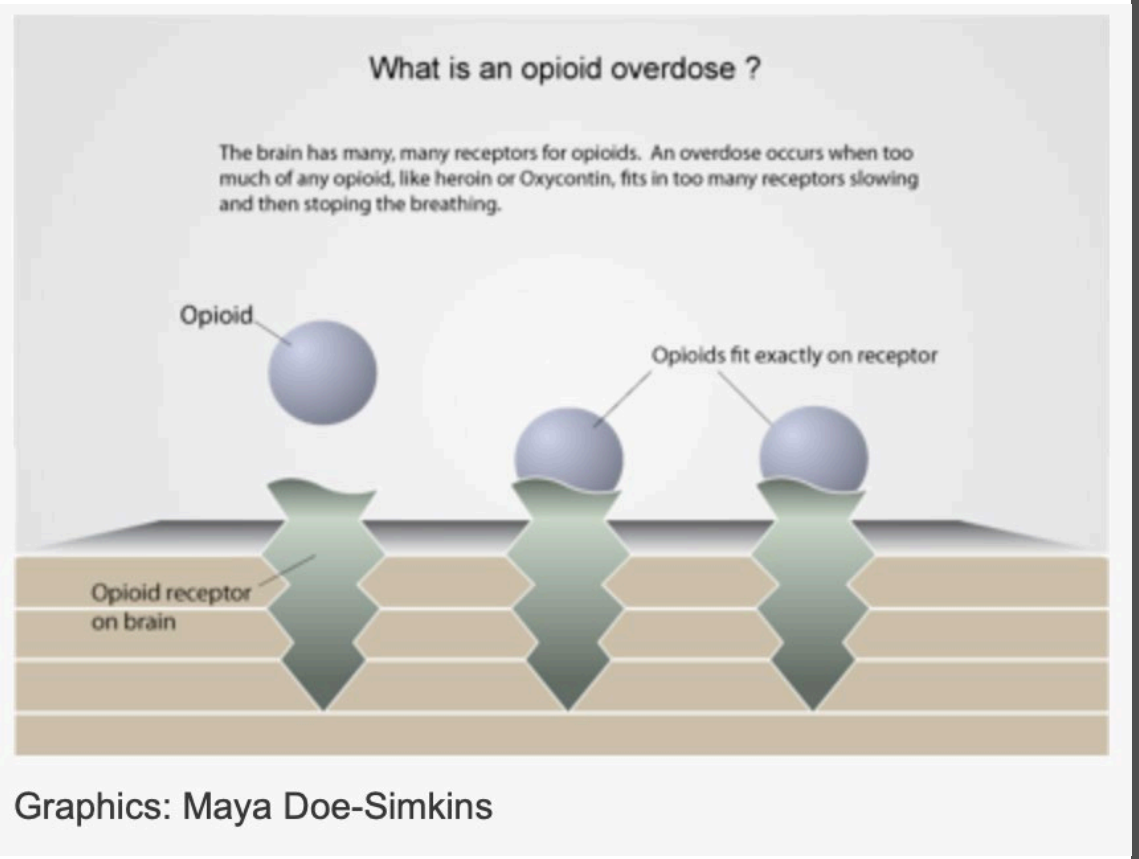
m painkillers, cocaine and heroin

tar of "A Knight's Tale," "Brokeback Mountain" and the Batman sequel "The Dark Knight," died in 20
tes such as oxycodone (OxyContin) and hydrocodone (Vicodin) were found in his system, along with
mnia drugs.





Chasing the Dragon



https://harmreduction.org/issues/overdose-prevention/overview/overdose-basics/what-is-an-overdose

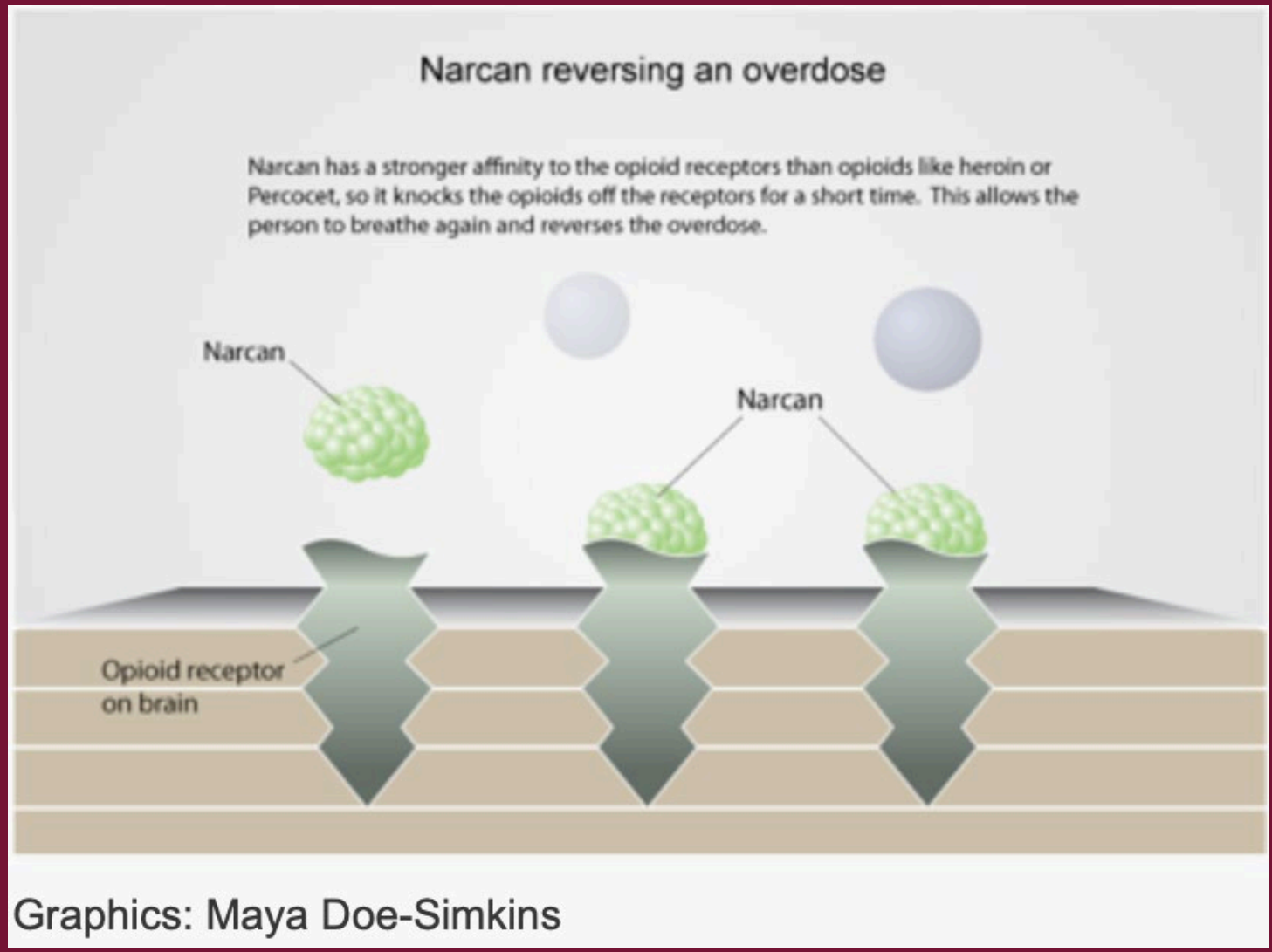
What are the signs of an opioid overdose?

The signs of an opioid overdose include

- The person's face is extremely pale and/or feels clammy to the touch
- Their body goes limp
- Their fingernails or lips have a purple or blue color
- They start vomiting or making gurgling noises
- They cannot be awakened or are unable to speak
- Their breathing or heartbeat slows or stops

The Antidote: Naloxone (NARCAN)

- Administered by emergency medical personnel
- Relatively inexpensive ($0.26 per dose)
- May require more than one dose, depending on potency of dose taken
- New Mexico police officers allowed to administer the drug (2001)
- Philadelphia FD accused of not giving enough and "killing" patients (DEA news clips 2007)



Source of information: Intelligence Center Unit Bulletin, October 6, 2006

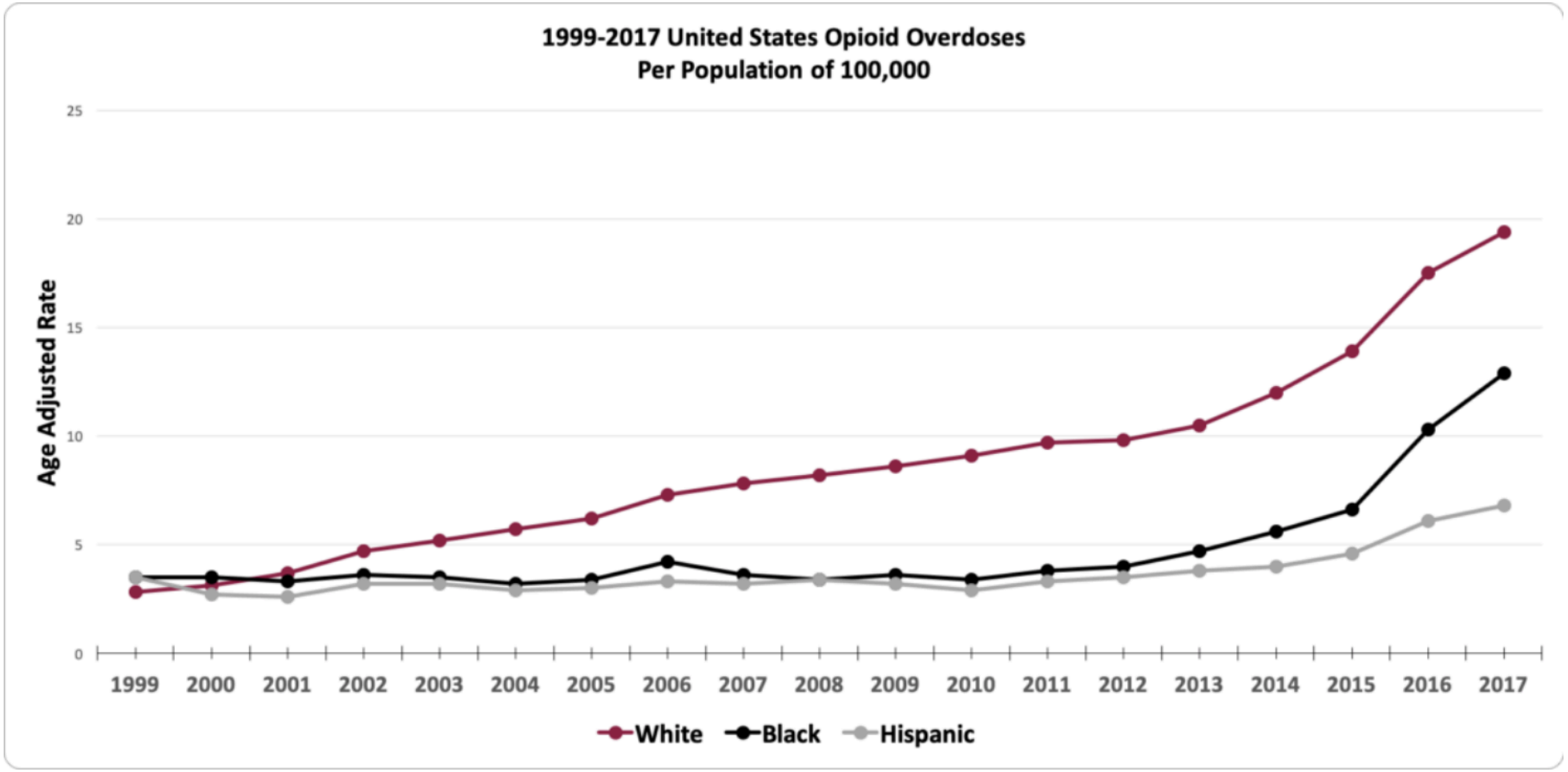
National Trends

The current face of the opioid epidemic in America has been considered to primarily plague rural and suburban communities, with White, Non-Hispanics overwhelmingly suffering its devastating effects.

Public Health Crisis or ”War on Drugs”???

http://forwardtimes.com/changing-faces-how-the-opioid-epidemic-is-sweeping-across-urban-minority-communities-in-the-u-s/

Figure 1. United States Opioid Overdoses by Ethnicity 1999-2017.



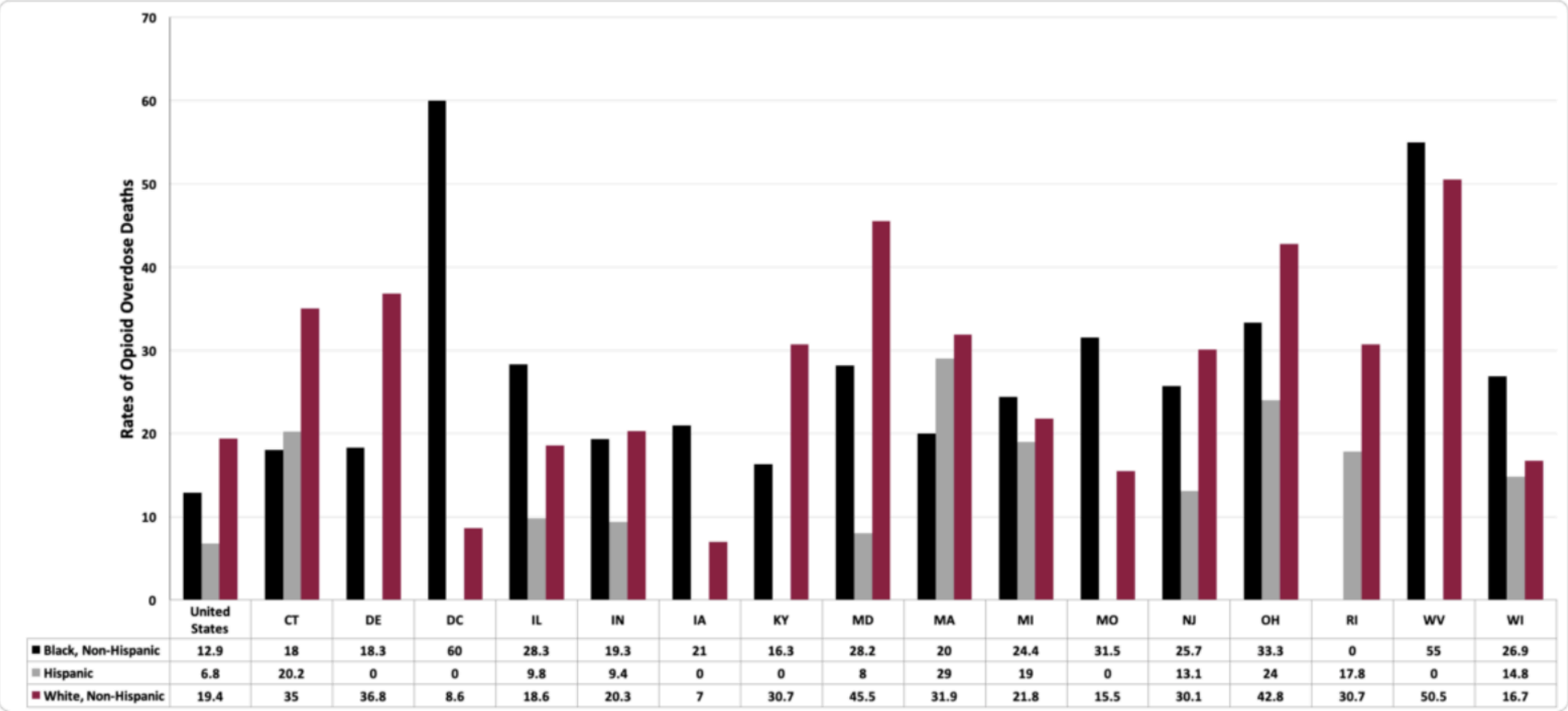
Source: Kaiser Family Foundation analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html

- In recent years, there has been a historic surge in the number of opioid overdose deaths sweeping across urban, minority communities in the United States.

- The CDC reports that over the past 18 years, age-adjusted opioid related deaths for Hispanics have climbed from **3.5** overdoses per 100,000 in 1999 to **6.8** overdoses per 100,000 in 2017.

- However, more significant increases have been reported for Blacks during the same 18-year timeframe with age-adjusted rates of **3.5** overdoses per population of 100,000 in 1999 surging to **12.9** overdoses per population of 100,000 in 2017.

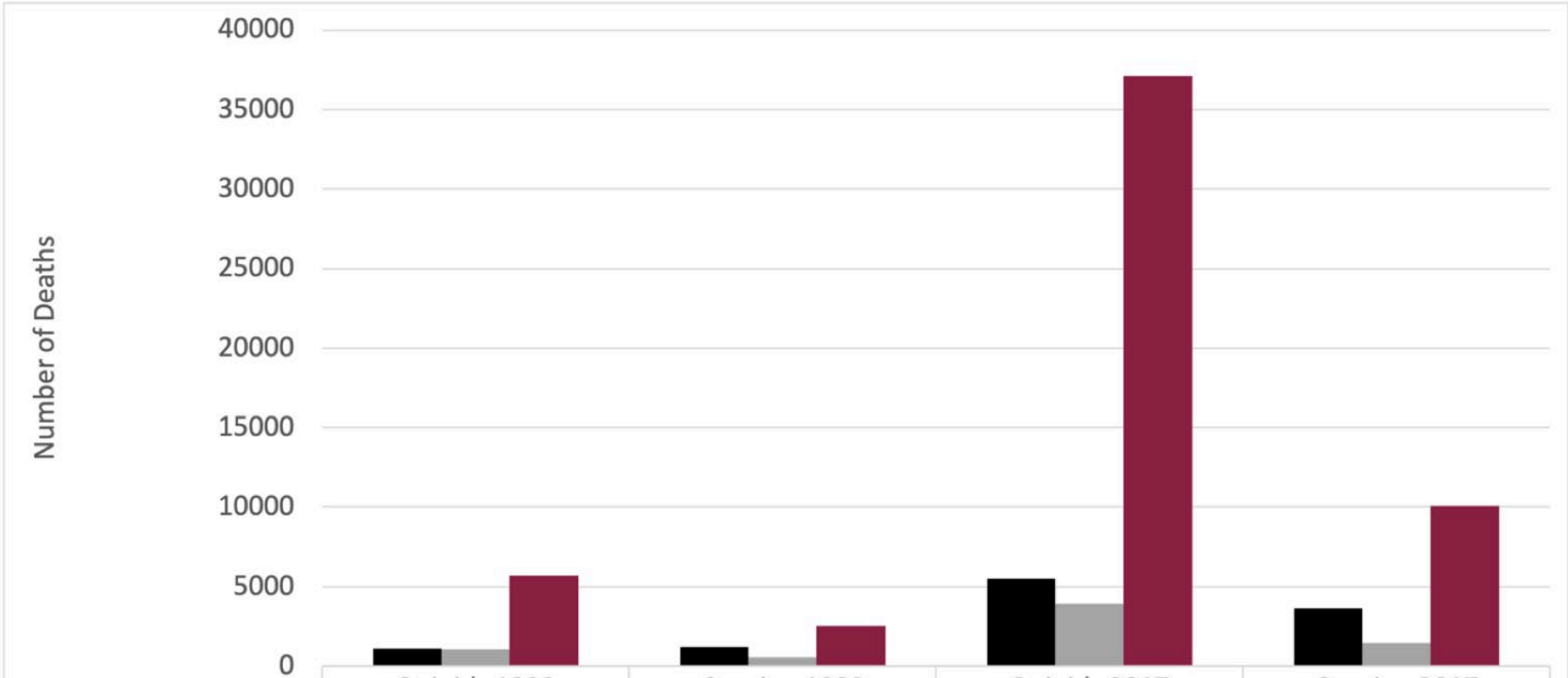
Figure 2. States with Minority Opioid Overdoses Age-Adjusted Rates Higher than the U.S. National Average in 2017.



	United States	CT	DE	DC	IL	IN	IA	KY	MD	MA	MI	MO	NJ	OH	RI	WV	WI
Black, Non-Hispanic	12.9	18	18.3	60	28.3	19.3	21	16.3	28.2	20	24.4	31.5	25.7	33.3	0	55	26.9
Hispanic	6.8	20.2	0	0	9.8	9.4	0	0	8	29	19	0	13.1	24	17.8	0	14.8
White, Non-Hispanic	19.4	35	36.8	8.6	18.6	20.3	7	30.7	45.5	31.9	21.8	15.5	30.1	42.8	30.7	50.5	16.7

SOURCE: Kaiser Family Foundation's State Health Facts, Centers for Disease Control and Prevention (CDC), and National Center for Health Statistics. NSD: Not sufficient data. Data suppressed to ensure confidentiality. NR: Data not reported. Data unreliable. NSD and NR were coded as 0. Note: Specific ethnicity-based data were not available or reported for all states.

Figure 3. Comparison of Opioid and Cocaine Overdose Deaths by Ethnicity in 1999 and 2017.



	Opioids 1999	Cocaine 1999	Opioids 2017	Cocaine 2017
Black, Non-Hispanic	1130	1234	5513	3652
Hispanic	1058	544	3932	1438
White, Non-Hispanic	5669	2545	37113	10079

SOURCE: Centers for Disease Control (CDC) Wonder. Accessed at http://wonder.cdc.gov/mcd-icd10.html

Table 1. Synthetic Opioids, Heroin and Prescription (*Rx*) Opioid Related Deaths by Ethnicity

	1999		2017	
	N	***AAR***	***N***	***AAR***
All U.S. Deaths	8,050	2.9	47,600	14.9
Synthetic Opioids	730	0.3	28,466	9.0
Heroin	1,960	0.7	15,482	4.9
Prescription (Rx)	3,442	1.2	17,029	5.2
Black, Non-Hispanic OODs				
Synthetic Opioid	37	0.1	3,832	9.0
Heroin	266	0.8	2,140	4.9
Prescription (Rx)	265	0.8	1,546	3.4
White, Non-Hispanic OODs				
Synthetic Opioid	628	0.3	21,956	11.9
Heroin	1,301	0.7	11,292	6.1
Prescription (Rx)	3,132	1.4	15,139	5.9
Hispanic OODs				
Synthetic Opioid	45	0.1	2,152	3.7
Heroin	346	1.1	1,669	2.9
Prescription (Rx)	472	1.6	1,211	2.2

N = raw number or overdoses

AAR = Age-adjusted rate per population of 100,000

In 1999, Prescription Drugs led to more overdoses for Whites and Hispanics. Heroin lead to more overdoses amongst Blacks.

In 2017, Synthetic Opioids lead to more overdoses amongst all Ethnicities

Understanding the Drug Laboratory Report and Toxicology

Presumptive vs. Confirmatory Testing

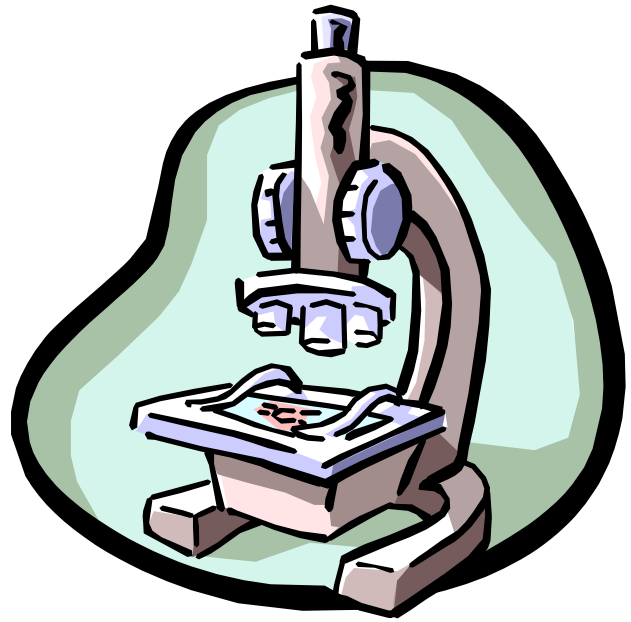
Instruments/Tests Commonly Used

Presumptive/ Screening Tests

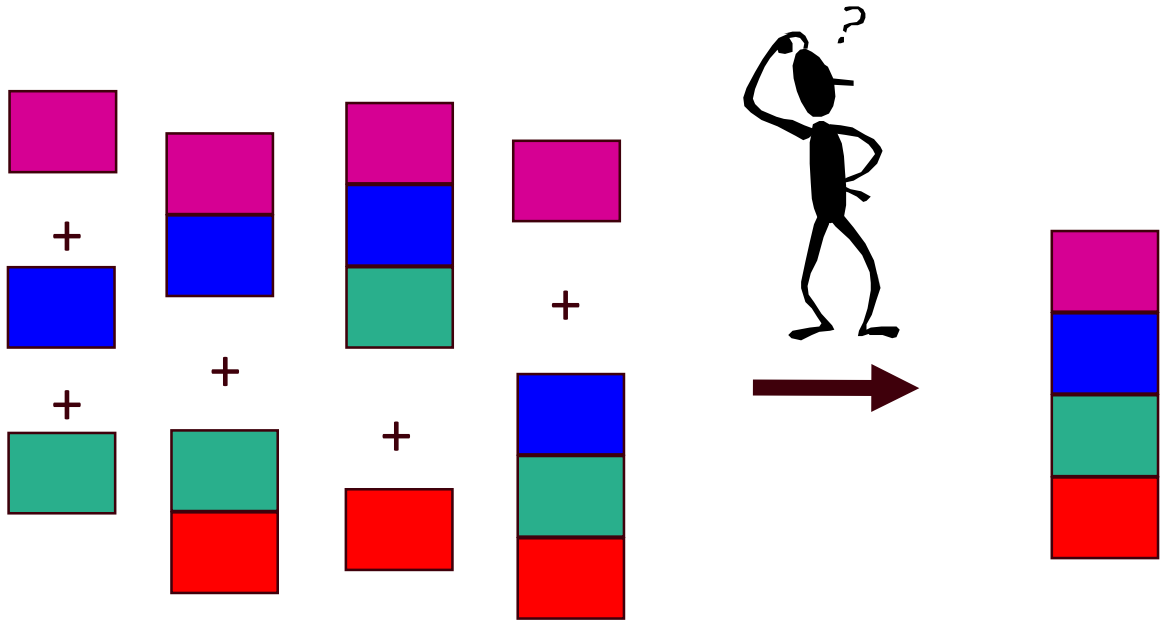
- GC/FID
- Color tests/ Field Tests
- Extractions
- Microscopic
- UV
- **Immunoassays**

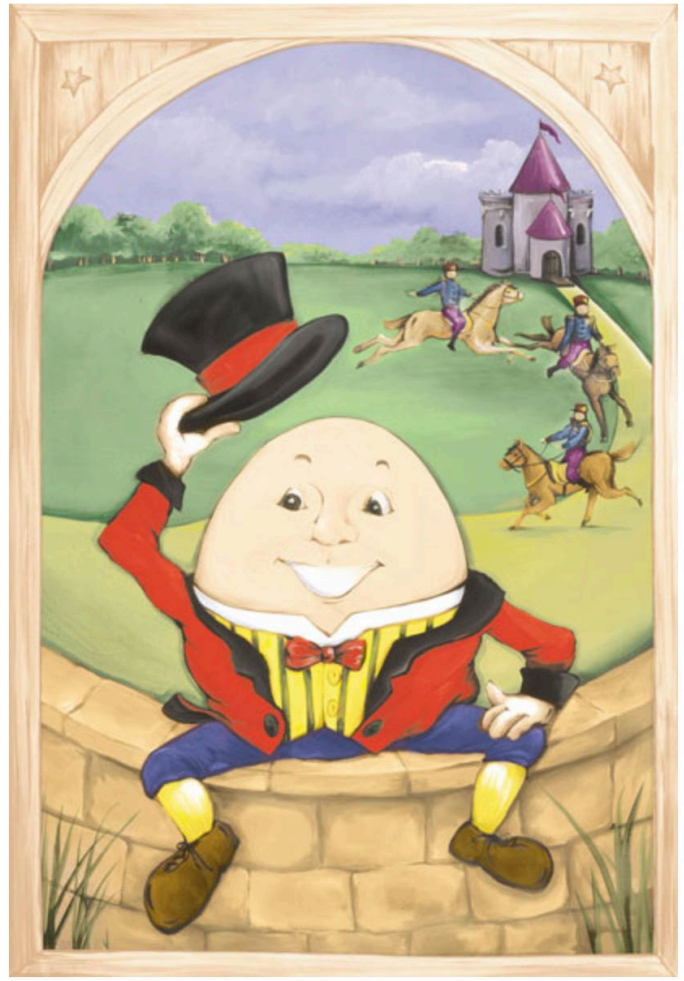
Confirmatory

- **GC/MS**
- FTIR/ATR
- CE
- GC/IRD
- HPLC
- LC/MS



GC/MS: Interpretation of an MS spectrum to derive structural information is analogous to solving a pu





Use the fragment ion masses as specific pieces of the puzzle to help piece the intact molecule back together

Instead of all the king's horses and all the king's men, a mass spectrometrist can put Humpty back together again.

Drug Evidence Lab Reports

What's in the Lab Report?

- Evidence Description
- Net Weight
- Reserve Weight
- Drug Identification
- Analyst
- Analytical Methods

vs.

What's not in the Drug Lab Report (Fantastic Beasts)? And Where to Find Them?

- Spectral Results (Case file)
- Blanks and standards (Case file)
- Laboratory SOPs (Online or Request)
- Quality Assurance- Instrument Maintenance (Request Instrument Log)
- Uncertainty Calculations (Spreadsheet in Case file)
- Evidence Handling Procedures

Sample Drug Laboratory Reports: Example 1

- **Questions:**
- SOP followed?
- Chain of Custody
- Number of Tests and Types Meet Requirements?
- Evidence Handling
- Uncertainty Calculation
- Data Print out
  - Blank
  - Quality Assurance Procedures According to SOP

HARRIS COUNTY INSTITUTE OF FORENSIC SCIENCES
1885 Old Spanish Trail
Houston, Texas 77054-2001
Phone: 713-796-6830 Fax: 713-796-6794

DRUG CHEMISTRY REPORT

Report Date

LABORATORY NUMBER: Lab No

Submission Form Information
SUSPECT: Suspect

Charging Information
COURT: 177 **CAUSE:** Cause

CASE OFFICER: Charlie Sanders **OFFENSE NUMBER:** OR No
Pasadena Police Department
1201 Davis
Pasadena, TX 77506

SUBMISSION INFORMATION:

On 2/10/2017 the following submissions were received from Azell Carter.

Submission 001 - Manila envelope

EVIDENCE DESCRIPTIONS, RESULTS OF ANALYSIS AND INTERPRETATIONS:

Item 2 (Contained within Submission 001)

Clear plastic ziplock bag containing a smaller plastic ziplock bag containing a white powdery substance

Multiple Compounds Detected
Net Weight: 0.02131 ± 0.00032 grams (95.45% Level of Confidence)

1. Heroin
2. Caffeine

Analytical Methods: GC-FID (Gas Chromatograph – Flame Ionization Detector)
GC-MS (Gas Chromatograph – Mass Spectrometer)

HARRIS COUNTY INSTITUTE OF FORENSIC SCIENCES
Drug Chemistry Laboratory
Amended Worksheet
Revision: 1

Drug Chemistry Laboratory procedure references: DC.DR.4010, DC.DR.4011, DC.IN.5016 AND DC.DR.4013 through DC.DR.4027.

Lab No

Subm. 001: Plastic evidence bag

Item 1: (1) Cracked partially burned brown cigar containing green leafy substance

Processed: 12/12/2015

Subitem	LabX Run Number	Tare	Gross Weight	Net Weight	Post Sample #1	Post Sample #2	Post Tare	LabX Acquisition Time	Balance ID	Weighed by
-	RS228646	0.000 g		0.218 g	0.157 g		0.001 g	5/8/18 9:59	DC132	Michelle DelHomme
-	RS228675	0.000 g		0.127 g	0.078 g		0.002 g	5/8/18 12:26	DC132	Michelle DelHomme

Analysis Notes:

MD 05/08/18
The evidence was reopened in order to obtain a microscopic photo.
The evidence was in a heat-sealed, plastic bag.

The evidence was reopened in order to obtain a MS sample.

LNB 5/9/2018: Botanical characteristics are not consistent with marihuana; reported compounds were not controlled pre-9/2015 legislative results. {LNB 5/10/18: updated result note}

LNB 5/18/2018: Updated result note

Multiple Compounds Detected

Net Weight: 0.007 ± 0.002 oz. (95.45% Level of Confidence)

1. AB-PINACA
This compound is also known as N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-pentyl-1H-indazole-3-carboxamide.

2. AB-CHMINACA
This compound is also known as
N-[(1S)-1-(aminocarbonyl)-2-methylpropyl]-1-(cyclohexylmethyl)-1H-indazole-3-carboxamide.

Analytical Methods: 2 GC-FID (Gas Chromatograph – Flame Ionization Detector)
4 GC-MS (Gas Chromatograph – Mass Spectrometer)
2 Macroscopic / Microscopic Visual Examination

LaToya Binder, B.S., F-ABC

HARRIS COUNTY INSTITUTE OF FORENSIC SCIENCES
1861 Old Spanish Trail
Houston, TX 77054-2001
Phone: 832-927-5005 FAX: 832-927-2876

AMENDED DRUG CHEMISTRY REPORT

Report Date

LABORATORY NUMBER: Lab No

Submission Form Information
SUSPECT: Suspect

CASE OFFICER: R. Johnson
Harris County Constable, Pct. 1-P
1302 Preston
Houston, TX 77002

OFFENSE NUMBER:

SUBMISSION INFORMATION:

On 1/15/2015 the following submissions were received from S. Jones.

Submission 001 - Plastic evidence bag

On 4/24/2018 the following submissions were received from L. Gomez.

Submission 001 - Plastic evidence bag

EVIDENCE DESCRIPTIONS, RESULTS OF ANALYSIS AND INTERPRETATIONS:

Item 1 (Contained within Submission 001)

(1) Cracked partially burned brown cigar containing green leafy substance

Multiple Compounds Detected
Net Weight: 0.007 ± 0.002 oz. (95.45% Level of Confidence)

1. AB-PINACA
This compound is also known as N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-pentyl-1H-indazole-3-carboxamide.

2. AB-CHMINACA
This compound is also known as
N-[(1S)-1-(aminocarbonyl)-2-methylpropyl]-1-(cyclohexylmethyl)-1H-indazole-3-carboxamide.

Analytical Methods: GC-FID (Gas Chromatograph – Flame Ionization Detector)
GC-MS (Gas Chromatograph – Mass Spectrometer)
Macroscopic / Microscopic Visual Examination

AMENDED REPORT. AMENDMENT DOES AFFECT EXAMINATION RESULT.

Evidence Disposition: All evidence items are being returned and may be stored at room temperature.

Sample Drug Laboratory Reports: Example 2

Sample Drug Laboratory Reports: Example 3

- **Questions:**
- What tests performed?
- Tests in accordance to the SOP?
  - Microscopic Examination
  - GC-MS
- Data Print out
  - Blank
  - Quality Assurance Procedures According to SOP

Houston Forensic Science Center
Forensic Analysis Division
Controlled Substances Section
1200 Travis Street, Houston, Texas 77002
(713) 308-2600

FQS ACCREDITED
FORENSIC TESTING
ISO/IEC 17025

Incident Number: [redacted]
Forensic Case Number: [redacted]
Report Date: [redacted]

Laboratory Report #1

Reference: N/A
Suspect(s): Suspect 1 [redacted]
Suspect 2 [redacted]

Items of Evidence:

Item	Description
1	sealed evidence envelope
1.1	brown cloth "Crown Royal" bag containing sealed plastic "Foodsaver" bag containing plant substance

Results and Interpretations:

Item	Net Weight	Results
1.1	1.97 ounces	Marihuana

Unless otherwise noted above: All reported items were individually identified by at least two tests including GC/MS or FTIR, all reported items identified as marihuana included a microscopic examination and at least one other test, and reported net weights do not include packaging.

Items of evidence not listed under Results and Interpretations were retained with no analysis.

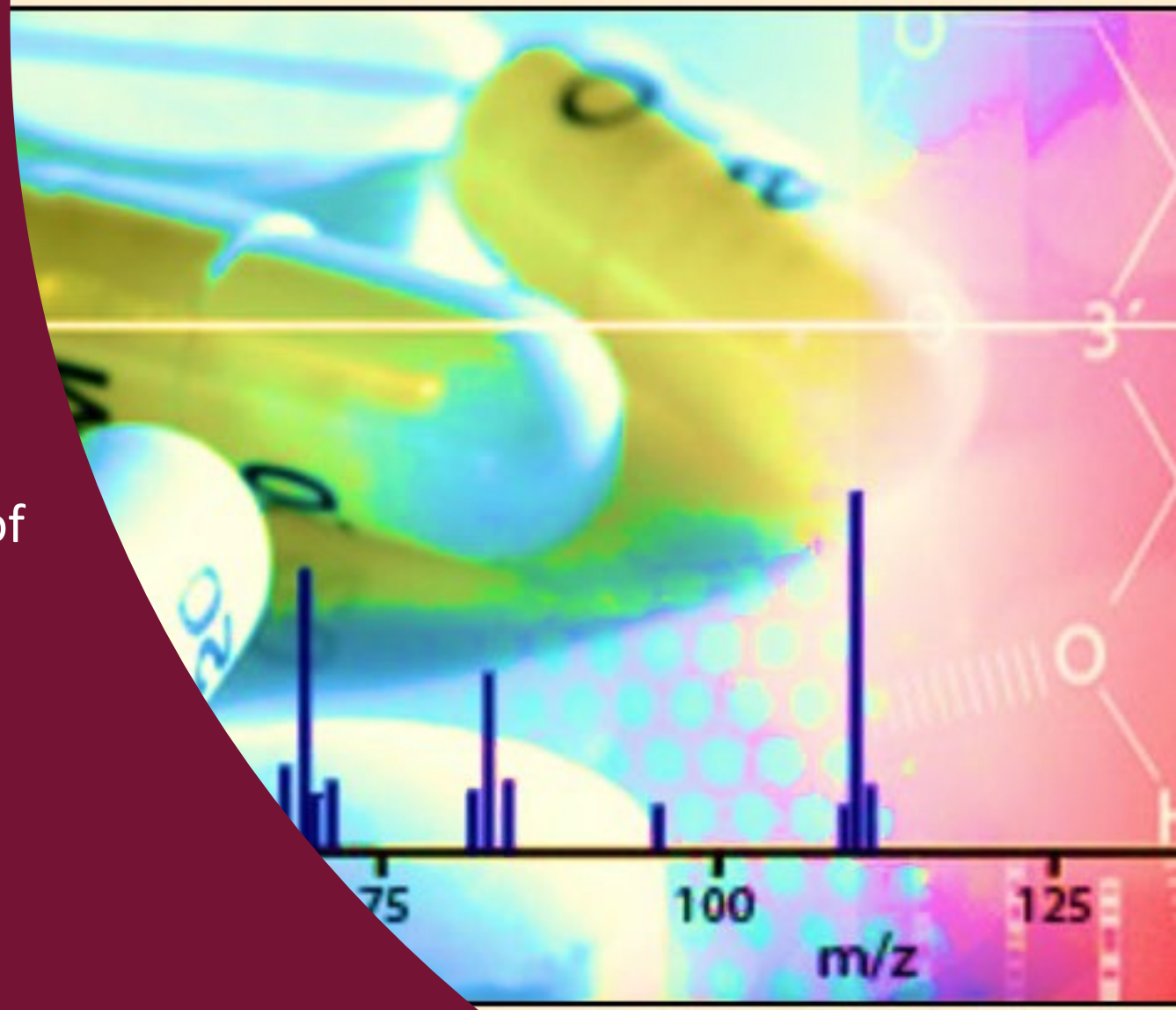
Scott F. Vajdos
Forensic Analyst
Assigned Analyst

WHAT CAN BE CHALLENGED?

- Collection Procedures (Blood, Urine).
- Seized Drugs Collected?
- Eliminate the association between the evidence and the client.
- Is Finding Based on the Science or an opinion? How did expert come up with the Opinion?
- What's the Burden of Proof? Who made the call? Medical Examiner or Coroner?
- Create doubt in the expert's testimony about the evidence

Application – *Ipse dixit*
(assertion without Proof)

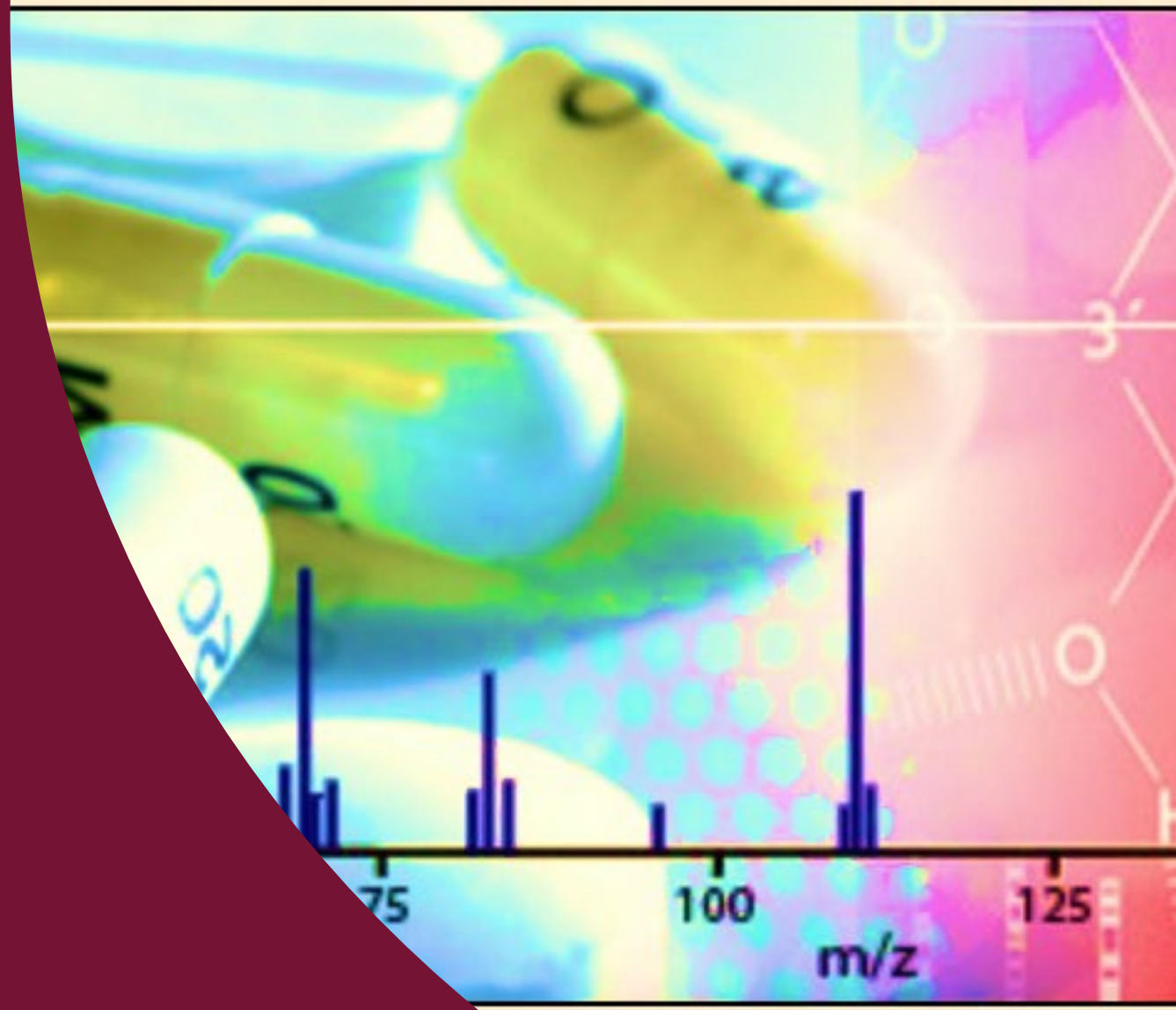
- The expert must provide basis for opinion
  - Case file versus “one liner”
  - “I performed tests” versus the output of those tests
  - Legal opinion versus scientific observation



SCOPE OF TESTIMONY

- Is the report or testimony a scientific finding, a policy decision, an interpretation of the law?

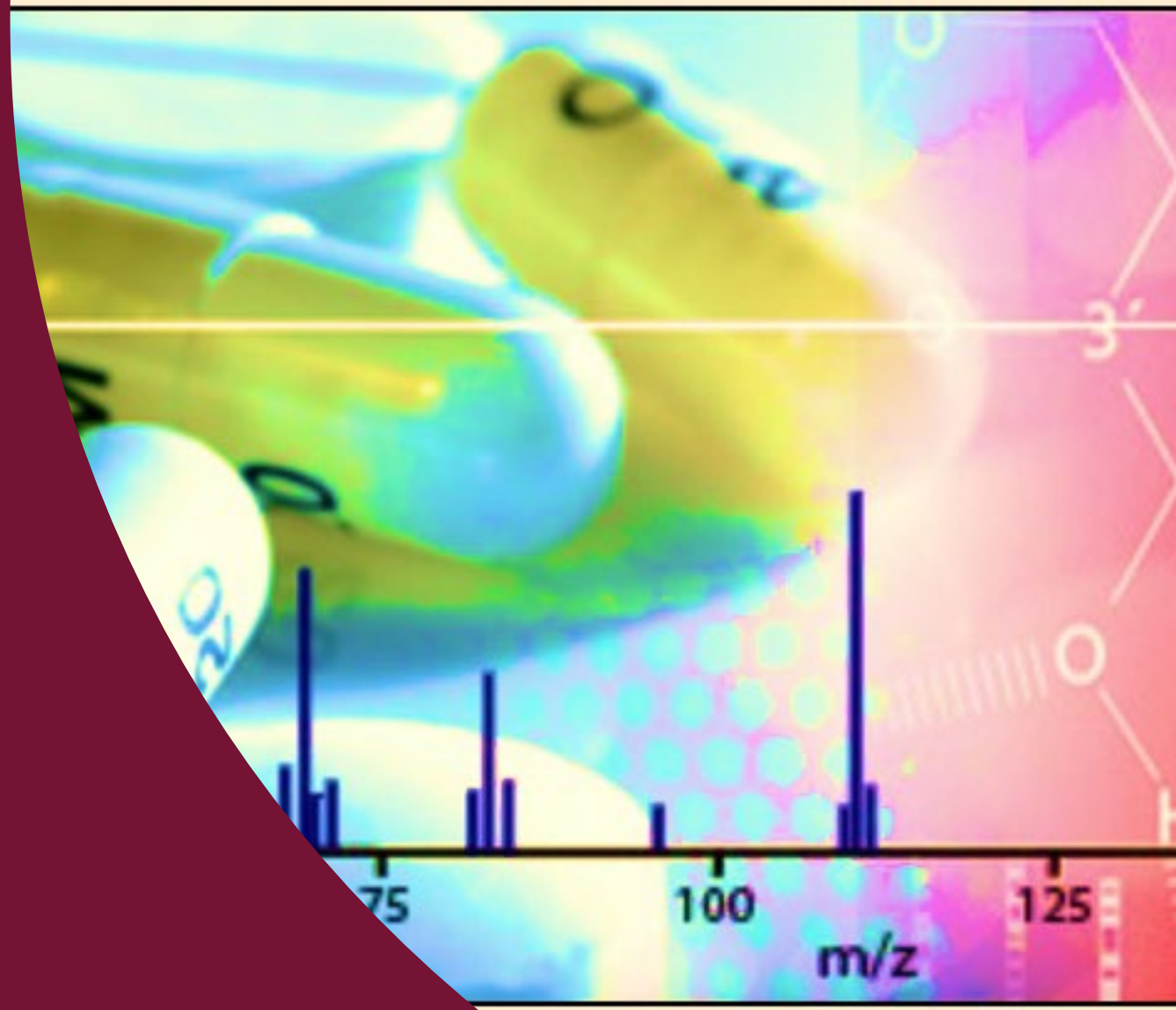
- Is the analyst staying within the scope of their experience?



METHOD - SUFFICIENT TESTING

Freedom or imprisonment - worth a second opinion?

- Test different portion of sample
  - Post-mortem vs. Antemortem Sample Collection
- Second confirmatory test
- Deriving chemical structure manually
- Consulting reference manuals
- Independent testing



US news

Toxicology report indicates Tyler Skaggs died of an accidental overdose

A medical examiner determined that the Los Angeles Angels pitcher died from an overdose of drugs and alcohol. A statement from the deceased player's family says the combination of drugs and alcohol indicated by the report is "completely out of character for someone who worked so hard to become a Major League Baseball player."

Tarrant County Medical Examiner's Office
200 Feliks Gwozdz Place
Fort Worth, TX 76104
(817) 920-5700

Nizam Peerwani M.D., DABFP
Chief Medical Examiner

Robert Johnson Ph.D., F-ABFT
Chief Toxicologist

Toxicology Laboratory

Forensic Toxicology Results

TCME Case #:1911392
Toxicology Work # : 1902625
Service Request No:002
Case Name : Tyler Wayne Skaggs

Agency :TCME

Items: Exhibit Number(s)

7	Toxicology Specimens
7.1	Blood, Subclavian
7.2	Blood, Femoral
7.3	Blood, Femoral
7.4	Urine
7.5	Vitreous Humor

Specimen/Analyte	Result	Instrument	Performed by
7.2 Blood, Femoral			
Ethanol	0.122 g/dL	GC FID	K. Scott
Oxymorphone	Positive	LC MS	L. Hazard
Oxycodone	38 ng/mL	LC MS	L. Hazard
Fentanyl	3.8 ng/mL	LC MS	L. Hazard
7.1 Blood, Subclavian			
Acid / Neutral Drugs	None Detected	LC MS	C. Lewis
7.4 Urine			
Ethanol	0.161 g/dL	GC FID	K. Scott
Fentanyl	Positive	LC MS	L. Hazard
Oxycodone	Positive	LC MS	L. Hazard
Oxymorphone	Positive	LC MS	L. Hazard
7.5 Vitreous Humor			
Ethanol	0.140 g/dL	GC FID	K. Scott

Immunoassay screening (ELISA) was used to screen for the following drugs or drug classes: amphetamine, methamphetamine, benzodiazepines, cocaine, opiates, cannabinoids, oxycodone, and fentanyl(s), and, if positive, confirmed quantitative/qualitative results are reported above.

The absence of an exhibit number indicates that the item was not tested or the item was screened and not used for the purposes of generating a reported result.

Robert Johnson Ph.D., F-ABFT — Date 7/15/19

Page 1 of 1

Tested Positive for Oxymorphone, Oxycodone, and Fentanyl

An initial toxicology report for Ms. Bland, who died in a jail in Waller County, Tex., on July 13, showed that she had marijuana in her system after her death.

HARRIS COUNTY INSTITUTE OF FORENSIC SCIENCES
1885 Old Spanish Trail
Houston, Texas 77054-2001
Phone: 713-796-6830 Fax: 713-796-6838

LABORATORY REPORT
July 21, 2015

LABORATORY NUMBER: OC15-030

Deceased: SANDRA ANNETTE BLAND

Submitted By:
Sara N. Doyle, M.D.
Assistant Medical Examiner
Harris County Institute of Forensic Sciences
1885 Old Spanish Trail
Houston, TX 77054

Agency Number: OC15-030
Submission Date: July 14, 2015

Specimen: Blood (femoral)

Analyte	Result	Analytical Method	Analyst
Delta-9-tetrahydrocannabinol	18 ± 4 ug/L	GC/MS/MS	D. Mike
Norcarboxytetrahydrocannabinol	120 ± 27 ug/L	GC/MS/MS	D. Mike

Specimen: Blood (femoral)

Analyte	Result	Analytical Method	Analyst
Ethanol, Methanol, Isopropanol, Acetone	None Detected	Headspace GC	A. Salazar

Specimen: Blood (subclavian)

Analyte	Result	Analytical Method	Analyst
Amphetamine	None Detected	Immunoassay - ELISA	M. Lenoir
Barbiturates	None Detected	Immunoassay - ELISA	M. Lenoir
Benzodiazepines	None Detected	Immunoassay - ELISA	M. Lenoir
Cocaine Metabolite	None Detected	Immunoassay - ELISA	M. Lenoir
Methadone	None Detected	Immunoassay - ELISA	M. Lenoir
Methamphetamine	None Detected	Immunoassay - ELISA	M. Lenoir
Opiates	None Detected	Immunoassay - ELISA	M. Lenoir
Phencyclidine	None Detected	Immunoassay - ELISA	M. Lenoir

INSTITUTE OF FORENSIC SCIENCES
JUL 22 2015
RECEIVED
RECORDS CUSTODIAN

Level of Confidence: The uncertainty value for ethanol represents an expanded uncertainty expressed at the 99.73% level of confidence. The uncertainty values for all other analytes represent an expanded uncertainty expressed at the 95.45% level of confidence.

Anna Kelly, Ph.D.
Technical Reviewer
Toxicologist II Specialist
July 21, 2015

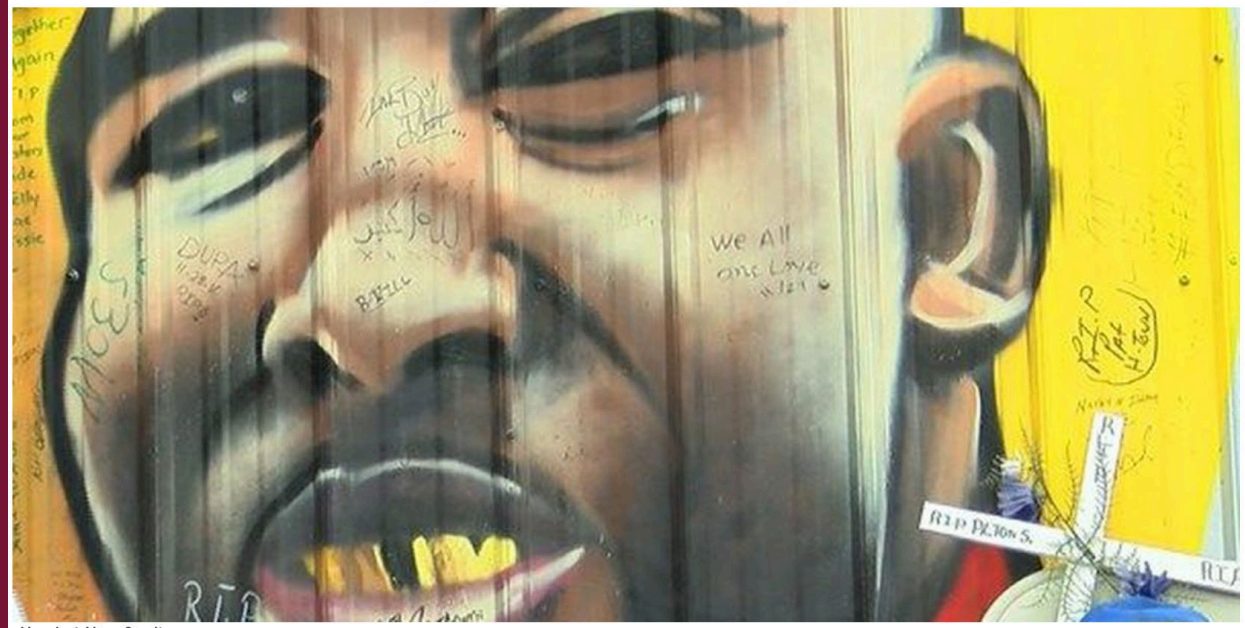
Fessessework Guale, DVM, D-ABVT, D-ABFT-FT
Expert Reviewer
Toxicology Analytical Operations Manager
July 21, 2015

Medical Examiner's Initial 7/22/15

Unless otherwise requested, toxicology specimens will be discarded one year after date of receipt.

This Laboratory is Accredited by ASCLD/LAB-*International* and ABFT.

Medical expert weighs in on Sterling toxicology report



Mural of Alton Sterling

Blood and urine tests revealed among those substances were various levels of alcohol, caffeine, amphetamines, methamphetamines, cocaine, opiates, and several forms of THC, which is the active ingredient in marijuana.

NMS LABS

CONFIDENTIAL

Workorder 16208842
Chain 16208842
Patient ID 096-EBR16

Page 2 of 7

ID	Tube/Container	Volume/ Mass	Collection Date/Time	Matrix Source	Miscellaneous Information
004	White Plastic Container	40 mL	07/05/2016 10:30	Urine	
005	White Plastic Container	23.47 g	07/05/2016 10:30	Liver Tissue	
006	White Plastic Container	18 mL	07/05/2016 10:30	Gastric Fluid	CHUNKY ORANGE FLUID, pH=3

All sample volumes/weights are approximations.
Specimens received on 07/09/2016.

Detailed Findings:

Analysis and Comments	Result	Units	Rpt. Limit	Specimen Source	Analysis By
Ethanol	29	mg/dL	10	001 - Chest Blood	Headspace GC
Blood Alcohol Concentration (BAC)	0.029	g/100 mL	0.010	001 - Chest Blood	Headspace GC
Caffeine	Positive	mcg/mL	1.0	001 - Chest Blood	LC/TOF-MS
Nicotine	Positive	ng/mL	100	001 - Chest Blood	LC/TOF-MS
Amphetamine	23	ng/mL	5.0	001 - Chest Blood	LC-MS/MS
Methamphetamine	280	ng/mL	5.0	001 - Chest Blood	LC-MS/MS
Cocaine	26	ng/mL	20	001 - Chest Blood	GC/MS
Benzoylecgonine	130	ng/mL	50	001 - Chest Blood	GC/MS
Hydrocodone - Free	<5.0	ng/mL	5.0	001 - Chest Blood	LC-MS/MS
Delta-9 Carboxy THC	13	ng/mL	5.0	001 - Chest Blood	LC-MS/MS
Delta-9 THC	3.8	ng/mL	0.50	001 - Chest Blood	LC-MS/MS
Ethanol	Confirmed	mg/dL	10	001 - Chest Blood	Headspace GC
Ethanol	34	mg/dL	10	003 - Vitreous Fluid	Headspace GC
Opiates	Presump Pos	ng/mL	300	004 - Urine	EIA
This test is an unconfirmed screen. Confirmation by a more definitive technique such as GC/MS is recommended.					
Cocaine / Metabolites	Presump Pos	ng/mL	150	004 - Urine	EIA
This test is an unconfirmed screen. Confirmation by a more definitive technique such as GC/MS is recommended.					
Cannabinoids	Presump Pos	ng/mL	20	004 - Urine	EIA
This test is an unconfirmed screen. Confirmation by a more definitive technique such as GC/MS is recommended.					
Amphetamines	Presump Pos	ng/mL	500	004 - Urine	EIA
This test is an unconfirmed screen. Confirmation by a more definitive technique such as GC/MS is recommended.					
Fentanyl	None.Detected	ng/mL	1.0	004 - Urine	LC-MS/MS
Norfentanyl	None.Detected	ng/mL	1.0	004 - Urine	LC-MS/MS

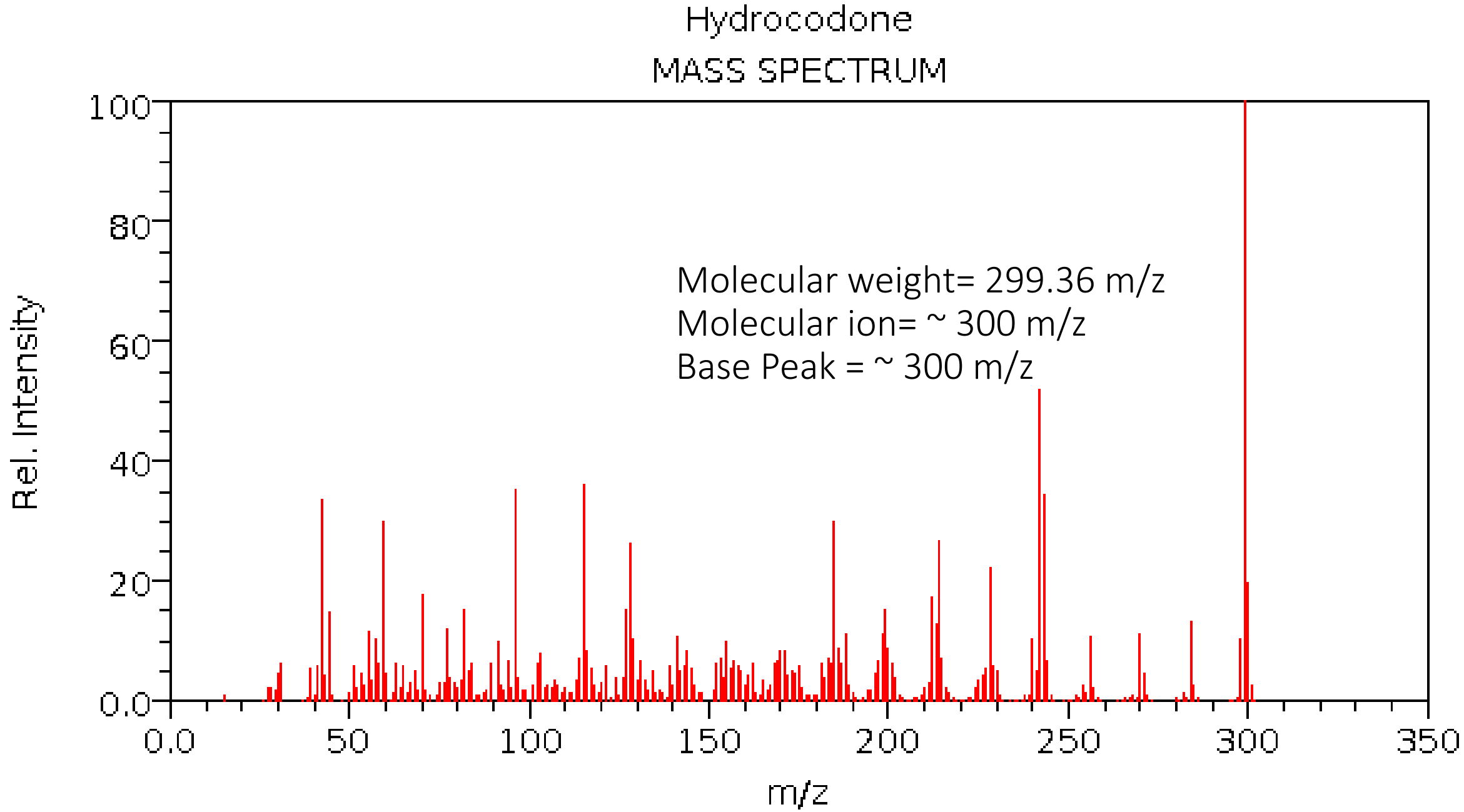
Other than the above findings, examination of the specimen(s) submitted did not reveal any positive findings of toxicological significance by procedures outlined in the accompanying Analysis Summary.

Reference Comments:

1. Amphetamine - Chest Blood:

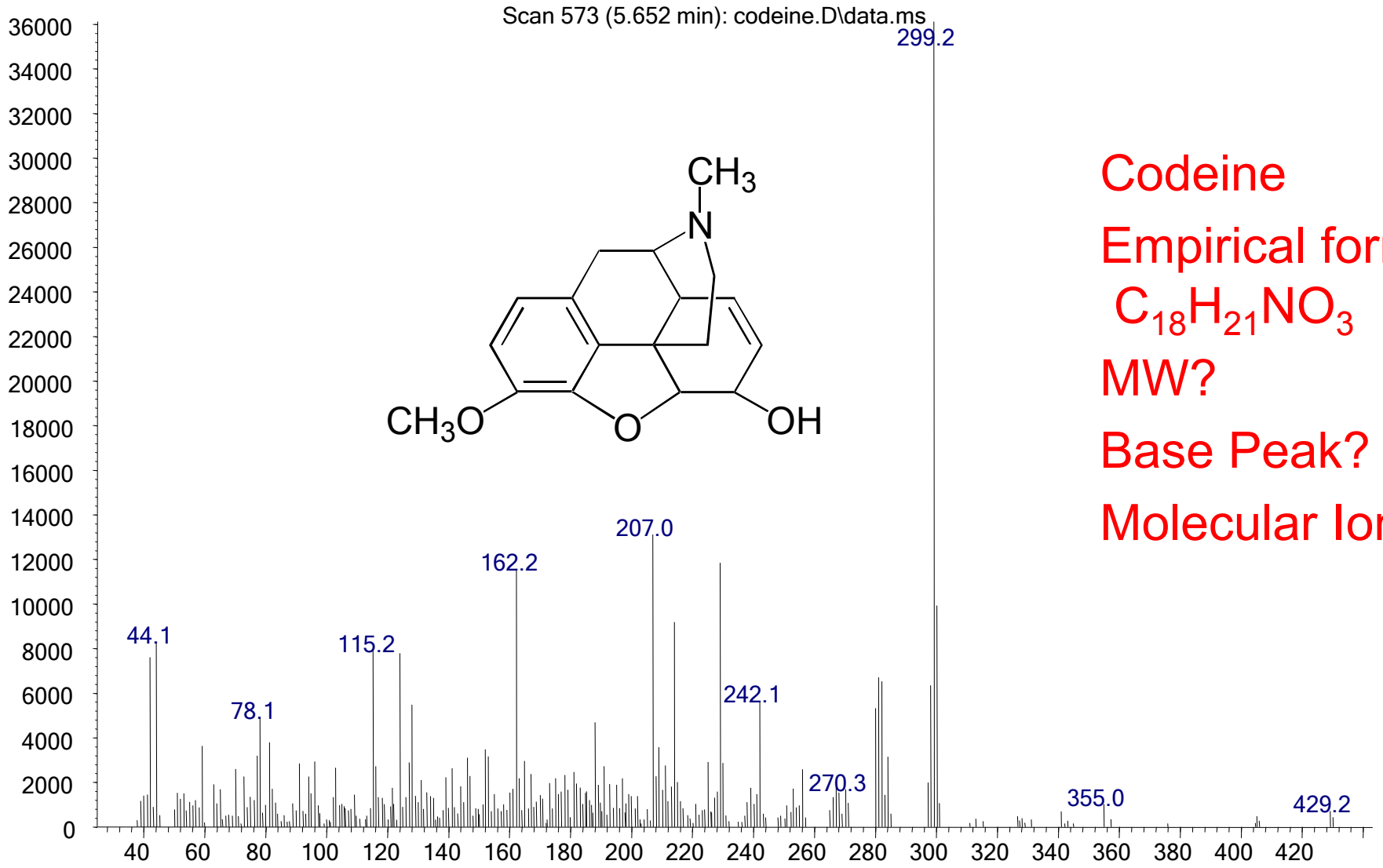
   Amphetamine (Adderall, Dexedrine) is a Schedule II phenethylamine CNS-stimulant. It is used therapeutically in the treatment of narcolepsy and obesity and also in the treatment of hyperactivity in children. Amphetamine has a high potential for abuse. When used in therapy, initial doses should be small and increased gradually. In the treatment of narcolepsy, amphetamine is administered in daily divided doses of 5 to 60 mg. For obesity and children with attention deficits, usual dosage is 5 or 10 mg daily.

NMS v.16.0



NIST Chemistry WebBook (http://webbook.nist.gov/chemistry)

Examples



Codeine

Empirical formula

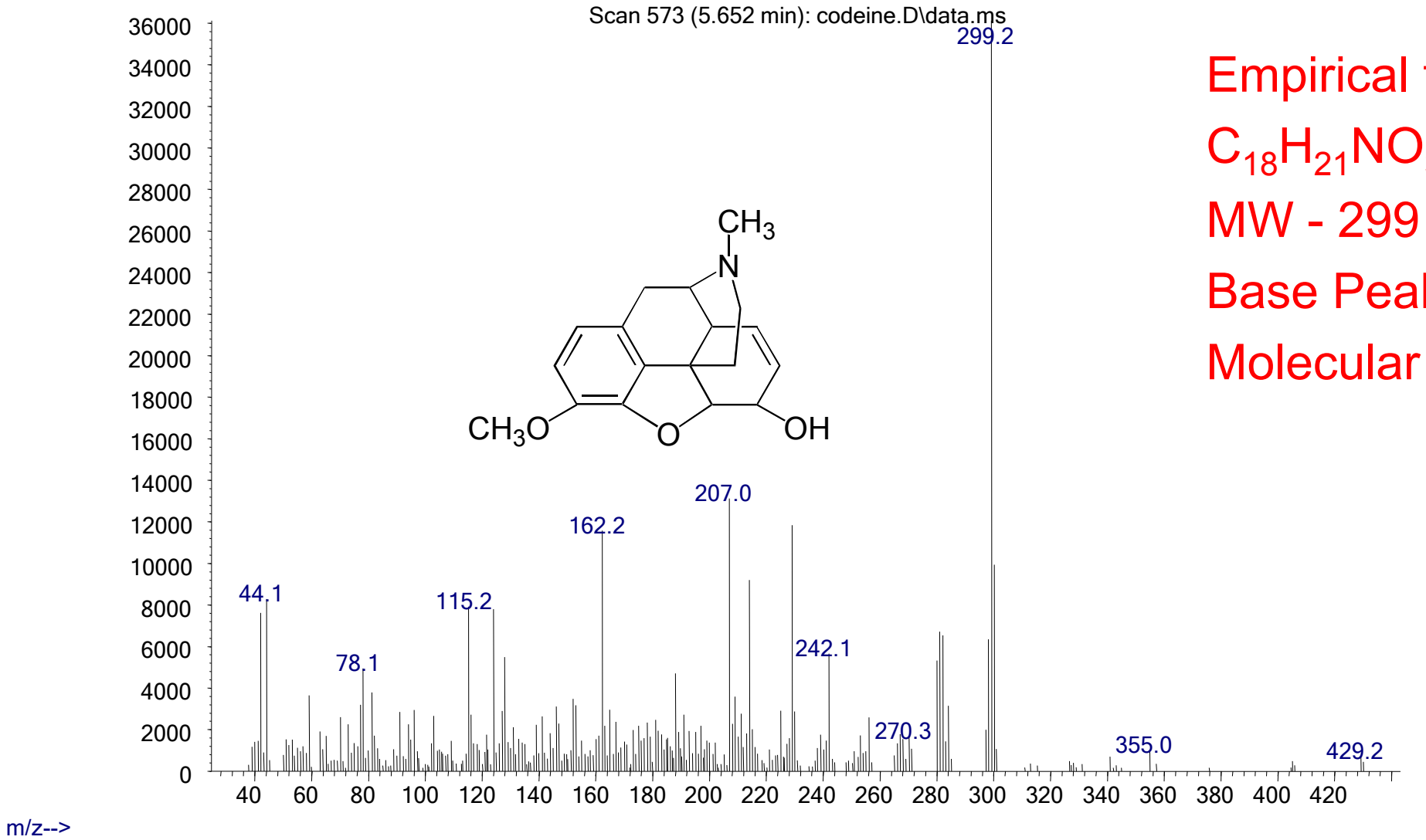
$C_{18}H_{21}NO_3$

MW?

Base Peak?

Molecular Ion?

Examples



Empirical formula

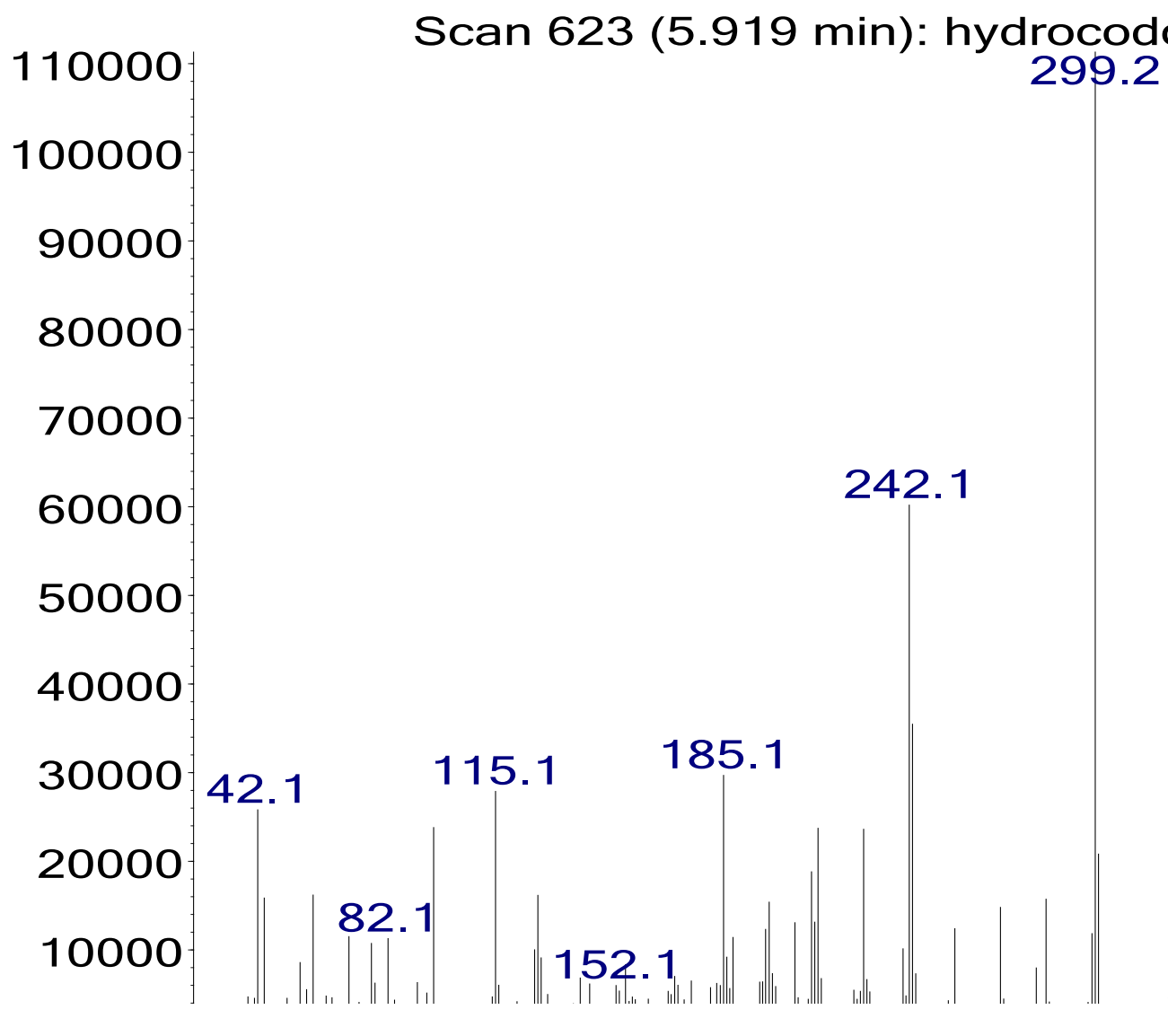
$C_{18}H_{21}NO_3$

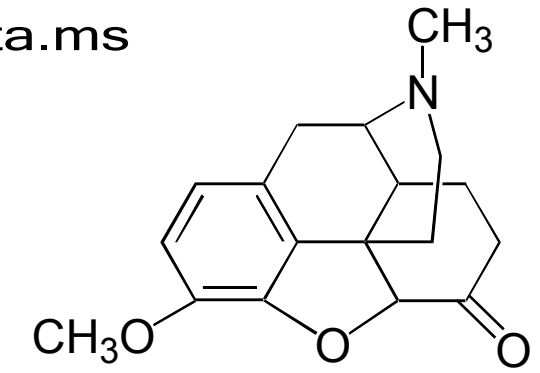
MW - 299

Base Peak - 299

Molecular Ion - 299

Examples





Hydrocodone:

Empirical formula

$C_{18}H_{21}NO_3$

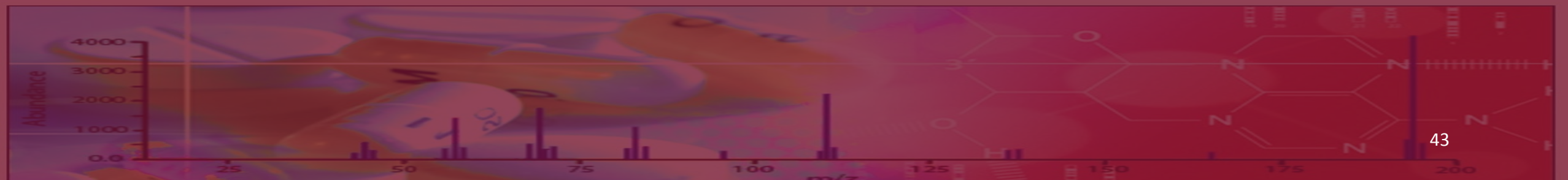
MW?

Base Peak?

Molecular Ion?

Maintenance and Quality Controls Procedures Performed Correctly According to SOPs?

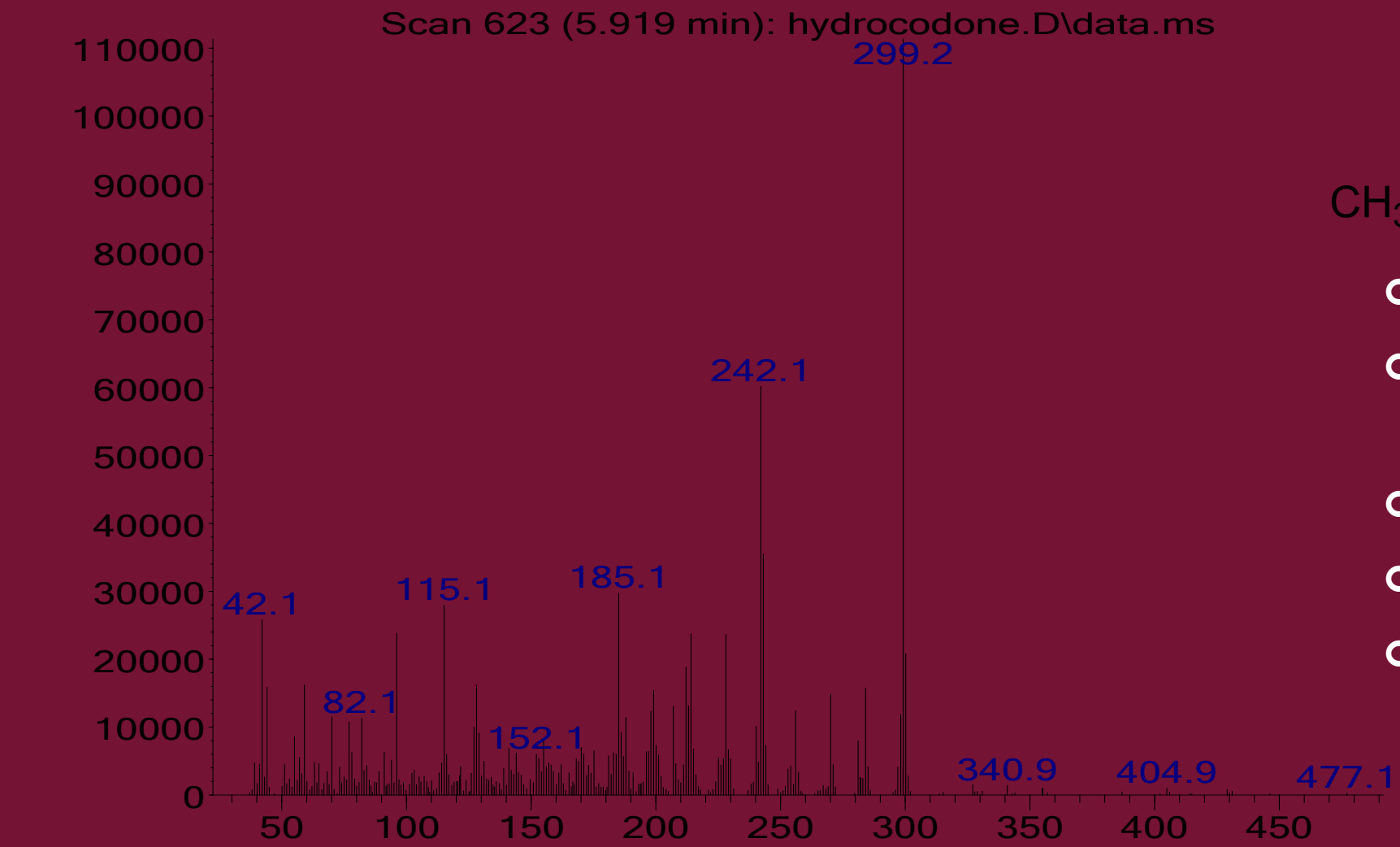
- Daily Autotune
- Quality Control Standards
- Change Septum and Liners
- Run Blanks
- Internal Standard

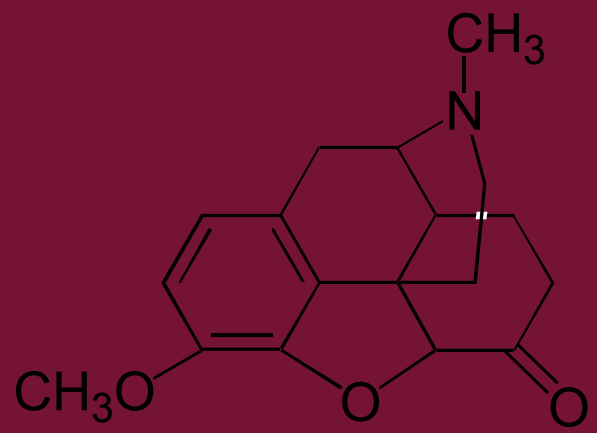


QUESTIONS?

Dr. Jasmine M. Drake, Assistant Professor
Administration of Justice Department
Forensic Science Learning
Graduate Program Director
Jasmine.drake@tsu.edu

Examples

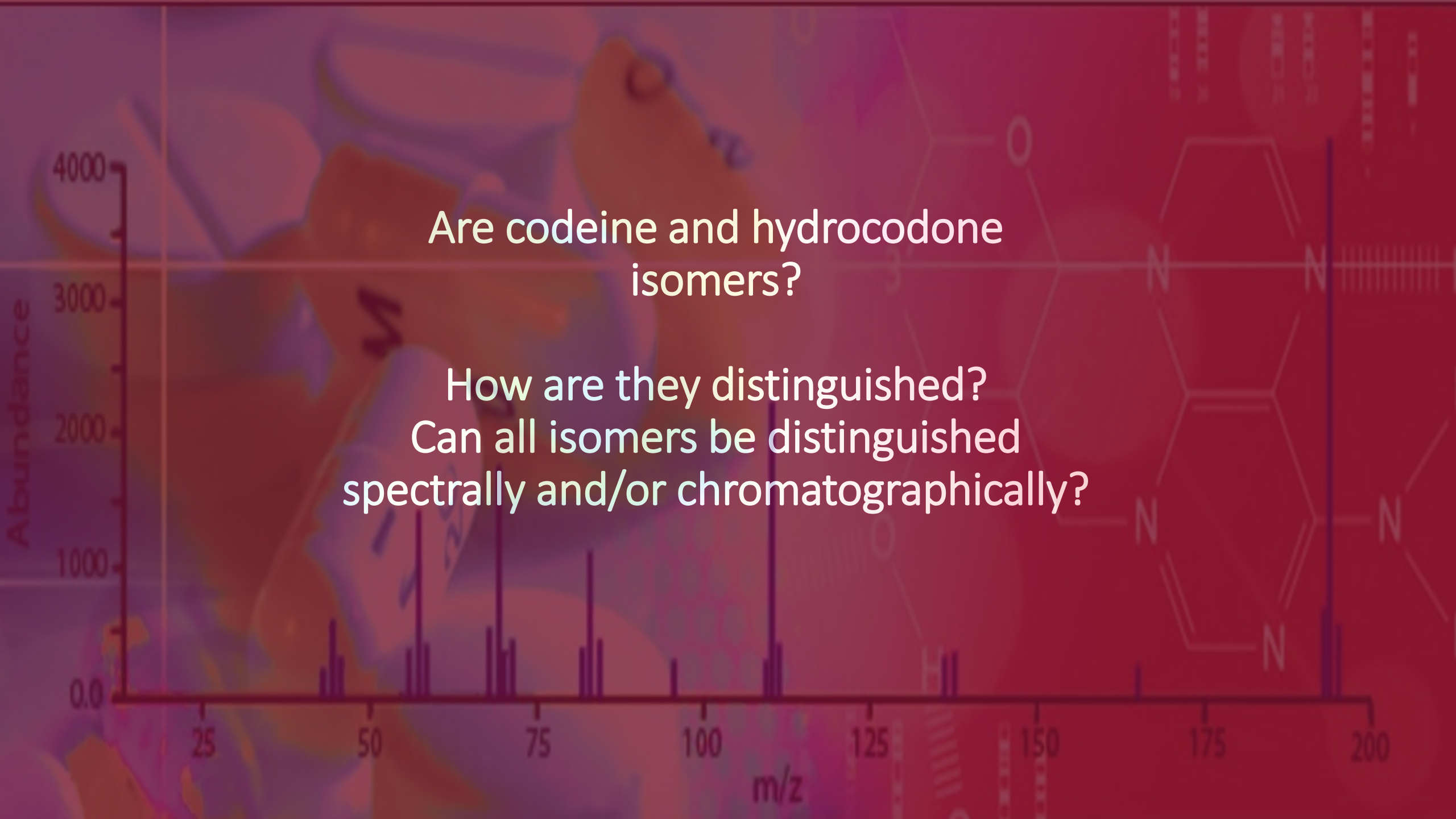




- Hydrocodone
- Empirical formula $C_{18}H_{21}NO_3$
- MW - 299
- Base Peak - 299
- Molecular Ion - 299

Are codeine and hydrocodone isomers?

How are they distinguished?
Can all isomers be distinguished spectrally and/or chromatographically?



A Path Forward: Strategies for Addressing the Opioid Epidemic in Minority Communities

- Culturally sensitive solutions for addressing the opioid problem in these communities
- Consider Socioeconomic factors, such as disparities in access to affordable healthcare that may also create barriers for minorities seeking help from rehabilitative treatment facilities
- Create evidence-based policies- consider cultural experiences of these populations
  - Policies should focus on key issues and culturally sensitive solutions to coping with this epidemic
    - Exploring minority relations with the criminal justice system
    - Increasing the availability of faith-based rehabilitative treatment alternatives
    - Availability of low-cost rehabilitative treatment facilities

Factors that Contribute to the Problem in Minority Communities

- Increasing threat of the opioid epidemic impact on urban, minority communities may be attributed to several factors
  - under-prescribing of prescription opioids to minorities
  - the availability of potent new non-methadone synthetic opioids
  - and the lack of evidence-based treatment solutions.

- Racial disparities in the under-prescribing of prescription medications in urban communities may cause minorities to access illicit preparations of these drugs, which are often laced with potent synthetic opioids like fentanyl and carfentanil.

- Significant spike in the number of opioid overdoses, which may be linked to the availability of synthetic opioids.
  - Addition of these potent synthetic opioids to street drugs and counterfeit pill preparations, which are available on the black market, may also be linked to the increased rates of overdoses over recent years in minority communities.

- According to CDC data, the reported number of cocaine overdoses for blacks doubled from 1.6 per population of 100,000 in 2003 to 4.3 per population of 100,000 in 2017.

"Locally criminal reform efforts have not had the benefit of academic research to provide the baseline and ongoing data collection and analysis necessary to evaluate their success or failure. By focusing on sound research practices pre- and post-reform, Center for Justice Research will help elected officials like me assess our progress."
~ Kim Ogg, Harris County District Attorney

"For years, Texas Southern has been a leader in research and problem solving in our under-served communities."
~ Sheila Jackson Lee, Member of Congress

CENTER FOR JUSTICE RESEARCH
E.O. Bell Building, Office 24
3100 Cleburne Street
Houston, Texas 77004
(713) 313-7813

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centerforjusticeresearch.org

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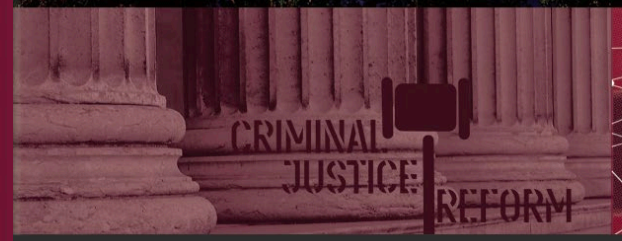
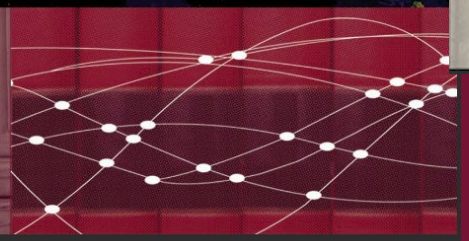
TEXAS SOUTHERN UNIVERSITY

Barbara Jordan – Mickey Leland
School of Public Affairs
Center for Justice Research





About the Center

Founded in January 2018, the Center for Justice Research is a research center devoted to data-driven solutions for an equitable criminal justice system. The primary focus is to produce innovative solutions to local criminal justice reform efforts by utilizing an experienced research collective. Ultimately, ensuring that our results are disseminated to key policy makers, justice-oriented decision-makers and community stakeholders. We stand as the only university level criminal justice research center situated on the campus of a historically black college or university. By bringing together a diverse set of expertise with the single goal of improving the criminal justice system, our projects support the multi-partisan push towards criminal justice reform.

In effect, we seek to serve as a Center focused on:

ADVANCING POLICE-COMMUNITY RELATIONS

DETERMINING THE INFLUENCE OF PREDICTIVE BIAS

UNDERSTANDING THE ROLE OF PROSECUTORIAL DECISION-MAKING