

# BASICS OF BLOOD TESTING; Attacking a DWI Blood Test

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# FORENSIC EXPERTS

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# *Kelly v. State,*

824 S.W.2d 568 (Tex.Crim.App. 1992).

1. The underlying scientific theory must be valid; (Enzymatic Assay Blood Testing)
2. The technique applying the theory must be valid; and
3. The technique must have been properly applied on the occasion in question.  
(site prep, blood draw, sample prep, GC analysis)

# Affidavit and Warrant Issues

- When a challenge is made to the truthfulness of a warrant affidavit on the ground that it contains a falsehood, the court may go behind the affidavit to determine if there is a showing of deliberate falsity. Also, evidence is inadmissible if seized under affidavit that knowingly or recklessly contains false statements material to PC and the remainder is insufficient for PC without the falsity. *Franks v. Delaware*, 438 U.S. 154 (1978); *Harris v. State*, 227 S.W.3d 83 (Tex.Crim.App. 2007). Falsity Hearing: *Dancy v. State*, 728 S.W.2d 772 (Tex.Crim.App. 1987); *Cates v. State*, 120 S.W.3d 352 (Tex.Crim.App. 2003); *Jones v. State*, 907 S.W.2d 850 (Tex.App.—Houston [1st Dist] 1995).
- Affidavit for warrant must be sworn to in person in front of a magistrate or other person in the room. *Aylor v. State*, No. 12-09-00460-CR, 2011 WL 1659887(Tex.App.--Tyler April 29, 2011, pet. ref'd).
- Excessive Force: *Hereford v. State*, 302 S.W.3d 903 (Tex.App.—Amarillo 2009)(brutal means); *Johnston v. State*, 305 S.W.3d 746 (Tex. App.—Fort Worth 2009)(no question of prior medical history).
- Search warrant needs date and time. *State v. Jordan*, 315 S.W.3d 660 (Tex.App.—Austin 2010).



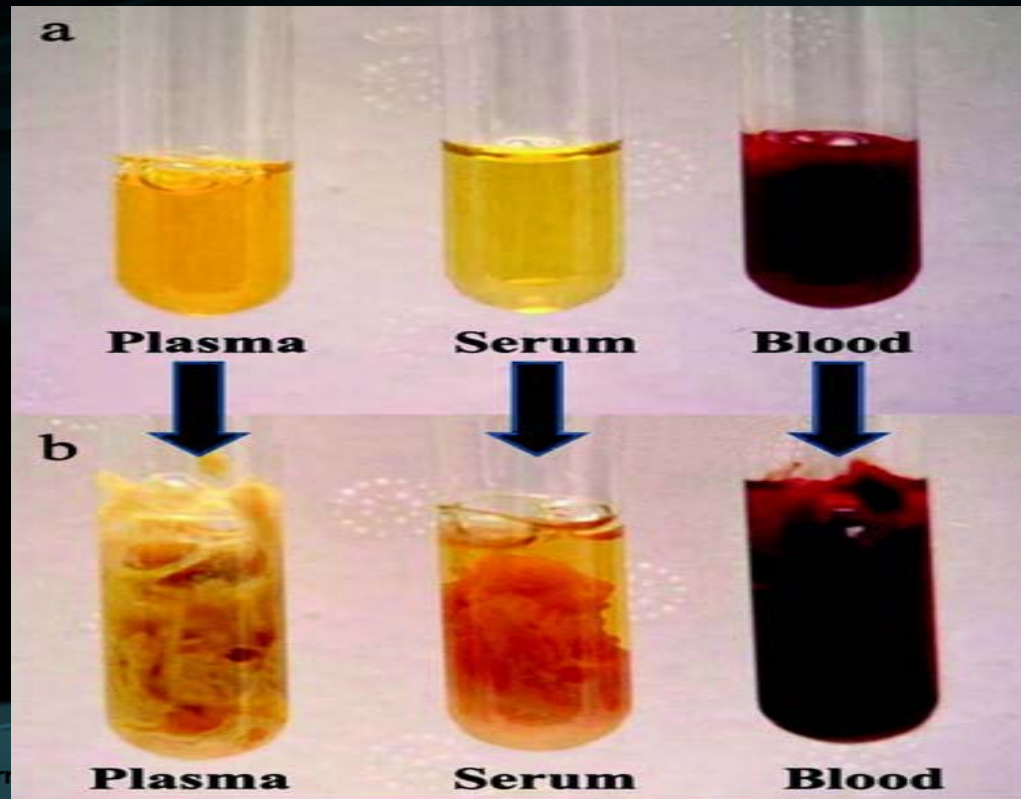
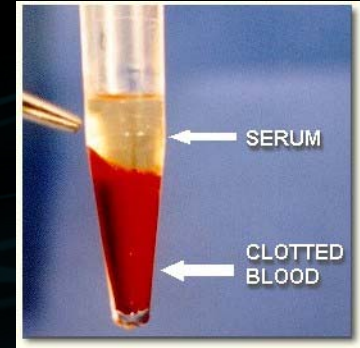
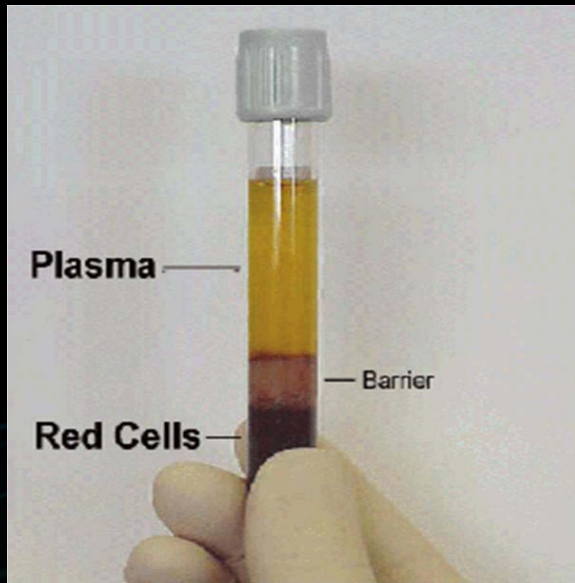
# Who Draws the Blood?

- **ONLY** Physician, qualified technician, chemist, registered professional nurse, or licensed vocational nurse. **TX TRANSP §724.017(a)**.
- A “qualified technician” does not include emergency medical service personnel. **TX TRANSP §724.017(c)**.
- Police Officers are **not** *usually* allowed. ***TXDPS v. Hutcheson***, 235 S.W.3d 312 (Tex.App.—Corpus Christi 2007).
- EMTs **MAY NOT** draw the blood. ***Krause v. State***, NO. 14-11-00884-CR (Tex.App.—Houston [14th Dist.] May 22, 2012).

# What Is Being Tested?

- **Whole Blood** – straight out of your arm. Great for GC testing.
- **Plasma** – centrifuge whole blood, all the cellular material is at the bottom, is yellowish, milky liquid at top. Usually used in Enzymatic Assay. Results in higher BAC. (1.18 18% to 1.59 59%)
- **Serum** – allow whole blood to clot, then centrifuge, is yellowish, clearer liquid at top. Does not contain fibrinogen (clotting element). Results in higher BAC. (1.18 18% to 1.59 59%)

-Edward F. Fitzgerald, Intoxication Test Evidence, § 4:11.1, at 136 (1993); Edward F. Fitzgerald, Intoxication Test Evidence, §19:13, at 9-12-13 (2d ed. 1995).



# GC – Site Prep

- Non-Alcoholic prep pad (TXDPS)
  - Usually betadine, iodine, povidone-iodine
- Concentric Circles – start from center of site and counterclockwise ever widening for 2-3 inches in diameter.

Ruth E. McCall, Phlebotomy Essentials; IV:11 pgs. 280,408 (4<sup>th</sup> ed. 2008).

- **Not** back and forth.



# Blood Extraction

- Vacutainer – the blood tube is pressurized and uses a butterfly needle and holder for gray top tube.
- Or withdraw with needle and shoot into gray topped tube. (not recommended)
- Approx 20ml (2 full gray top tubes)



# How Is It Being Tested?

- ◉ **Gas Chromatography Mass Spectrometry (GCMS)** – The gold standard.
- ◉ **Gas Chromatography (GC)** – liquid (LGC) or head space gas (HSGC). Separation science.
- ◉ **Enzymatic Assay** – EMIT, EIA, usually done in hospital. Indirect method of testing. Not forensically acceptable or reliable.

GAS CHROMATOGRAPHY  
MASS SPECTROMETRY (GC-MS)



Axion Training Institute, Inc.



# GAS CHROMATOGRAPH



Axion Training Institute, Inc.



# GC – Grey Top Tubes

- Sodium Fluoride – Preservative. Glycolysis inhibitor to allegedly prevent fermentation.
- Potassium Oxalate - Anticoagulant
- Invert 8-10 times. Full 180 and back. **NO SHAKING.** See BD Vacutainer protocol sheet.



# Preparing the Sample

- 1. Whole Blood
- 2. N-Propanol – standard throughout samples and controls
- 3. Shouldn't be anything else. If so.....
- HENRY'S LAW: At a constant temperature, the amount of a given gas that dissolves in a given type and volume of liquid is directly proportional to the partial pressure of that gas in equilibrium with that liquid.
- Salting out – adding salting agents to help alcohol rise from the liquid into the headspace
- Pipette – Automatic or Manual? Press passed point? Wipe off? Contamination? Carryover?

# GC – K.I.S.S.

- McShane's Mall Example: Retention Time
  - > 1. Galleria – High fashion: Gucci, Vera Wang, BCBG, Tori Burch, Betsy Johnson, Jimmy Choo, Victoria's Secret, Claire's
  - > 2. Out Door Mall – Best Buy, Sun & Ski Sports, Bass Pro Shops, Game Stop, Nike, Sbarro's

# GAS CHROMATOGRAPH ANIMATION

Thanks to Justin McShane



# THE GAS CHROMATOGRAPH



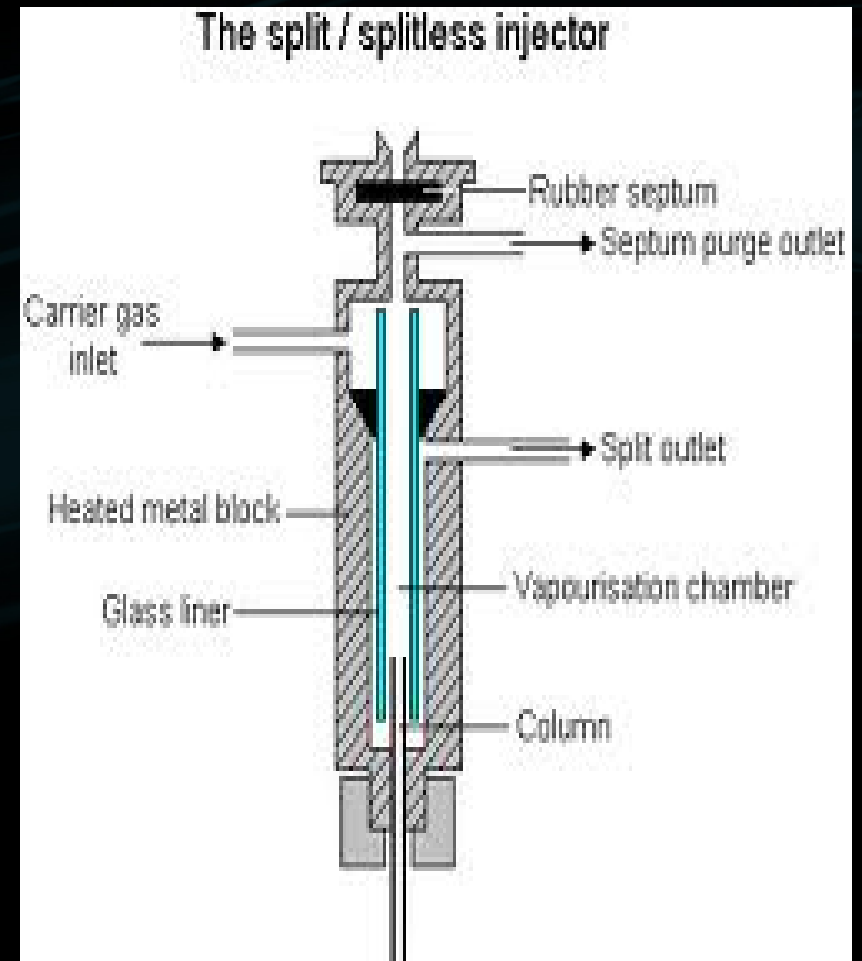
Auto Sampler with GC

# THE GAS CHROMATOGRAPH



Headspace Auto Sampler

# The Injection Port



Axion Training Institute, Inc.

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# Septums





# THE GAS CHROMATOGRAPH



Inside the GC. Axion Training Institute, Inc.

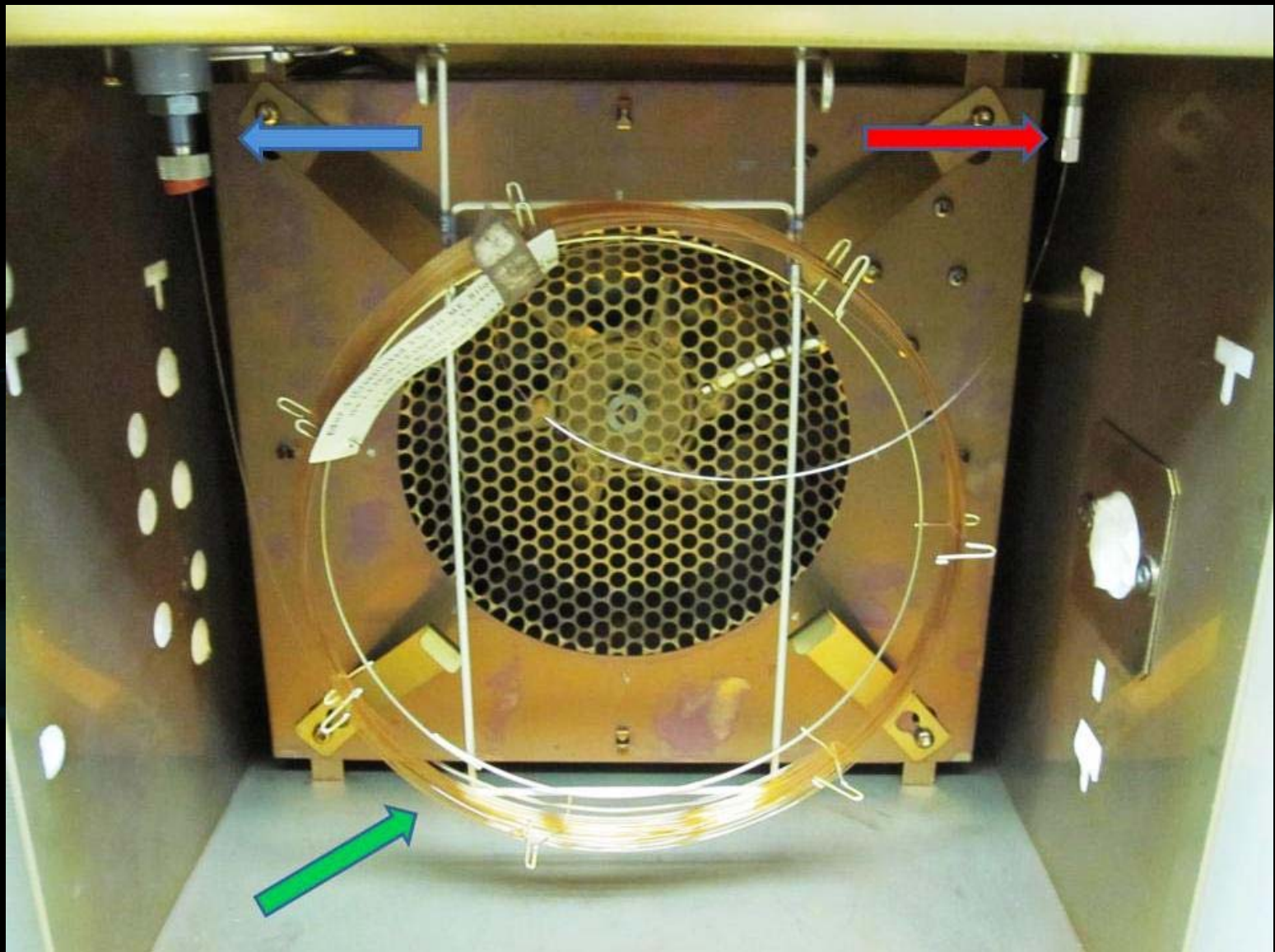
# THE GAS CHROMATOGRAPH



Inside GC. Single Column. Axion Training Institute, Inc.



# THE CAS CHROMATOGRAPH



Inside the GC. Thanks to Justin McShane.

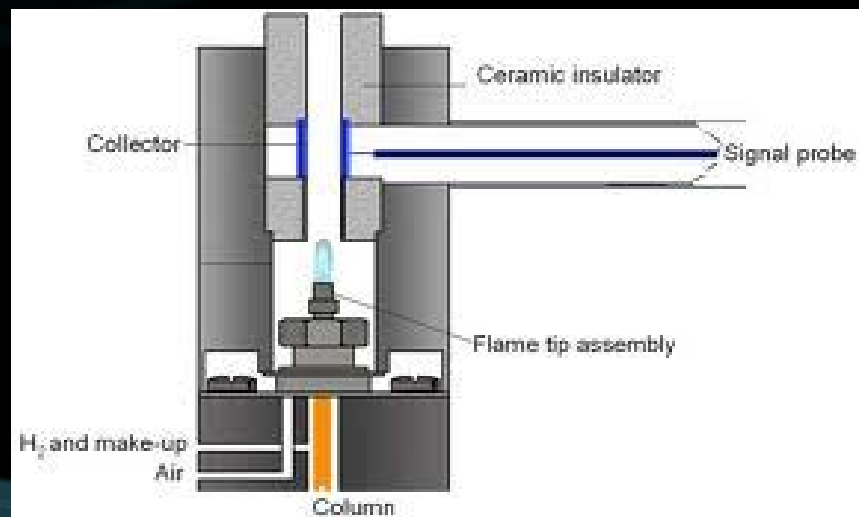
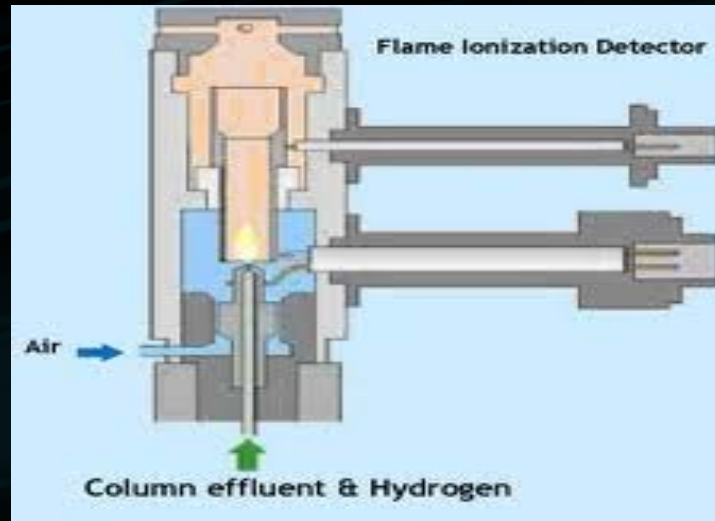
# THE GAS CHROMATOGRAPH



Dual Columns.



# Flame Ionization Detector (FID)



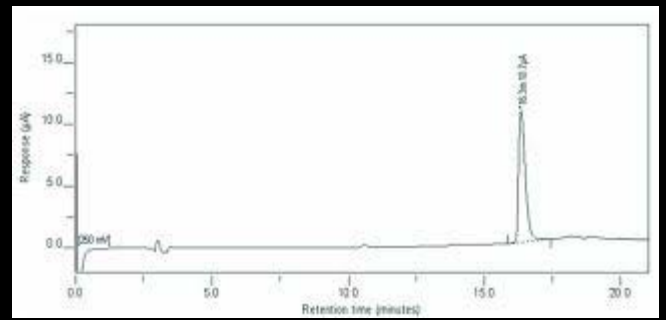
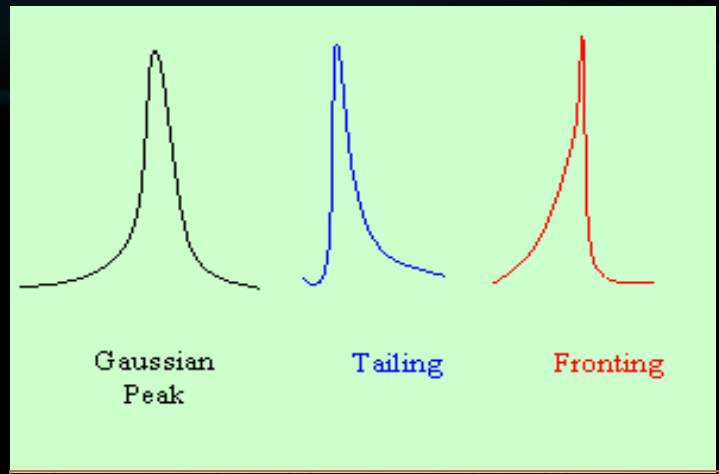
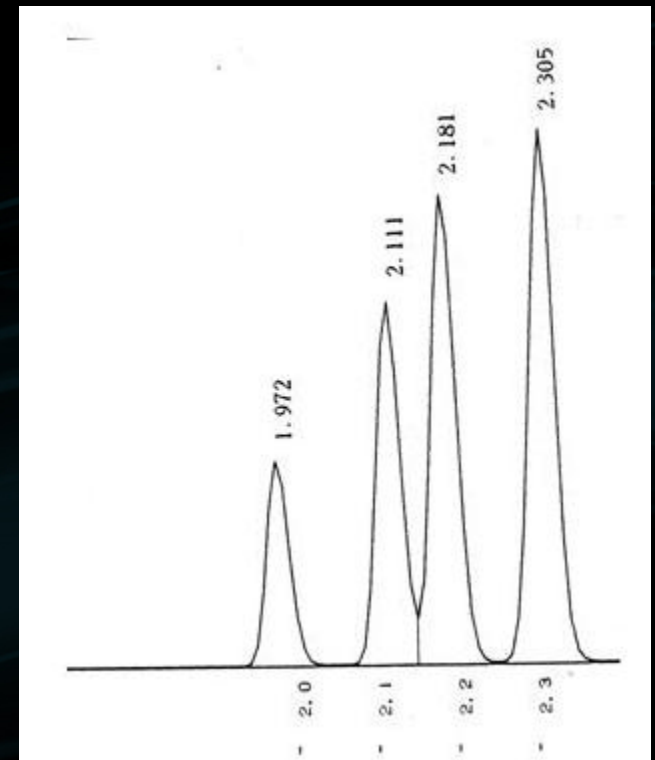
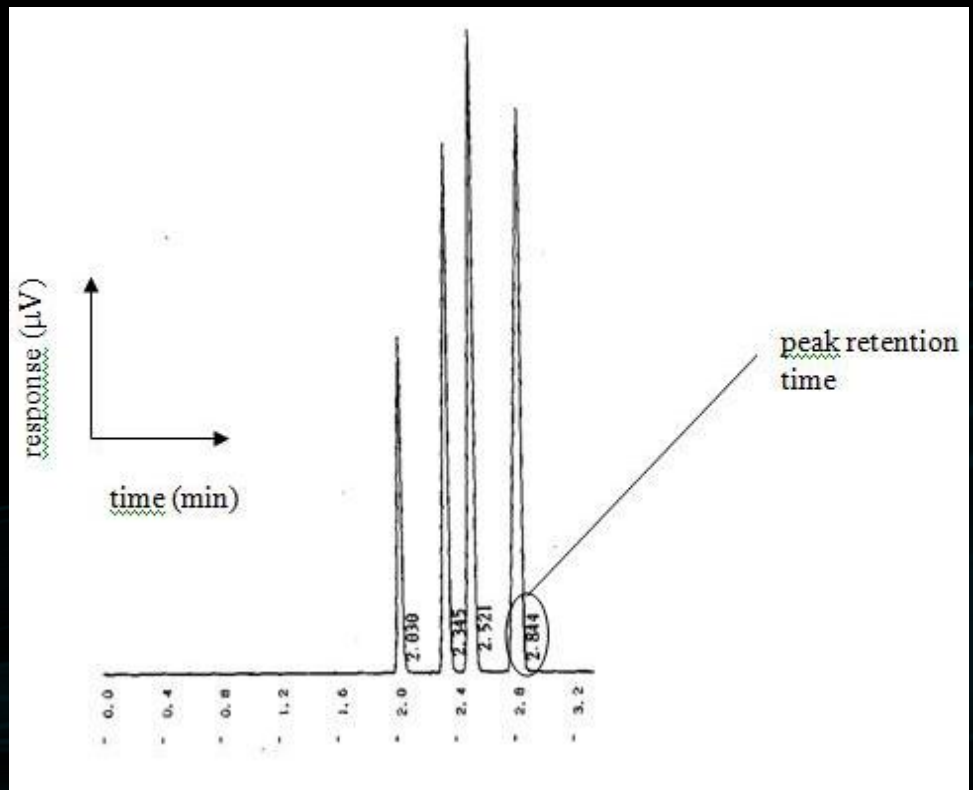
# THE GAS CHROMATOGRAPH ISSUES

- Sample prepared by analyst – human error
- Cleanliness of injector port, liner, septum, y-splitter, column(s), and FID.
- Placed in autosampler – Blanks in between?
- Who created the method?
  - › Temperature and run time can affect separation?
- Clipping the column? (slide w/ balls)
- Replacing parts?
- Forged initials or signatures?

# THE CHROMATOGRAM

- Looking for two things: (1) quality, and (2) quantity.
- Tall, skinny peaks!
- Issues:
  - Fronting, Tailing, Broadening, Co-elution, or Unidentified
  - Baseline drift
  - Evidence of Manual Manipulation
    - No tic marks, area reported on the side, "M" in data, baseline drawn half way through peak

# EXAMPLES



Thanks to Justin McShane and Google Images



# HOSPITAL ENZYMATIC ASSAY

- ◉ Same site prep
- ◉ Collect blood in red top tube
- ◉ Plasma or Serum
  - > Usually Plasma since time is valuable
- ◉ Not for forensic purposes, but save life.
- ◉ Following trauma
  - > Intox Assault and Intox Manslaughter

# HEA Procedure

- Indirect Way of Measuring
- Spectrometry – colorimetric response. Beer-Lambert law. Intoxilyzer 5000
- Blood on slide with Nicotinamide Adenine Dinucleotide (NAD<sup>+</sup>) and Alcohol Dehydrogenase (ADH) which catalyzes the metabolism of alcohol to acetaldehyde.
- **ETOH + NAD<sup>+</sup> -----(ADH)----> Acetaldehyde + NADH + H<sup>+</sup>**
- Light source beams at 340 nanometers, specific for NADH.
- Sample absorbs energy and photodetector on other side computes how much energy actually made it through.
- Colorimetric response is produced, lighter or darker based upon concentration of NADH.
- Measures NADH, NOT alcohol!

# HEA Problems

- Lactate Dehydrogenase (LDH) oxidizes Lactate to Pyruvate using the coenzyme NAD, which also reduces to form NADH.
- **LACTATE + NAD+ -----(LDH)----> PYRUVATE + NADH + H+**
- Lactated Ringers Solution – administered intravenously to combat acidosis for acute fluid loss or renal failure. Or pregnant.
- Lactate – natural compound formed in body as a result of trauma or hypoxia where the tissue is deprived of oxygen.
- Lactate Dehydrogenase (LDH) is naturally in the muscles to breakdown lactate formed after anaerobic exercise and released after a trauma or car crash.

# HEA = Forensically Unacceptable

- **ETOH + NAD<sup>+</sup> + Ringer, Lactate, LDH ----(ADH/LDH)--- --> Acetaldehyde + NADH (but way more) + H**
- Photodetector cannot differentiate between energy absorbed by NADH from the oxidation of ethanol or lactate.
- NADH not specific to ethanol.
- No way to convert this method to whole blood measurement.
- Produces falsely elevated ethanol result. See Nine, Jeffrey S., *Serum-Ethanol Determination: Comparison of Lactate and Lactate Dehydrogenase Interference in Three Enzymatic Assays*, 19 J. Analytical Toxicology 192, 192 (1995); Rose, Stefan M.D., *How False Positive Serum Ethanol Results Occur Using Enzyme-Assay Hospital Tests*, p.1; University Medical and Forensic Consultants, Inc. 10130 Northlake Boulevard, Suite 214-300, West Palm Beach, Florida 33412.
- Not forensically acceptable under *Kelly*.



# THE DISCONNECT DEFENSE

- High Blood Test (0.15 and higher)

+

- Good Video Performance

=

- Indisputable Conflict

- > Alleged blood alcohol science

- > Common sense theme of believing what you see.

- > e.g. a DISCONNECT