Drug Testing
in Child Welfare Cases: Chemistry, Methodology, and Legal Implications

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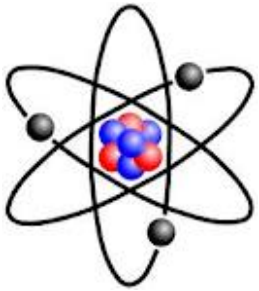
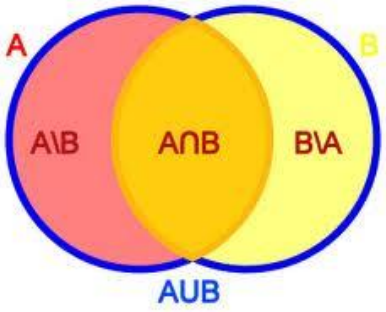
CWLS Meeting
Lake Lanier, GA
September 17, 2021

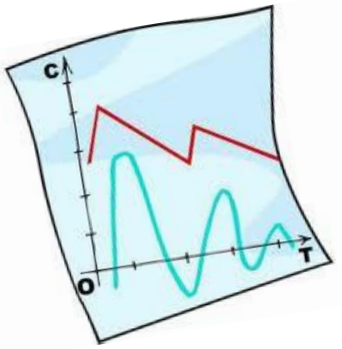
TOPICS

- Science of drug testing
- Evidentiary issues
- Trial techniques

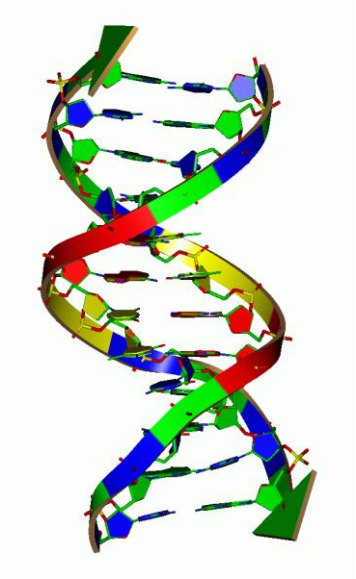
SCIENCE

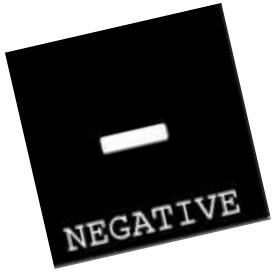


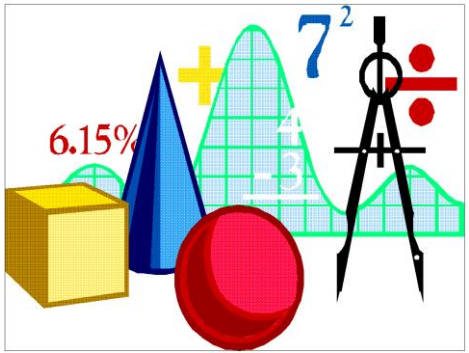


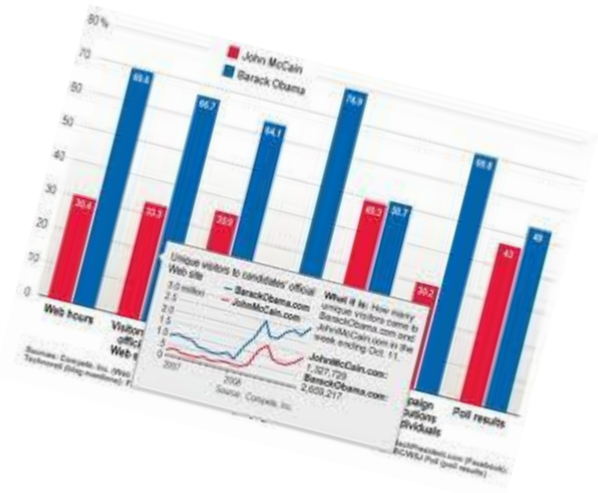


Information is only useful when it can be understood.



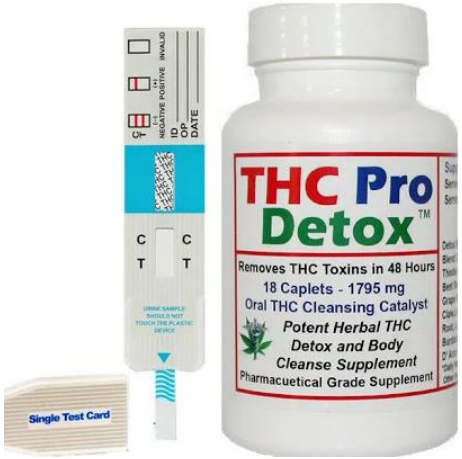







The Old Style
Aloe
Pumped From Gallons
NET WT 5 OZ (14.78mL)


dr. Google
Google Search
I'm Feeling Lucky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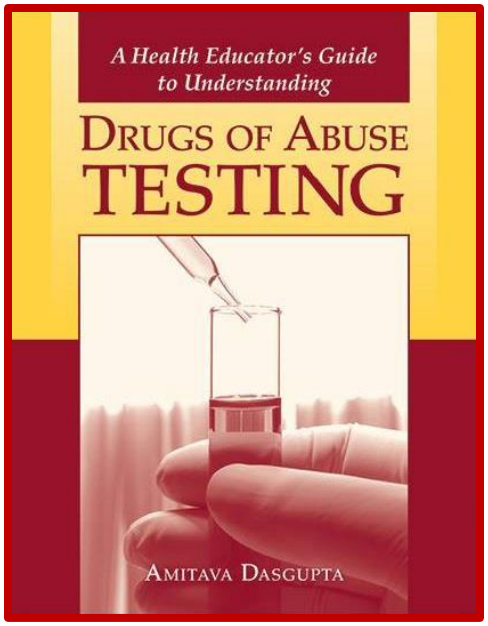
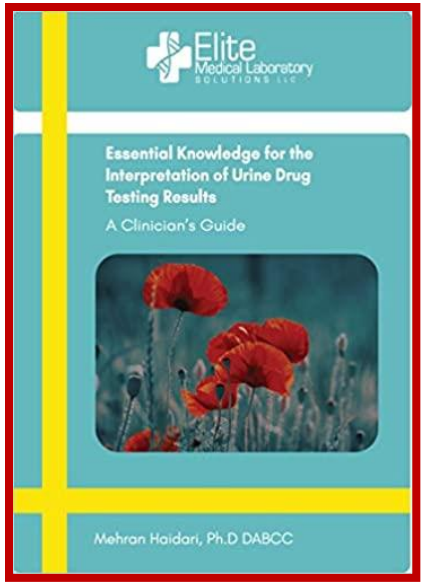
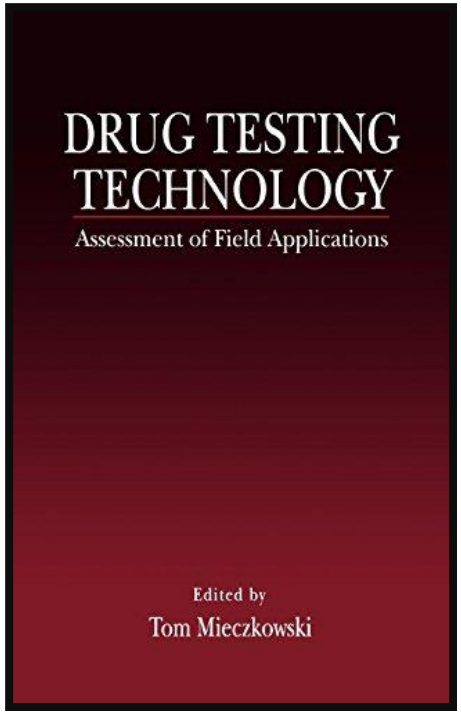
RECOMMENDED FOR LIGHT USAGE
Kit Contents: 2 Day Dosage of Green Gone Dietary Supplement, 5 Medical Grade THC Test Strips and Detailed Detox Instructions.

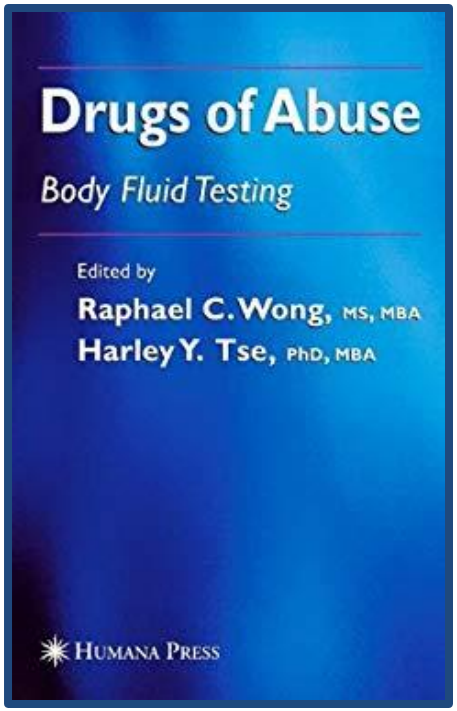
ON-LINE RESOURCES

BOOKS


A Health Educator's Guide to Understanding
DRUGS OF ABUSE TESTING
AMITAVA DASGUPTA


Elite Medical Laboratory Solutions LLC
Essential Knowledge for the Interpretation of Urine Drug Testing Results
A Clinician's Guide
Mehran Haidari, Ph.D DABCC


DRUG TESTING TECHNOLOGY
Assessment of Field Applications
Edited by
Tom Mieczkowski

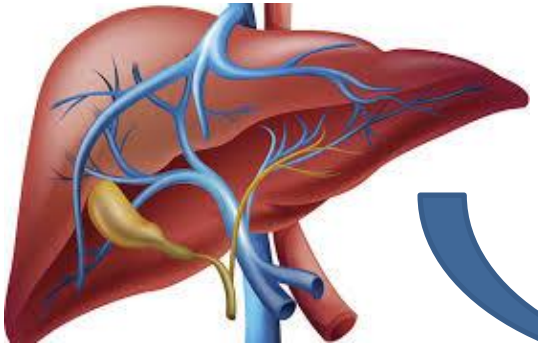

Drugs of Abuse
Body Fluid Testing
Edited by
Raphael C. Wong, MS, MBA
Harley Y. Tse, PhD, MBA
HUMANA PRESS

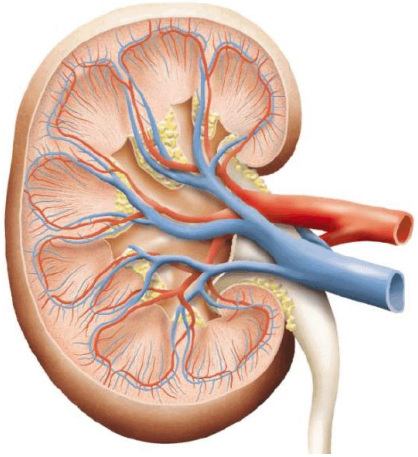
DEA DRUG SCHEDULES

- **I** - no currently accepted medical use and high potential for abuse
  - LSD, heroin, marijuana, peyote
- **II** - high potential for abuse with use potentially leading to severe psychological or physical dependence
  - Vicodin, cocaine, methamphetamine, methadone, Dilaudid, Demerol, OxyContin, fentanyl, Adderall, Ritalin
- **III** - moderate to low potential for physical and psychological dependence
  - Tylenol w/codeine, ketamine, anabolic steroids, testosterone
- **IV** - low potential for abuse and dependence
  - Xanax, Soma, Darvon, Darvocet, Valium, Ativan, Ambien, Tramadol
- **V** - lower potential for abuse than Schedule IV that contain limited quantities of certain narcotics
  - Robitussin AC, Lyrica, Lomotil, Motofen

WHAT DO DRUG TESTS DETECT?

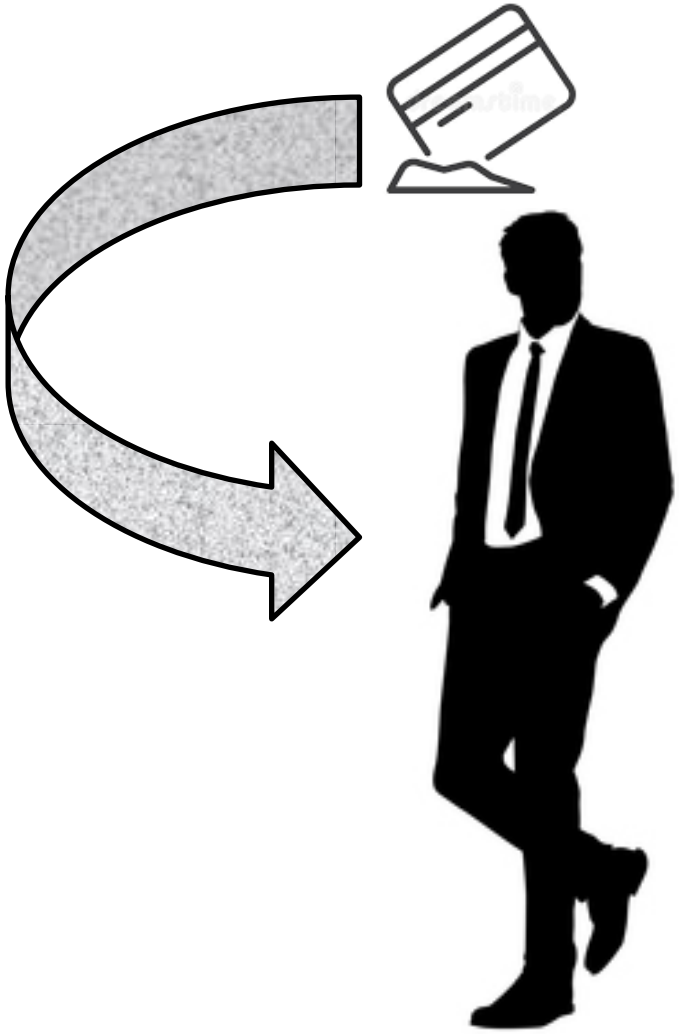
DRUGS





DRUGS & DRUG METABOLITES

DRUG METABOLITE - a substance made when the body breaks down food, drugs, chemicals, or its own tissue



- cocaine
- egconine methyl ester
- benzoylecgonine
- norcocaine
- benzoylnorecgonine

GRAY AREA 1

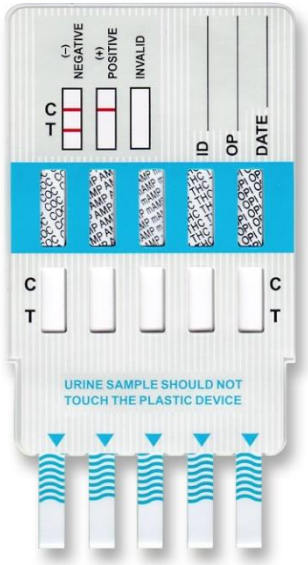
THE MYTH OF THE FAINT POSITIVE

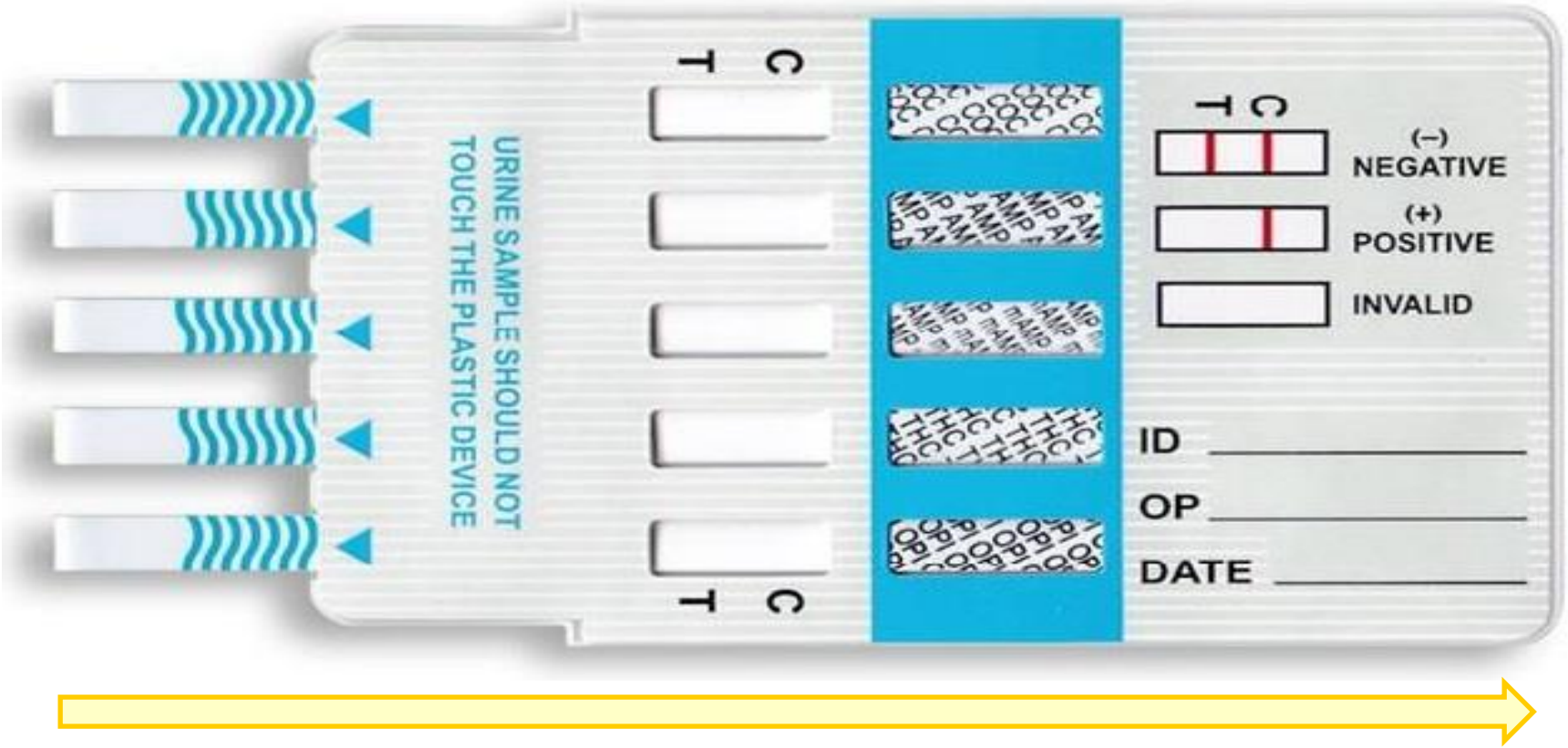
TYPICAL WINDOWS OF DETECTION

DRUG	DETECTION WINDOW IN URINE
Alcohol	7-12 hours
Amphetamine	2-3 days
Benzodiazepines	2 days – short acting 5 days – intermediate acting 10-30 days – long acting
Cocaine	2 days after single use 4 days after repeated use
Morphine	2-3 days
Methadone	3-5 days
Oxycodone	2-4 days
Codeine	2 days
Heroin	2 days
Phencyclidine	14 days
Marijuana	2-3 days after single use 30 days in chronic abuser

POINT OF CARE TESTS

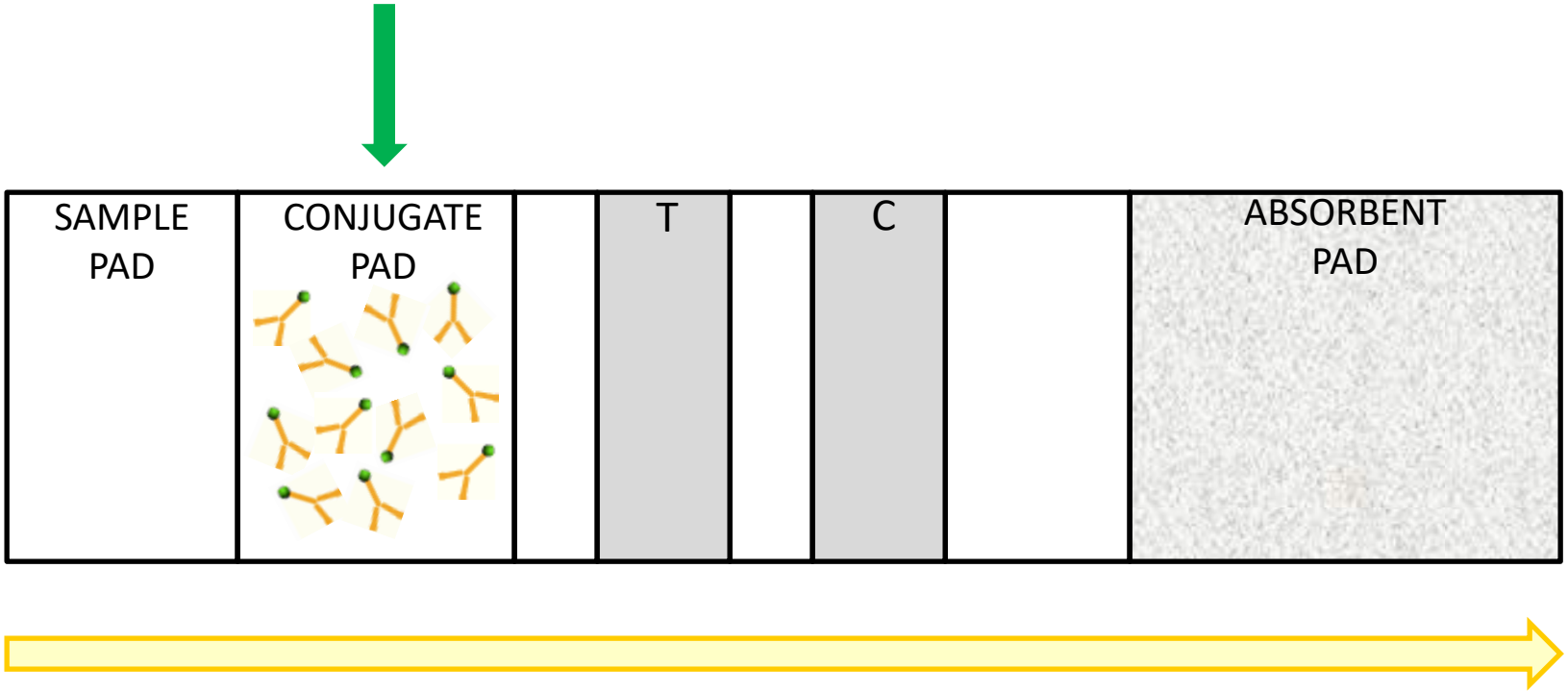
- Lateral flow immunochromatographic assays
- Drug metabolites are recognized and bound by specific antibodies
- Chemical reaction → color change



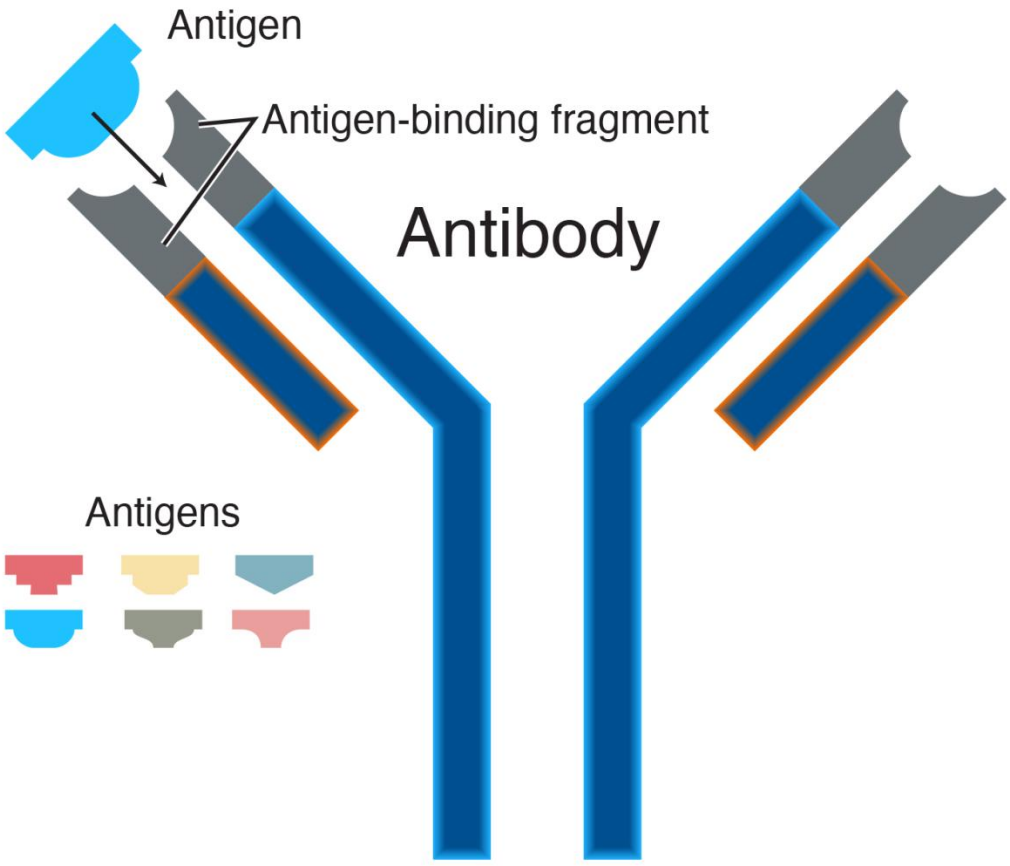


SAMPLE PAD	CONJUGATE PAD				ABSORBENT PAD

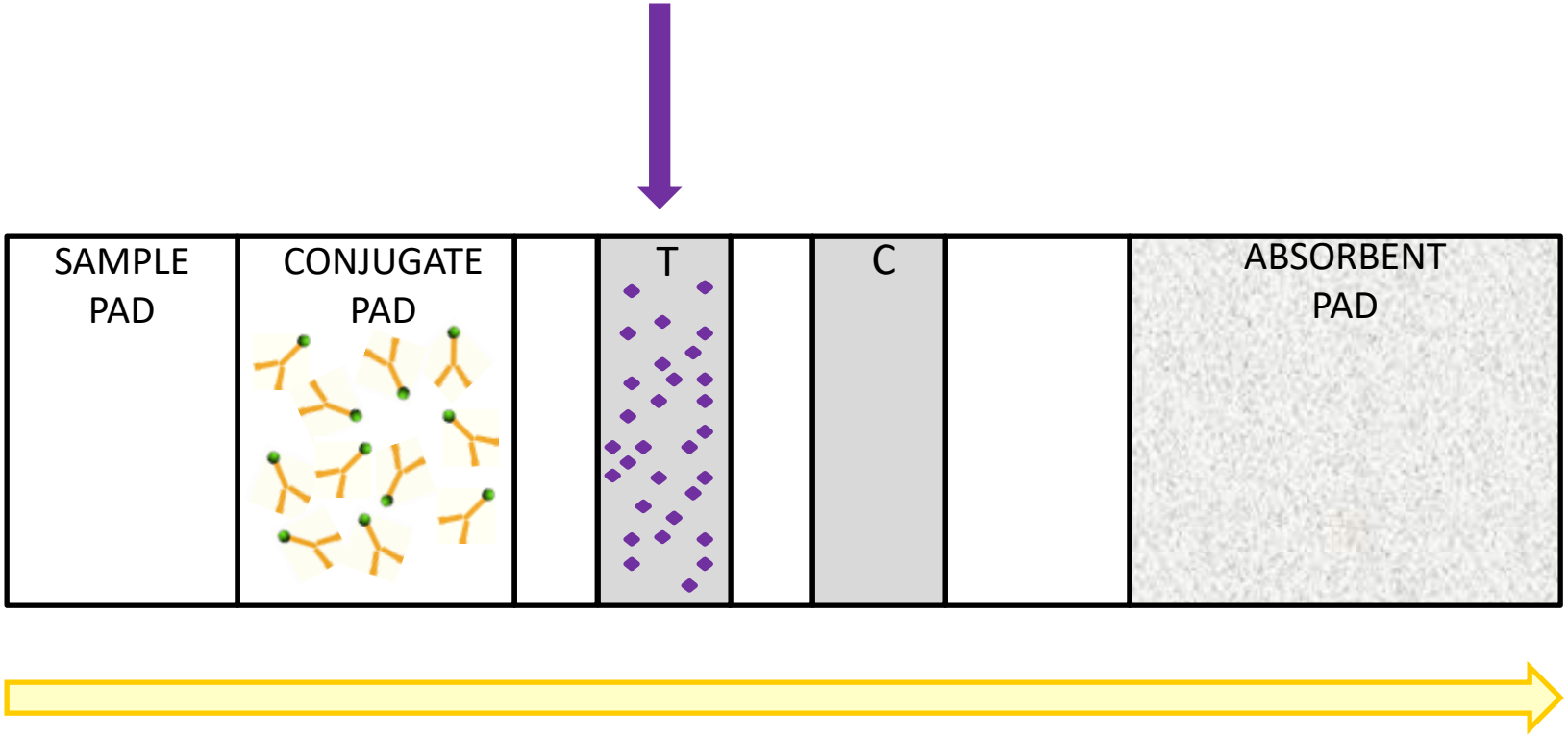
COATED WITH COLORED, COLLOIDAL GOLD NANOPARTICLES THAT ARE CONJUGATED WITH ANTIBODIES



HOW ANTIBODIES WORK



CONTAINS DRUG CONJUGATES THAT ARE STRUCTURALLY SIMILAR TO THE PORTIONS OF THE DRUG METABOLITE THAT THE ANTIBODIES WILL RECOGNIZE



SAMPLE DOES NOT CONTAIN DRUG METABOLITES

Figure 1

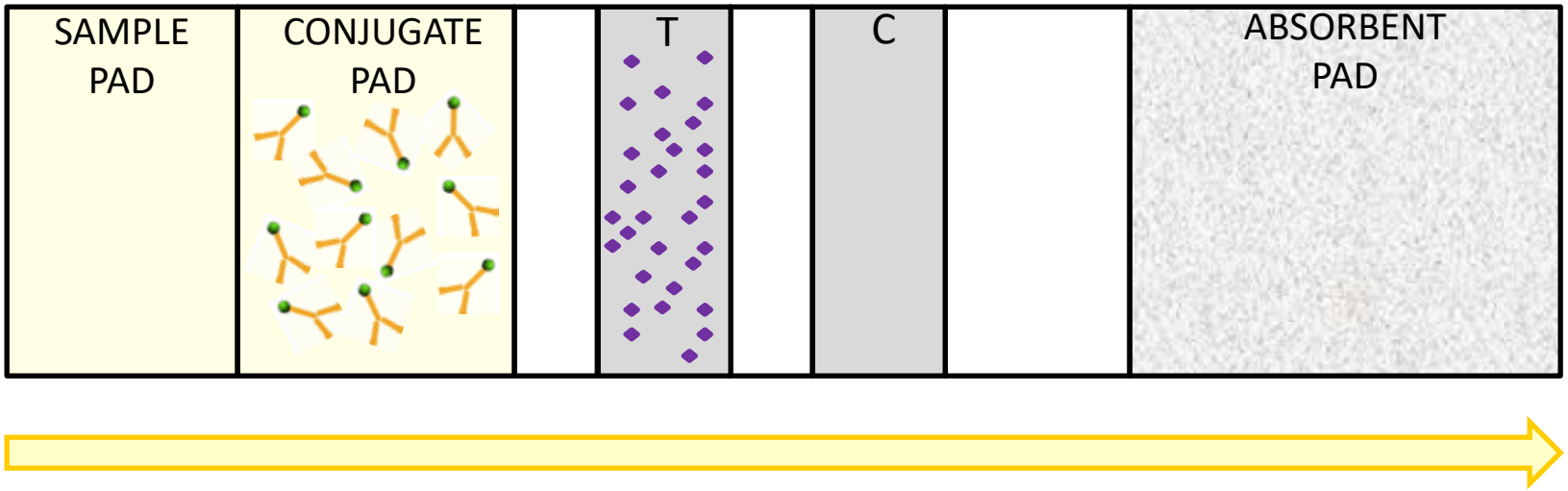


Figure 2

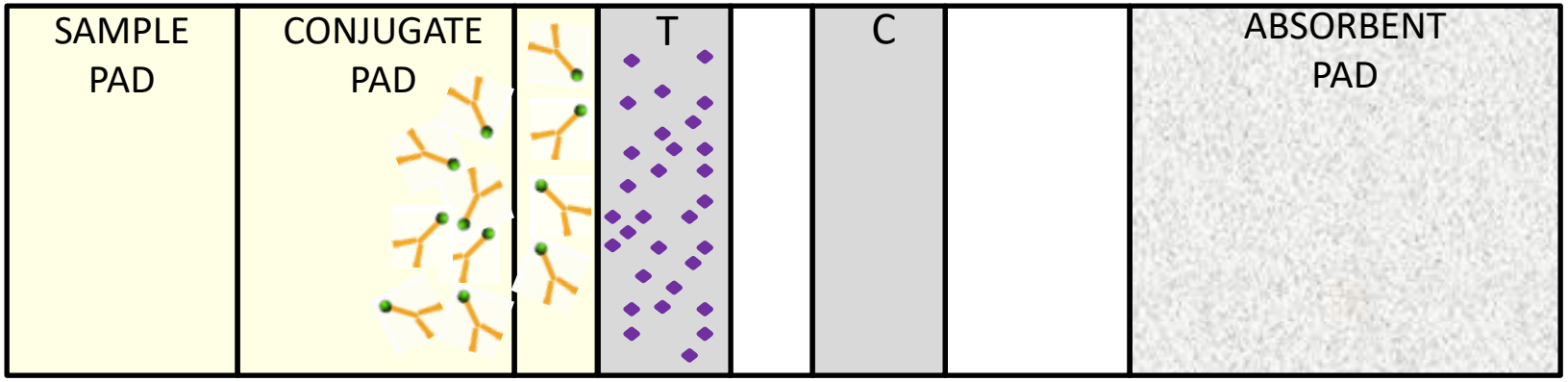


Figure 3

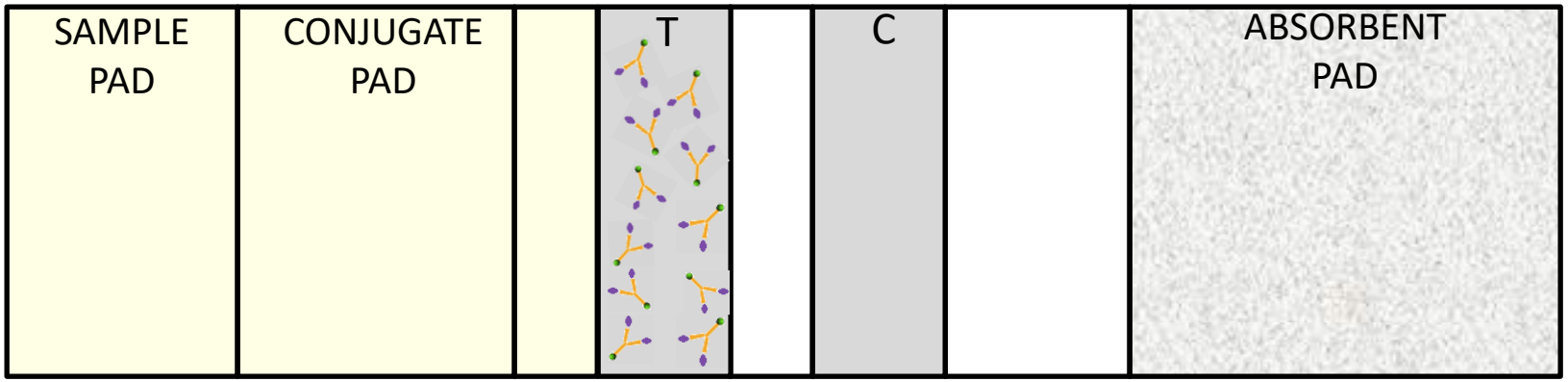


Figure 4

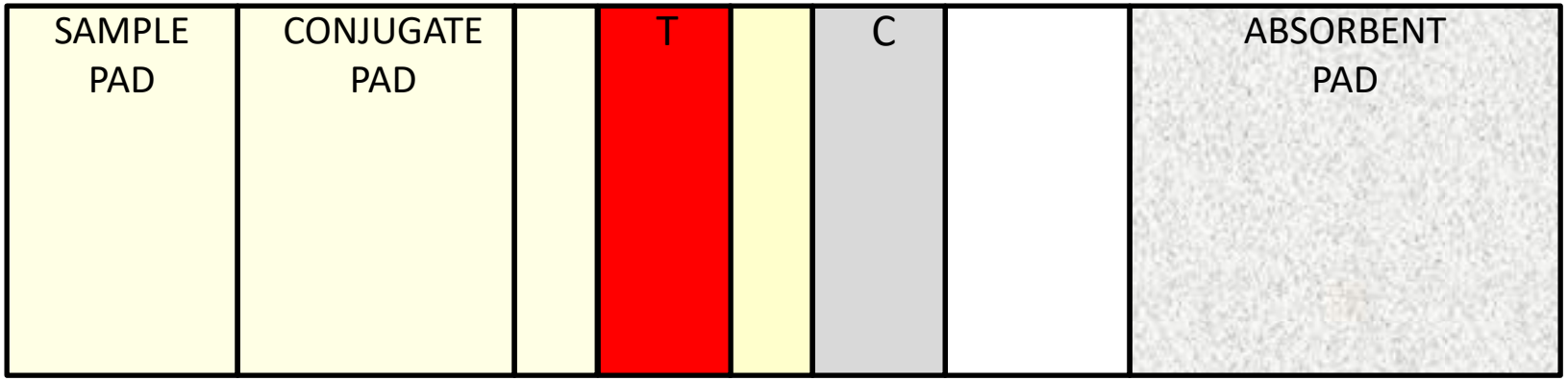
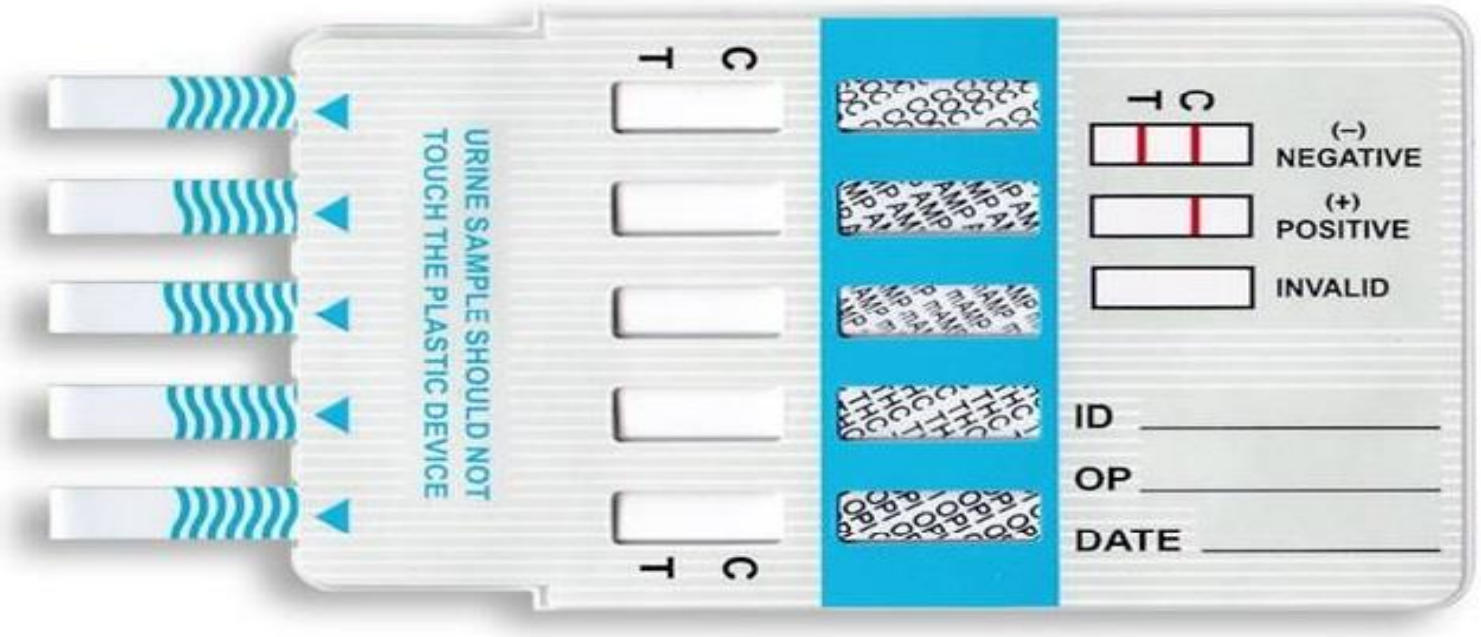


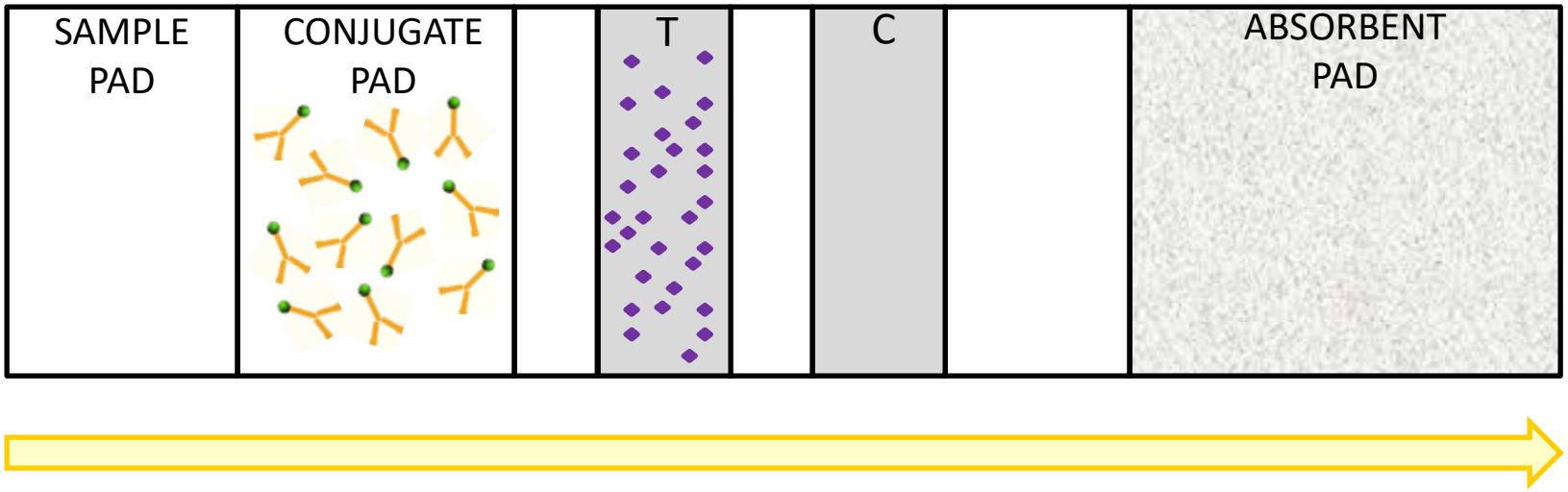
Figure 5

SAMPLE PAD	CONJUGATE PAD		T		C		ABSORBENT PAD



SAMPLE CONTAINS DRUG METABOLITES

Figure 6



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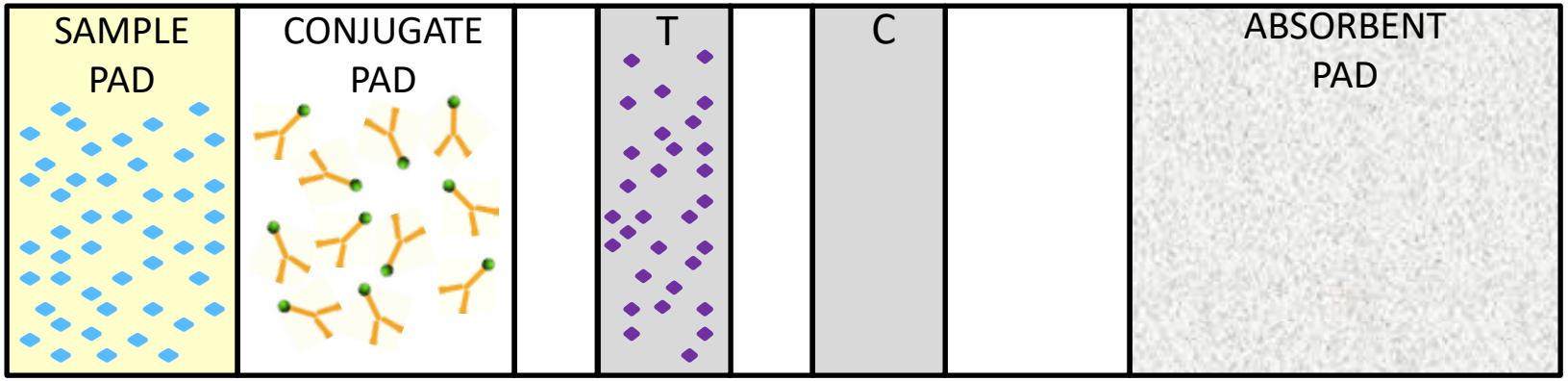

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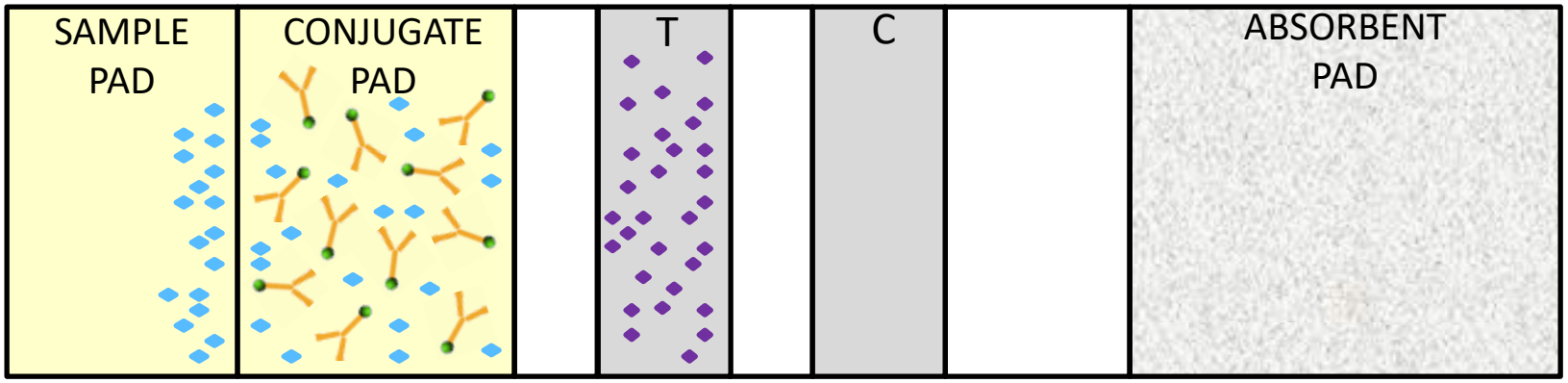

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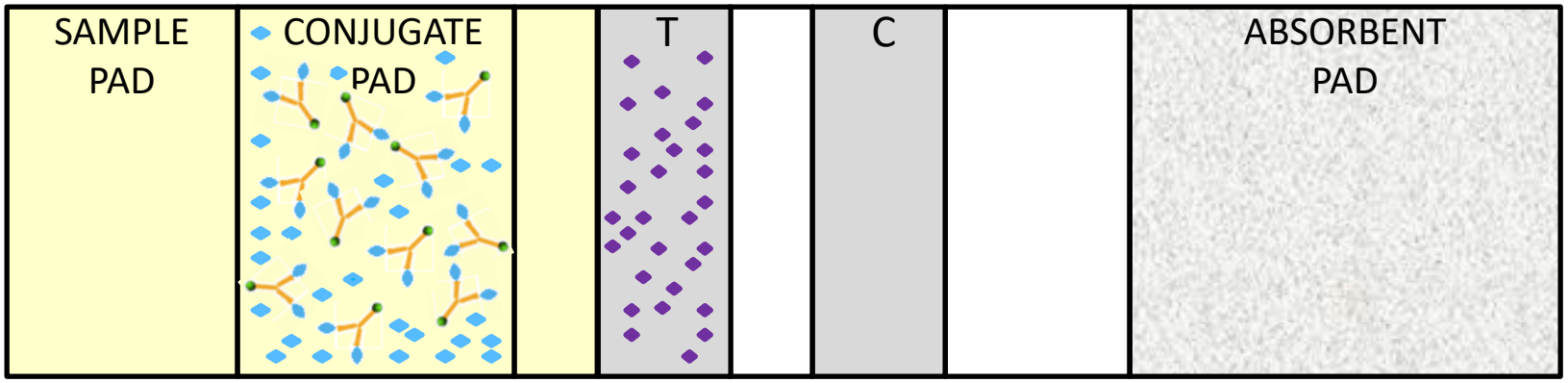

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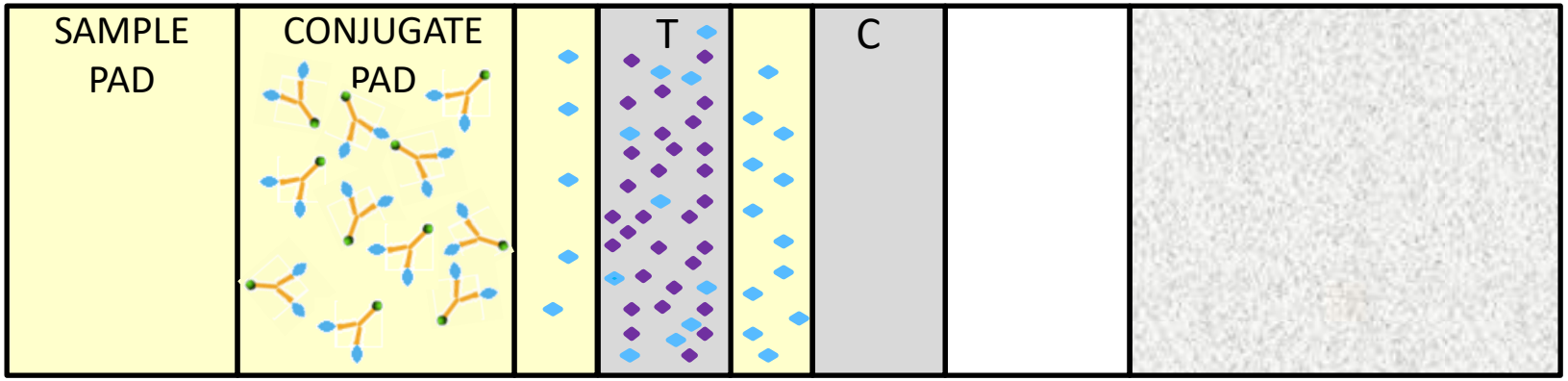

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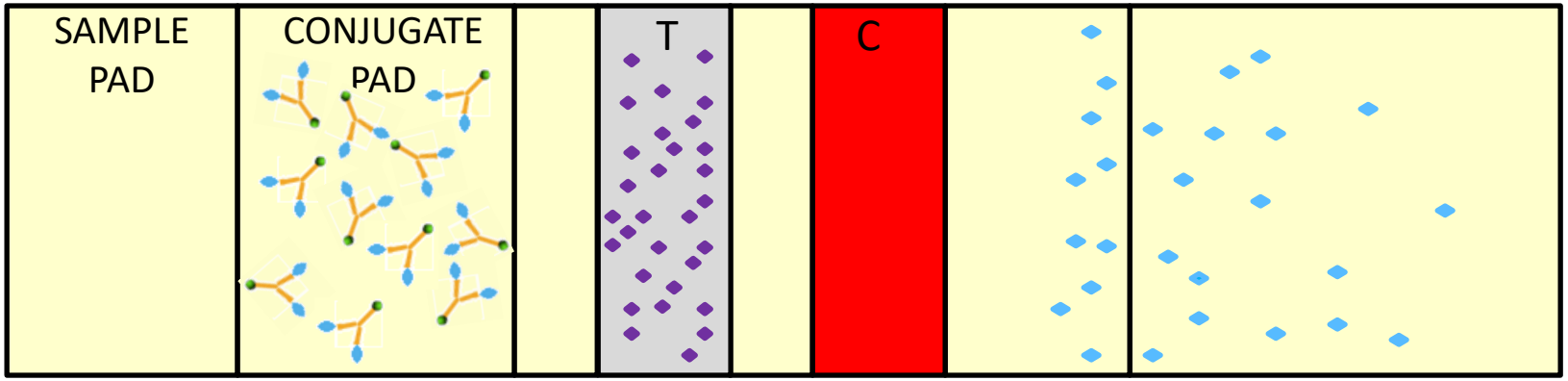


HOW RELIABLE ARE THE RESULTS OF POINT OF CARE URINE SCREENS?

The answer is in the **package insert**.

One Step Multi-Drug Test Dip card
CLIA Waived Package Insert

INTENDED USE & SUMMARY

Urine based CLIA Waived/OTC Drug tests for multiple drugs of abuse range from simple immunoassay tests to complex analytical procedures. The speed and sensitivity of immunoassays have made them the most widely accepted method to screen urine for multiple drugs of abuse.

The **One Step Multi-Drug Screen Test Dip card** is a lateral flow chromatographic immunoassay for the qualitative detection of multiple drugs and drug metabolites in urine at the following cut-off concentrations in urine:[1]

Test	Calibrator	Cut-off (ng/mL)
Methamphetamine (MET, mAMP)	D-Methamphetamine	1,000
Cocaine(COC)	Benzoylecgonine	300
Marijuana (THC)	11-nor-Δ^9-THC-9 COOH	50
Morphine (MOP)	Morphine	300
Benzodiazepines (BZO)	Oxazepam	300
MDMA(Ecstasy)	D,L-3,4-Methylenedioxymethamphetamine (MDMA)	500
Oxycodone (OXY)	Oxycodone	100
Barbiturates (BAR)	Secobarbital	300
Buprenorphine (BUP)	Buprenorphine	10
Methadone (MTD)	Methadone	300
Phencyclidine(PCP)	Phencyclidine	25
Amphetamine (AMP)	D-Amphetamine	1,000

This test will detect other related compounds, please refer to the Analytical Specificity table in this package insert.

This assay provides only a preliminary analytical test result. A more specific alternate chemical method must be used in order to obtain a confirmed analytical result. Gas chromatography/mass spectrometry (GC/MS) is the preferred confirmatory method. Clinical consideration and professional judgment should be applied to any drug of abuse test result, particularly when preliminary positive results are used.

Multi-Drug Urine Test Cup
Package Insert (CLIA Waived)

INTENDED USE

Clarity CLIA Waived Multi-Drug Urine Test Cup is competitive binding, lateral flow immunochromatographic assay for qualitative and simultaneous detection of Amphetamine, Oxazepam, Cocaine, Cannabinoids, Methamphetamine, Morphine, Oxycodone, EDDP, Secobarbital, Buprenorphine, Methylenedioxymethamphetamine, Phencyclidine, Propoxyphene , Nortriptyline and Methadone in human urine at the cutoff concentrations of:

Test	Calibrator	Cut-off (ng/ml)
AMP	d-Amphetamine	1000 ng/mL
BAR	Secobarbital	300 ng/mL
BUP	Buprenorphine	10 ng/mL
BZO	Oxazepam	300 ng/mL
COC	Benzoylecgonine	300 ng/mL
MDMA	3,4-Methylenedioxy-methamphetamine	500 ng/mL
MET	D-Methamphetamine	1000 ng/mL
MTD	Methadone	300 ng/mL
MOP	Morphine	300 ng/mL
OPI	Morphine	2000 ng/ml
OXY	Oxycodone	100 ng/mL
EDDP	2-Ethylidene-1,5-dimethyl-3,3-dipheylpyrolidine (EDDP)	300 ng/ml
PCP	Phencyclidine	25 ng/mL
TCA	Nortriptyline	1000 ng/ml
THC	11-nor-Δ^9-THC-9-carboxylic acid	50 ng/mL
PPX	Propoxyphene	300 ng/ml

SUMMARY

The test is intended for use as the first step to provide health care professionals and consumers with information concerning the presence or absence of the above stated drugs in a urine sample.

WHAT IF THE COLOR CHANGE AT THE TEST LINE IS FAINT?

INTERPRETATION OF RESULTS

(Please refer to the illustration above)

NEGATIVE:* Two lines appear. One red line should be in the control region (C), and another apparent red or pink line adjacent should be in the test region (Drug/T). This negative result indicates that the drug concentration is below the detectable level.

*NOTE: The shade of red in the test line region (Drug/T) will vary, but it should be considered negative whenever there is even a faint pink line.

POSITIVE: One red line appears in the control region (C). No line appears in the test region (Drug/T). This positive result indicates that the drug concentration is above the detectable level.

INVALID: Control line fails to appear. Insufficient specimen volume or incorrect procedural techniques are the most likely reasons for control line failure. Review the procedure and repeat the test using a new test panel. If the problem persists, discontinue using the lot immediately and contact your manufacturer.

Note: There is no meaning attributed to line color intensity or width.

A preliminary positive test result does not always mean a person took illegal drugs and a negative test result does not always mean a person did not take illegal drugs. There are a number of factors that influence the reliability of drug tests. Certain drugs of abuse tests are more accurate than others.

IMPORTANT: The result you obtained is called preliminary for a reason. The sample must be tested by laboratory in order to determine if a drug of abuse is actually present. Send any sample which does not give a negative result to a laboratory for further testing.

GRAY AREA 2

CORRELATING TEST RESULTS TO INSTANCES OF DRUG USE

DFCS – received report that father was seen using marijuana

CLIENT – admitted smoking marijuana one time after a decade of abstinence

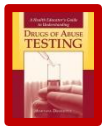
SA EVALUATION – recommended inpatient drug treatment because client tested positive multiple times since beginning of case

LIMITATIONS OF POINT OF CARE TESTS

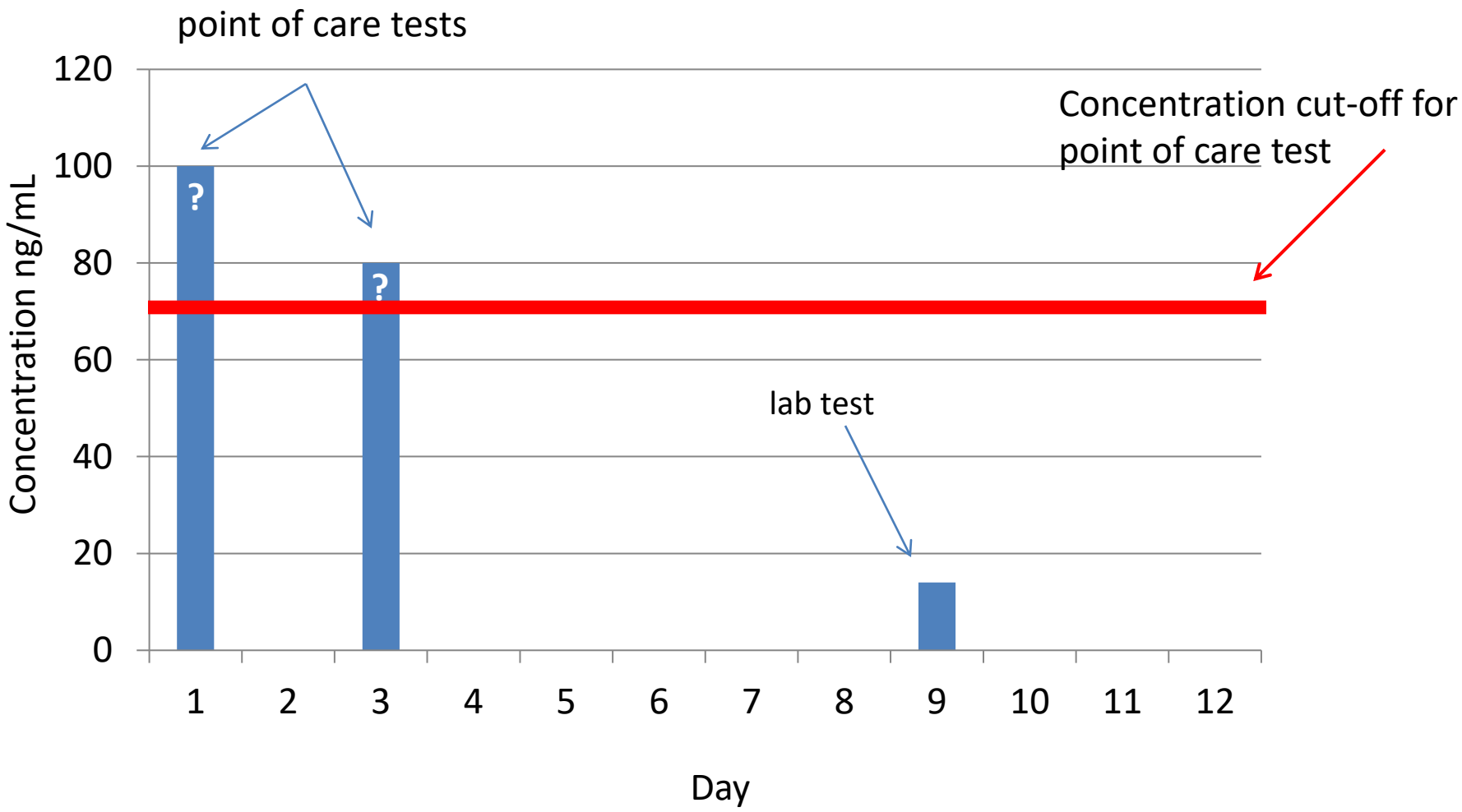
- Concentration cutoffs
- Relatively short detection window
- Qualitative, not quantitative
- Antibody cross-reactivity with over-the-counter medications

Typical Cut-off Concentrations

DRUG	CUT-OFF CONCENTRATION ng/mL
Amphetamine	1000
Benzodiazepines	200 or 300
Barbiturates	200 or 300
Cocaine	300
Opiates	300
Oxycodone	100 or 300
Methadone	300
Marijuana	50
Phencyclidine	25



CLIENT'S POSITIVE TESTS



GRAY AREA 3

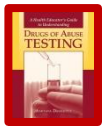
FALSE POSITIVES

COMMON PRODUCTS THAT INTERFERE WITH IMMUNOASSAYS

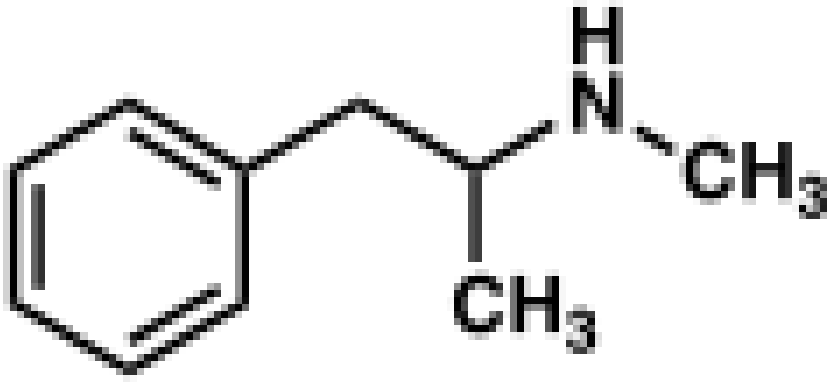
CLASS OF DRUG	COMMERCIAL NAME	IMMUNOASSAY AFFECTED
Antiretroviral Proton pump inhibitors	Efavirenz Prilosec, Omeprazole	THC
Antidepressant, sleep aid	Trazodone	Fentanyl
Atypical antipsychotic	Quetiapine	Methadone
Quinolone antibiotics	Cipro, Noroxin, Levaquin	Opiates

COMMON PRODUCTS THAT INTERFERE WITH AMPHETAMINE AND METHAMPHETAMINE IMMUNOASSAYS

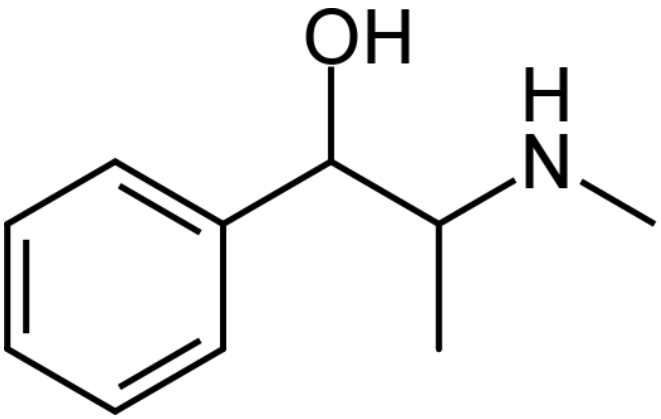
CLASS OF DRUG	INTERFERING COMPOUND	PRODUCT NAMES
Antihistamine	Brompheniramine	Allent, Andehist syrup, Bromadrine PD, Bromofed-DMDallergy, Demetapp
Diet Pill	Ephedra (ephedrine) Phentermine Tyramine	Fastin, Adipex
Decongestant	Phenylpropanolamine Pseudoephedrine Phenylephrine	Actifed, Alka-Seltzer Plus, Allegra-D, Clartin D, Comtrex Daytime, Tylenol, Tylenol Sinus, Vicks 44
Acid reducer	Ranitidine	Zantac



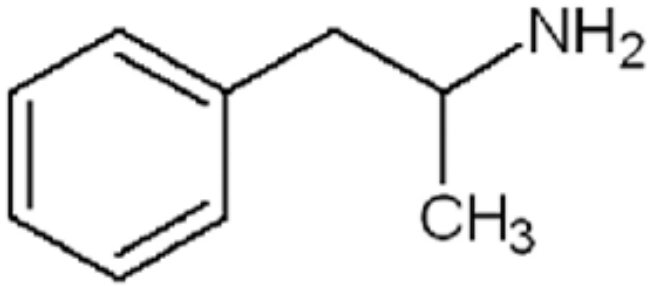
LOOK AT THE SIMILARITIES



methamphetamine

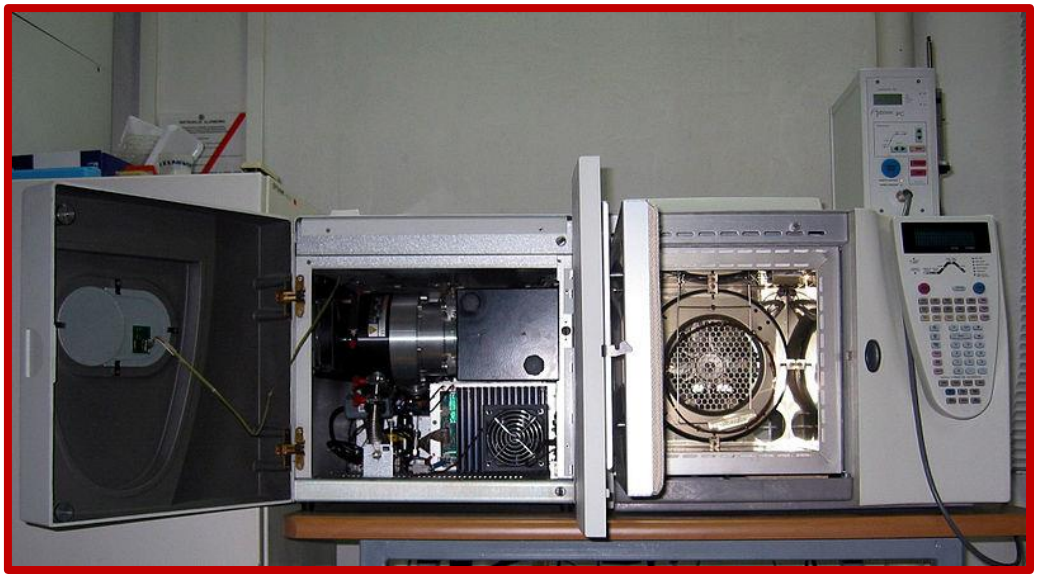


ephedrine

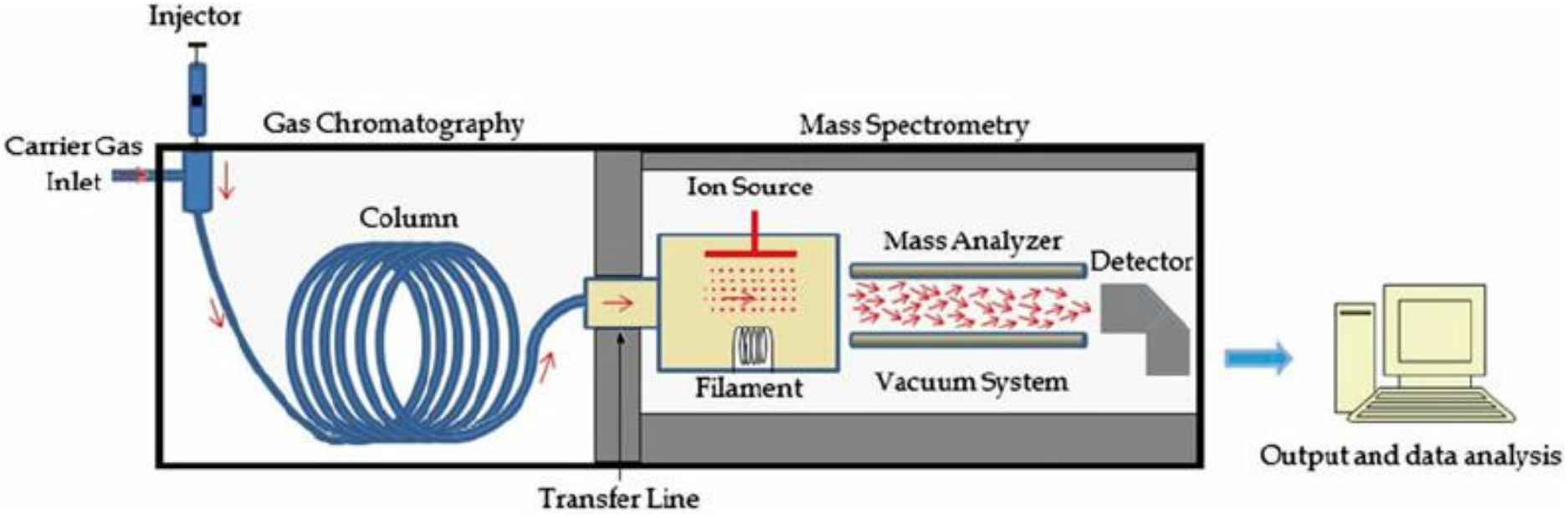


amphetamine

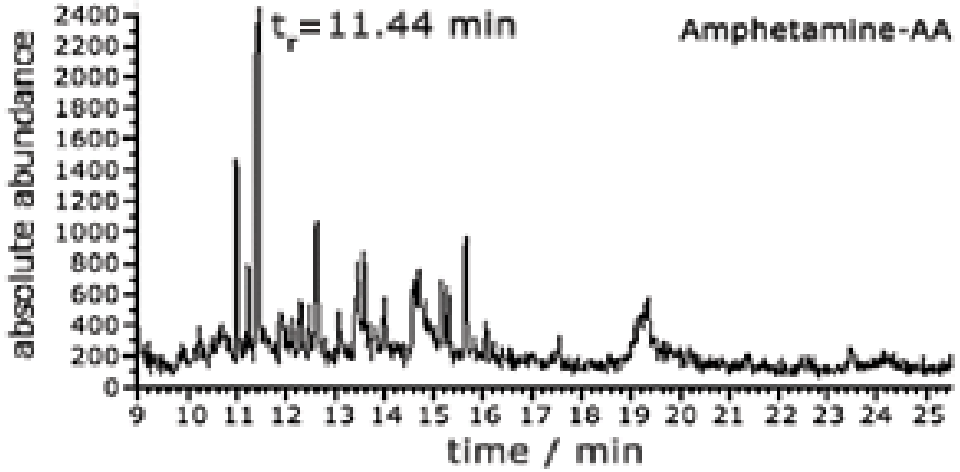
GC/MS CAN DISTINGUISH BETWEEN SIMILAR COMPOUNDS

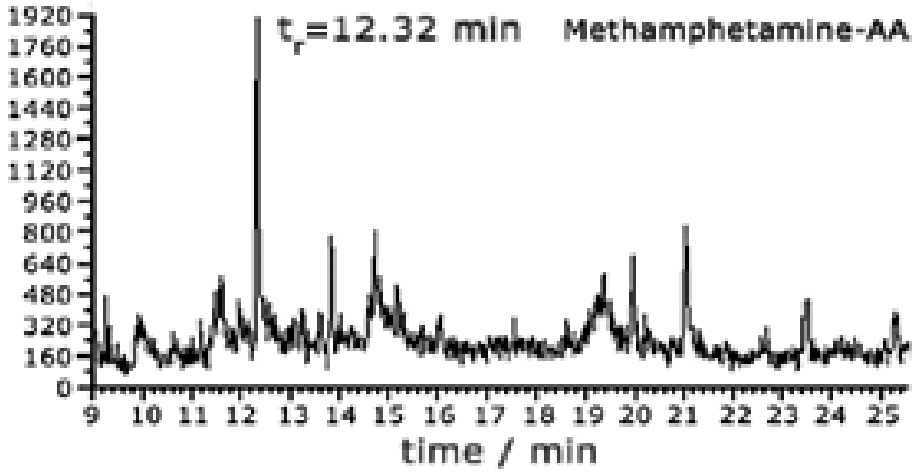


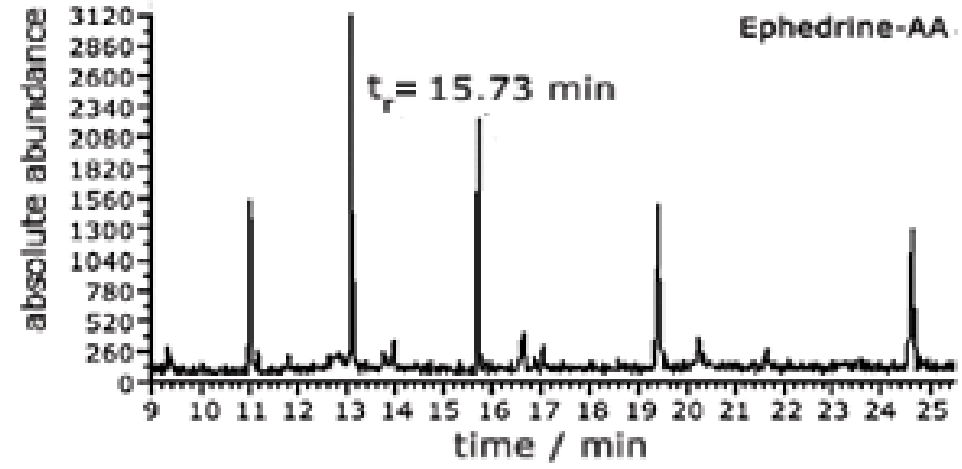
HOW GAS CHROMATOGRAPHY / MASS SPECTROMETRY WORKS

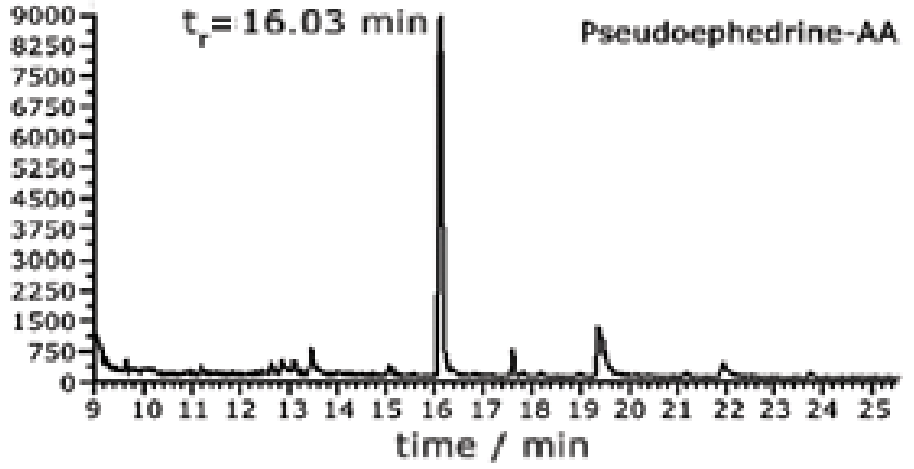


GC/MS RESULTS









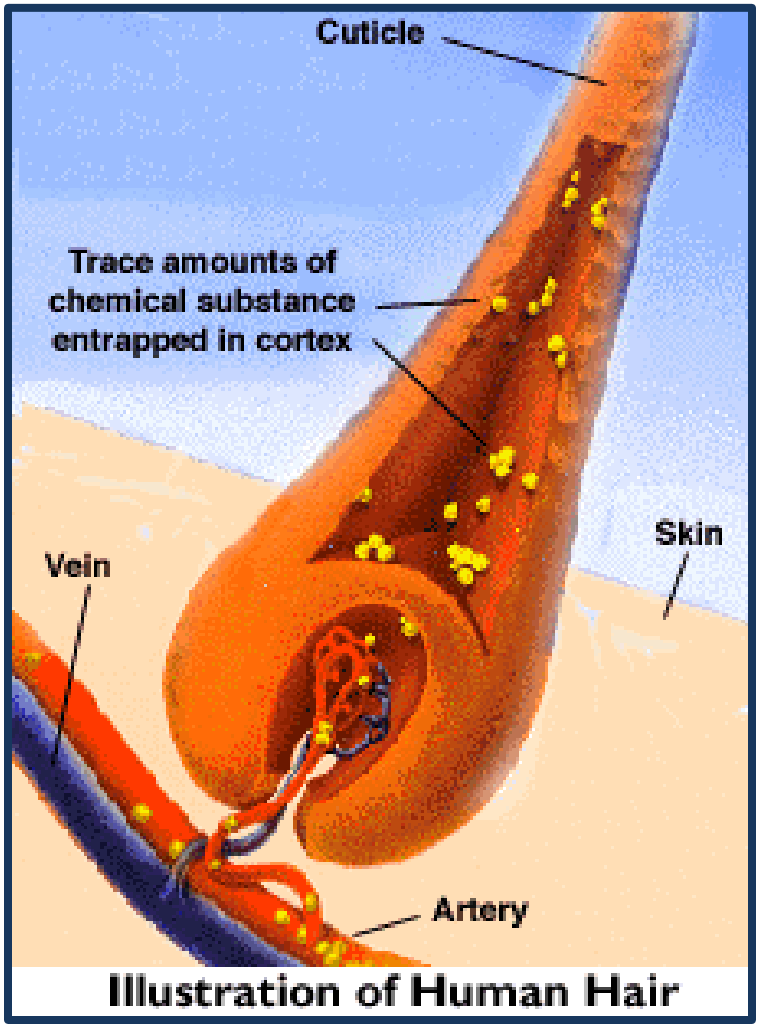
GRAY AREA 4

HAIR FOLLICLE TESTING

- “Unfortunately, it has become clear that data in child protection cases involving hair analysis for markers of illicit drug and alcohol misuse, respectively, has either not always been presented in a way that enabled the Courts to give proper weight to the evidence, or has been erroneous, with incalculable consequences for the families involved.”
  - Cuypers E, Flanagan RJ. The interpretation of hair analysis for drugs and drug metabolites. Clin Toxicol (Phila). 2018 Feb;56(2):90-100.

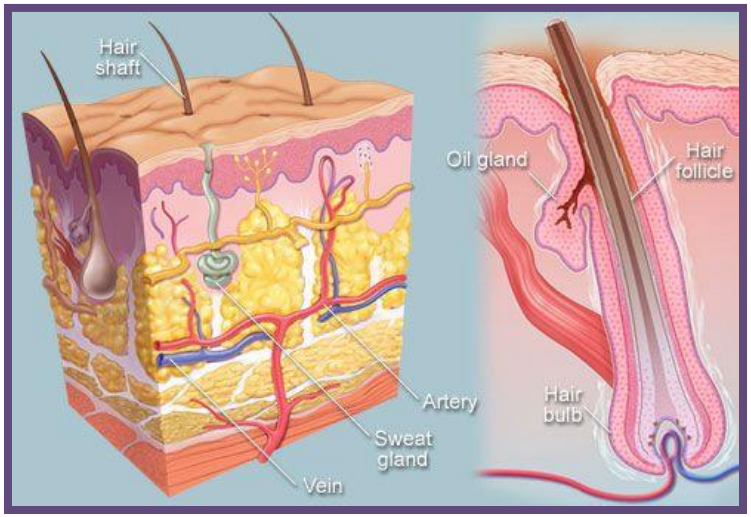
WHY TEST HAIR?

- Hair is composed of mostly protein
- Principle protein = keratin
- Drug metabolites in bloodstream are deposited into hair follicle
- Drug metabolites get trapped in keratin matrix of hair as it grows
- Drug metabolites can be reliably isolated from the most recent 3.75cm of growth



OTHER WAYS DRUG METABOLITES CAN BE INCORPORATED INTO HAIR

- Sweat and sebum
- Environmental exposure



HAIR FOLLICLE TESTING

ADVANTAGES

- Longer detection window (~90 days)
- Relatively non-invasive
- Difficult to adulterate
- Stable specimen

DISADVANTAGES

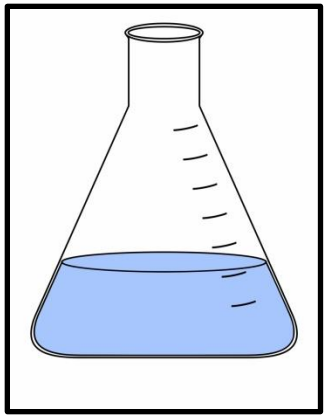
- Unable to detect recent use
- More expensive
- May not be available if subject is bald
- Requires laboratory analysis
- Hair color bias

TESTING PROCESS

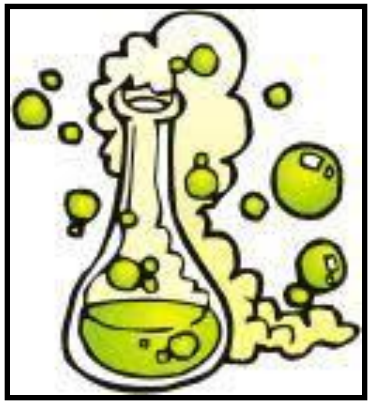
SAMPLE COLLECTION

OFF TO THE LAB

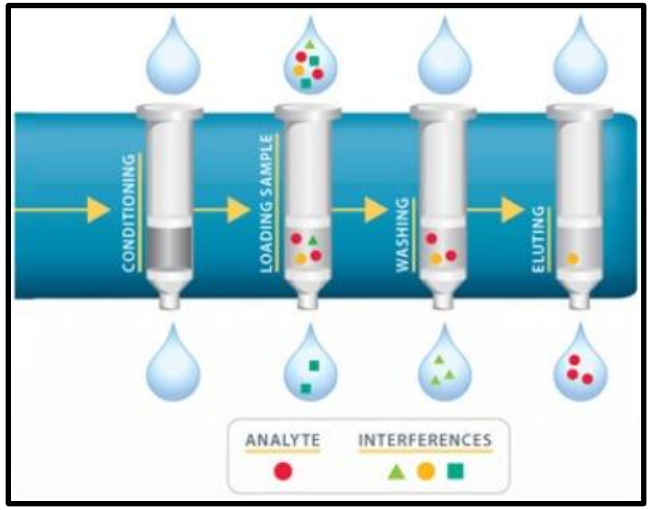
SOLVENT WASH



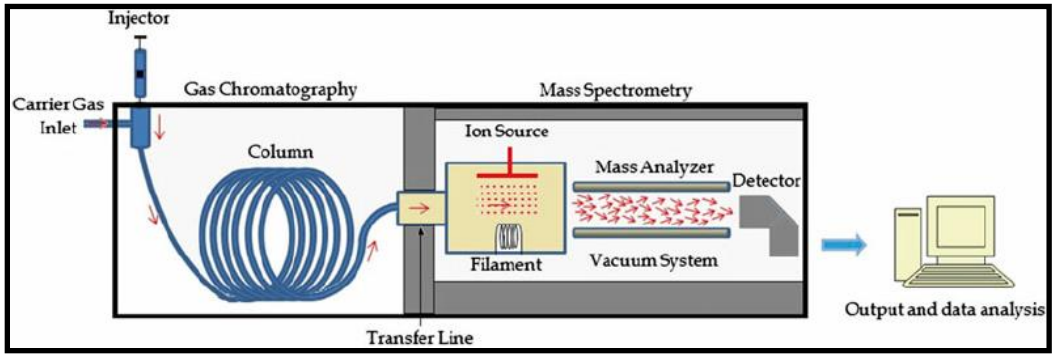
DIGESTION



EXTRACTION



GC/MS ANALYSIS



90-DAY WINDOW IS NOT EXACT

- Head hair grows at an average rate of 1cm per month
- 3cm sample represents roughly a 3 month period
- Variations in hair growth rate
- Variations in how close to the scalp the hair is cut

INABILITY TO DETECT RECENT USE

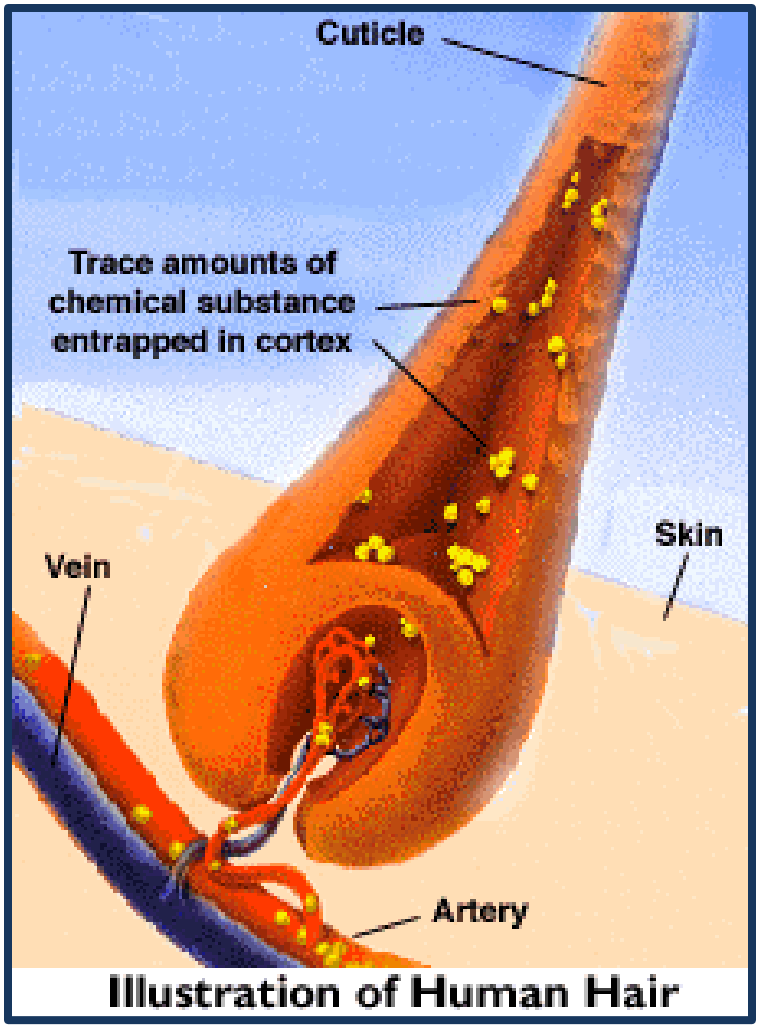
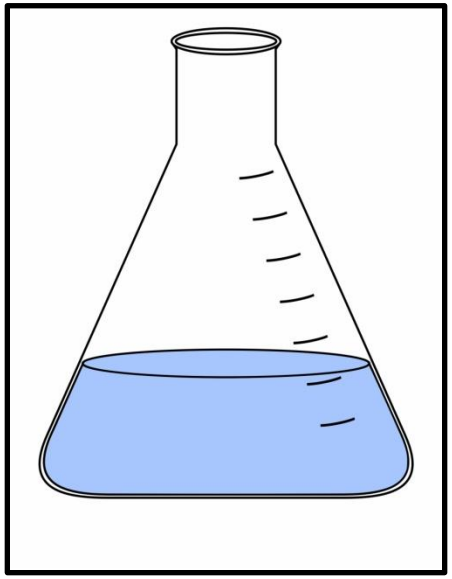


Illustration of Human Hair

- Drug intake
- Circulation of drug metabolites in blood
- Incorporation of drug metabolites into hair follicle
- Incorporation of drug metabolites into keratin matrix
- Growth of hair above surface of skin takes 5-6 days

RISK OF SWEAT, SEBUM, OR ENVIRONMENTAL CONTAMINATION

- Initial organic solvent wash to remove oils
- Aqueous washes to remove other contaminants
- No set standard for decontamination across industry
- No 100% reliable way to distinguish ingestion from environmental contamination



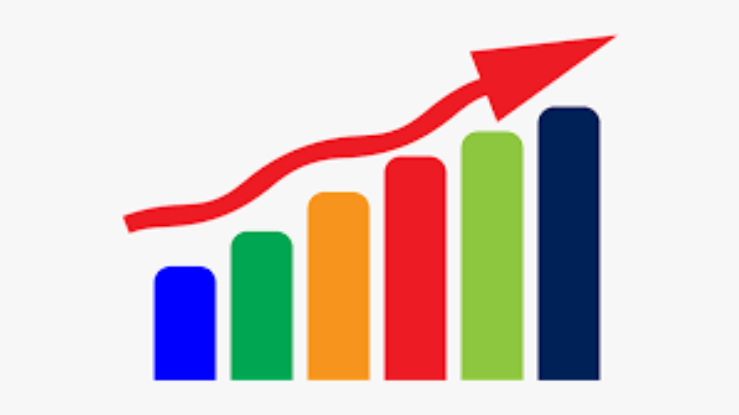
EFFECTS FROM CHEMICAL TREATMENTS AND SHAMPOOS

- Slight decrease in metabolite concentrations for cocaine, monoacetylmorphine, and marijuana, but not enough to cause a positive hair specimen to test negative
  - Rohrich J, Zorntlein S, Potsch L, Skopp G, Becker J. Effect of the shampoo Ultra Clean on drug concentrations in human hair. Int J legal Med. 2000;2:102-106.
- Bleaching can affect the stability to benzodiazapines in hair and result in decreased drug concentrations on testing, but not to the extent that regular benzodiazepine use would not be detected.
  - Yegles M, Marson Y, Wennig R, Influence of bleaching on stability of benzodiazapines in hair. Forensic Sci Int. 2000;1-7:87-92.

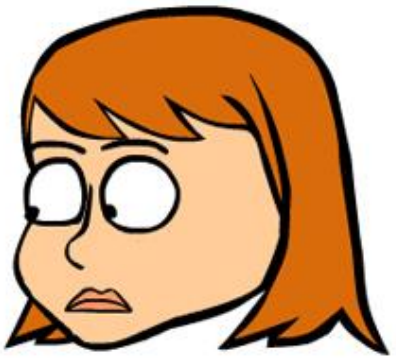
- Bleaching and chemical treatment also make hair more susceptible to drug uptake from environmental exposure.
  - Skopp G, Potsch L, Moeller M. On cosmetically treated hair: aspects and pitfalls of interpretation. Forensic Sci Int. 1997;84:43-52.
- In all cases studied, the drug content in hair that had undergone treatment decreased in comparison with untreated hair with mean differences of between approximately 40%–60% depending on the substance, type of treatment, and the extent of hair damage.
  - Jurado, C., Kintz, P., Menéndez, M., & Repetto, M. (1997). 'Influence of the cosmetic treatment of hair on drug testing' in http://www.ncbi.nlm.nih.gov/pubmed/9228567; 110(3):159–63. PMID: 9228567.

CAN WE COMPARE LEVELS FROM TEST TO TEST?

- Incorporation of drugs into the hair is not consistent from person to person or even across multiple ingestions by a single person.
  - Kitnz P, Bundeli P, Brenneisen R, Ludes B. Dose-concentration relationship in hair from subjects in a controlled heroin-maintenance program. J Analytical Toxicol. 1998;22:231-236.



EFFECT OF HAIR COLOR

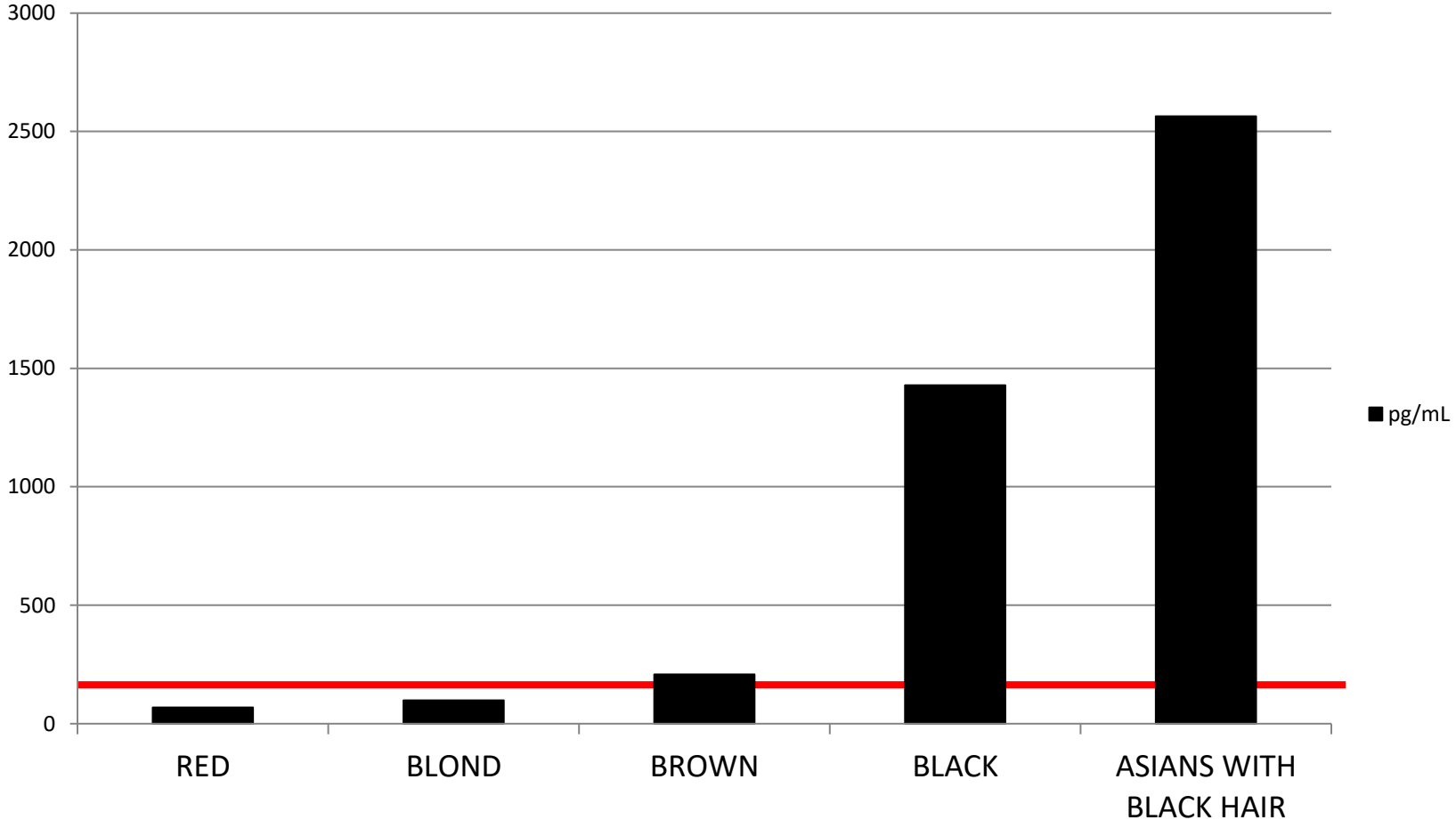


- Melanin is responsible for hair color
- Melanin is a polymer consisting of eumelanin (**black**/**brown**) and phemelanin (**red**)
- Drug metabolites bind more to eumelanin than to phemelanin

EFFECT OF RACE

- Even among person with the same hair color, there are racial differences in drug metabolite uptake
- After the same dosage pattern of codeine, Asians with black hair tested 56% higher than Caucasians with black hair. Asians have a higher percentage of melanin in their hair.
  - Rollins DE, Wilkins DG, Krueger GG, et al. The effect of hair color on the incorporation of codeine into human hair. J Analytical Toxicol. 2003;27:545-551.

HAIR FOLLICLE TEST RESULTS AFTER 5 WEEKS OF CODEINE DOSING




EVIDENCE

Sources of Law

- With regard to scientific tests (drug screens are scientific tests), there have been two main approaches:
  - *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923) (which the U.S. Supreme Court identified as the "dominant standard for determining the admissibility of novel scientific evidence" from 1923 to 1993).
  - *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) (and its progeny).
- The Federal Rules of Evidence (Rule 702) express the substance of *Daubert*, et al. (though some argue that FRE 702 tightens the *Daubert* requirements).
- The majority of States use an evidence code that is substantially similar to, or materially derived from, the Federal Rules of Evidence.

Sources of Law

- As of May 2020, all States used *Daubert* or a modified version of *Daubert* for civil cases except:
- Illinois, Minnesota, New York, Pennsylvania, Washington use *Frye*;
- Nevada, North Dakota, South Carolina, and Virginia have unique rules – all but Virginia share some similarity with *Daubert* or Rule 702.

  – https://www.lexvisio.com/article/2019/07/09/the-states-of-daubert-after-florida (updated May 6, 2020).

Review of the Major Standards

- *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923) – has the methodology ”gained general acceptance in the particular field to which it belongs?” (*Frye*, 293 F. at 1014)
  - Looks for scientific consensus, and treats that consensus as relatively stable.
  - On its own terms, *Frye* applies only to “novel” scientific principles or discoveries - at some point, these become simply ”demonstrable”.

Review of the Major Standards

- *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) – FRE 702 superseded the "general acceptance" doctrine.
  - Not confined to "novel" evidence, but to all "scientific, technical, or other specialized knowledge".
  - *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999) – clarified that the test applies to all "specialized knowledge" and not just to strictly scientific evidence.

Review of the Major Standards

- Current FRE 702:

"A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
b) the testimony is based on sufficient facts or data;
c) the testimony is the product of reliable principles and methods; and
d) the expert has reliably applied the principles and methods to the facts of the case."

FRE 702 – Specialized Knowledge

- *…qualified as an expert by knowledge, skill, experience, training, or education*…
  - This is the traditional criterion of specialized knowledge. Expert witnesses have always had to have some kind of knowledge that could shed light on a question before the factfinder.
  - The expert is not qualified to opine on any subject, but only on the narrow subject for which qualification is demonstrated.
- *…will help the trier of fact to understand the evidence or to determine a fact in issue…*
  - Everything an expert says on the stand is not necessarily competent “expert testimony”.

FRE 702 – Heightened Scrutiny

The testimony is based on sufficient facts or data; the testimony is the product of reliable principles and methods; and the expert has reliably applied the principles and methods to the facts of the case.

The chain of causation is enquired into at every stage from the observations to the conclusions – for **reliability and applicability**.

FRE 702 signals a major change of focus from mere qualification to the details of the testimony.

FRE 703 – Writings (An Exception)

An expert may base an opinion on facts or data in the case that the expert has been made aware of or personally observed. If experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject, they need not be admissible for the opinion to be admitted.

Though an expert may base an opinion on inadmissible facts or data, the practice is restricted to facts or data **reasonably relied upon by experts in that field**. Testing this requires a thorough cross-examination, and that examination should involve the admission of the scientific report consulted by the expert.

FRE 703 – Writings (An Exception)

Be aware that this area of law is in considerable flux!

For a good introduction, see *U.S. v. Turner*, 709 F.3d 1187 (7th Cir. 2013). This case reviews (then) recent U.S. Supreme Court cases and state law, primarily focusing on the issue of whether an expert's reliance on work done by another violates the Confrontation Clause.

Though not all States recognize the application of the Confrontation Clause to dependency matters, counsel should continue vigorously to argue for it. Same liberty interest.

Drug test evidence in hearings where hearsay is allowed

Remember that the issue addressed by FRE 702 and comparable state statutes is *reliability and correct application of methodology*, not the truthfulness of a statement.

Introduction of a drug screen or testimony regarding the results of a screen without an expert on the stand creates a **foundation issue** not cured by the fact that hearsay may be allowable in a particular hearing.

Example –Unqualified Witness

1. CM allowed to answer questions from agency attorney as to the results and recommendations of psychological evaluation, parenting assessment, and substance abuse evaluation. None of these documents were in evidence, and no foundational witnesses were called.
2. CASA opined that mother's substance abuse was not likely to be remedied.

Practice Points

- All of the standards deal with the question of *the reliability of scientific evidence*.
- Scientific tests are not admissible simply because they're scientific tests.
- The "Bat Boy Phenomenon of Scientific Belief":

"If scientists say something, it must be true…"

Voire dire at the point of the tender of the expert
and
cross-examine thoroughly.

Practice Points

The requirements of FRE 702/*Daubert* apply in bench trials. *Metavante Corp. v. Emigrant Sav. Bank,* 619 F.3d 748 (7th Cir. 2010); *Attorney Gen. of Okla. v. Tyson Foods, Inc.,* 565 F.3d 769, 779 (10th Cir. 2009); *Seaboard Lumber Co. v. United States*, 308 F.3d 1283, 1302 (Fed. Cir. 2002).

The "court must provide more than just conclusory statements of admissibility or inadmissibility to show that it adequately performed its gatekeeping function". *Gayton v. McCoy*, 593 F.3d 610, 616 (7th Cir. 2010).

Practice Points

"To be admissible under Rule 702, the expert's opinion must offer more than a 'bottom line'. … The expert must explain the methodologies and principles supporting the opinion." *Minix v. Canarecci*, 597 F.3d 824, 835 (7th Cir. 2010)

"Nothing in either *Daubert* or the Federal Rules of Evidence requires a …court to admit opinion evidence that it connected to existing data only by the *ipse dixit* of the expert." *General Elec. Co. v. Joiner*, 522 U.S. 136, 137 (1997)

TRIAL SKILLS

IDENTIFICATION

- Custodian of Records
- Certificate of Authentication
- Took the test
- Tested the sample

BUSINESS RECORDS EXCEPTION

1. Made at or near the time of the described acts
2. Made by a person with personal knowledge and a business duty to report
3. Kept in the course of regularly conducted business activity
4. It was the regular practice of that business activity to make the record

ENTERING INTO EVIDENCE

- Mark
- Show
- Approach
- Hand
- Publish

OTHER CONSIDERATIONS

- Bolstering credibility
- Cumulative
- Hearsay within hearsay

QUESTIONS?