Drug Testing and Dilutes
Forensic Toxicology

- Toxicology is a science that deals with poisons and their effect.

- Forensic toxicology is the application of toxicology as it applies to law.
Different Subgroups of Toxicology

- Postmortem Forensic Toxicology
- Human Performance Toxicology
- Forensic Drug Testing
Testing Approach

• Screening
Immunoassay

- Presumptive screening for the following drug/drug classes:
  - Methamphetamines
  - Benzodiazepines
  - Barbiturates
  - Cannabinoids
  - Carisoprodol
  - Cocaine
  - Opiates
  - Phencyclidine
  - Zolpidem
  - Methadone
  - Tramadol
  - Oxycodone
  - Amphetamine
  - Fentanyl
Accurate and Reliable Testing Procedures
Step One – Screening

- often based on immunoassay technology
- more drug – more binding - more “color” produced – more instrument detector response
- numerous commercial manufacturers
- designed for high throughput instrumentation or on-site devices
Immunoassay
Drug Screening

- Blank Plates
Drug Screening

- Addition of conjugate
Drug Screening

• Addition of color reagent
Drug Screening

- Addition of stop reagent
Drug Screening

- Reading the plates
# Drug Screening

## Sample report

### Immunnoassay Drug Screening Report

<table>
<thead>
<tr>
<th>Control ID</th>
<th>Barbiturates</th>
<th>Benzodiazepines</th>
<th>Cannabinoids</th>
<th>Carisoprodol</th>
<th>Cocaine/BE</th>
<th>Methamphetamine</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>100ng/ml</td>
<td>100ng/ml</td>
<td>10ng/ml</td>
<td>1000ng/ml</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>NC</td>
<td>Blank</td>
<td>Blank</td>
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</tr>
<tr>
<td>HPC</td>
<td>200ng/ml</td>
<td>200ng/ml</td>
<td>50ng/ml</td>
<td>1000ng/ml</td>
<td>29</td>
<td>24</td>
</tr>
<tr>
<td>% B/BO</td>
<td>112</td>
<td>75</td>
<td>22</td>
<td>108</td>
<td>111</td>
<td>5</td>
</tr>
<tr>
<td>Result</td>
<td>ND</td>
<td>ND</td>
<td>POSITIVE</td>
<td>ND</td>
<td>ND</td>
<td>POSITIVE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control ID</th>
<th>Opiates</th>
<th>PCP</th>
<th>Methadone</th>
<th>Oxyc/M</th>
<th>Tramadol</th>
<th>Zolpidem</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>10ng/ml</td>
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<tr>
<td>% B/BO</td>
<td>95</td>
<td>108</td>
<td>131</td>
<td>109</td>
<td>109</td>
<td>110</td>
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<tr>
<td>Result</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
</tbody>
</table>

None Detected (ND)
Step Two - Confirmation

- gas chromatography-mass spectrometry (GC/MS) or LC/MS or LC/MS/MS
  - drug molecules separated by physical characteristics
  - identified based on chemical “finger-print”
  - considered “gold standard”
- other chromatographic techniques
Why confirm?

- Is it really necessary to confirm drugs that tested positive by initial screening tests?
- Why can’t the court adjudicate cases based on the screening test results?
- FALSE POSITIVES
Drug tests & cross reactivity:

- screening tests can and do react to “non-target” compounds
  - amphetamines
  - benzodiazepines

- obtain list of interfering compounds from lab or on-site test vendor

- initial screening (“instant” tests) may only be 60-70% accurate

- confirm positive results
Drug Confirmation

- Extraction
- GC/MS and LC/MS
- Separation
- Identification
- Confirmation
- Various drugs classes
Drug Confirmation

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- Identification
- Confirmation
Drug Identification

- Extraction
- GC/MS and LC/MS
- Separation
- Identification
- Confirmation

COCaine R12251 SIGMA L#41H0374 MPW 3-23-94

Entry Number 6 from C:\Database\CAS 1000128-22-2
Melting Point 96
Boiling Point -300
Retention Index 0
Mol Formula C17H21NO4
Mol Weight 303.15
Company ID SIGMA

Miscellaneous Information
Cocaine
Drug Identification

- Extraction
- GC/MS and LC/MS
- Separation
- Identification
- Confirmation

No structure available for 007632-10-2
Drug Identification

- Extraction
- GC/MS and LC/MS
- Separation
- Identification
- Confirmation

No structure available for 000077-10-1
Drug Identification

- Extraction
- GC/MS and LC/MS
- Separation
- Identification
- Confirmation
Drug Identification

- Extraction
- GC/MS and LC/MS
- Separation
- Identification
- Confirmation
Drug Identification

- Extraction
- GC/MS and LC/MS
- Separation
- Identification
- Confirmation

No structure available for 028981-97-7
### Drug Identification

<table>
<thead>
<tr>
<th>Entry Number</th>
<th>CAS</th>
<th>Melting Point</th>
<th>Boiling Point</th>
<th>Retention Index</th>
<th>Mol Formula</th>
<th>Mol Weight</th>
<th>Company ID</th>
<th>Miscellaneous Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>127</td>
<td>000303-53-7</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>C2DH1N</td>
<td>275.17</td>
<td>SIGMA</td>
<td>Cyclobenzaprine</td>
</tr>
</tbody>
</table>

**Entry Number 127:**
- **CAS:** 000303-53-7
- **Melting Point:** 1
- **Boiling Point:** 1
- **Retention Index:** 0
- **Mol Formula:** C2DH1N
- **Mol Weight:** 275.17
- **Company ID:** SIGMA
- **Miscellaneous Information:** Cyclobenzaprine

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<table>
<thead>
<tr>
<th>Entry Number</th>
<th>CAS</th>
<th>Melting Point</th>
<th>Boiling Point</th>
<th>Retention Index</th>
<th>Mol Formula</th>
<th>Mol Weight</th>
<th>Company ID</th>
<th>Miscellaneous Information</th>
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</thead>
<tbody>
<tr>
<td>195</td>
<td>000050-48-6</td>
<td>~300</td>
<td>~300</td>
<td>0</td>
<td>C2DH23N</td>
<td>277.18</td>
<td>Cerilliant</td>
<td>Amitriptyline</td>
</tr>
</tbody>
</table>

**Entry Number 195:**
- **CAS:** 000050-48-6
- **Melting Point:** ~300
- **Boiling Point:** ~300
- **Retention Index:** 0
- **Mol Formula:** C2DH23N
- **Mol Weight:** 277.18
- **Company ID:** Cerilliant
- **Miscellaneous Information:** Amitriptyline

---

**No structure available for 000303-53-7**

**No structure available for 000050-48-6**
Drug Identification

IBUPROFEN

Entry Number  718  from  C:\Database\  
CAS    000000-54-4  
Melting Point    -300  
Boiling Point    -300  
Retention Index     6  
Mol Formula C13H18O2  
Mol Weight        206.131  

Miscellaneous Information
Probability Based Matching Data Base Entry.

No structure available for 000000-54-4

TETRAHYDROCANNABINOL, Delta-9

Entry Number  1403  from  C:\Database\  
CAS    000001-58-9  
Melting Point    -300  
Boiling Point    -300  
Retention Index     6  
Mol Formula C21H30O2  
Mol Weight        314.225  
Company ID

Miscellaneous Information
Probability Based Matching Data Base Entry.

No structure available for 000001-58-9
Drug Confirmation

- Extraction
- GC/MS and LC/MS
- Separation
- Identification
- Confirmation
ETG/ETS Testing

- EtG is a direct metabolite of ethanol.

- In addition to EtG, recent scientific studies have identified ethyl sulfate (EtS) as a second specific metabolite or biomarker of ethanol.

- The detection of EtG and EtS offers greater sensitivity and accuracy for determination of recent ethanol ingestion, than by detection of either biomarker alone.
Benefits of ETG/ETS Testing

- Accurate
- Greater sensitivity and accuracy
- Concurrent with drugs
Challenging Urine Collection Strategies
Sample Collection

Pre-collection Preparation:

• Site Selection
• Prepare Ahead
• Remove Outer Clothing
Sample Collection

- Wash Hands
- Witness
- Chain of Custody (label)
Sample Collection

- Accept sample and inspect
- Temperature, color, odor
- Labeled and proper storage
- Proper chain of custody
• Developing control strategies to prevent sample tampering is critical.

• Once clients understand that they cannot beat the system, they are more likely to engage in the therapeutic process towards recovery.
Valid Specimens

The Effective Use of Urine Creatinine Measurements in Abstinence Monitoring
EVERY urine sample collected for drug detection should be tested for creatinine.
Client has a bladder full of urine with a drug concentration of greater than the cutoff level of the test - thus producing a positive result.

Urine in the bladder is diluted by the consumption of large amounts of non-drug containing fluid; which results in a drug concentration that is less than the cutoff level of the test - thus producing a negative result.
Water contains no drugs!

- easiest, cheapest, simplest

- urine with a creatinines of less than 20 mg/dL are considered “dilute” and rarely reflect an accurate picture of recent drug use

- dilute samples are more like water than like urine

- incidence of low creatinines in a population undergoing random drug testing is significantly (up to 10 times) greater than a non-drug tested population
The “Normal” Urine Creatinine

- normal urine creatinine: 2005 study “Urinary Creatinine Concentrations in the U.S. Population” determine the mean (based upon 22,245 participants) was 130 mg/dL

- study was not associated with drug testing

- subjects came from a variety of ethnic groups

- samples were collected AM, mid-day, and PM

- less than 1% below 20 mg/dL

- less than 1% greater than 400 mg/dL
Creatinine Distribution

N = 11,141
Median = 119.3 mg/dL
Mean = 130.3 mg/dL
More Creatinine Issues

- rapid ingestion (90 minutes) of 2-4 quarts of fluid will almost always produce low creatinines & negative urine drug tests within one hour

- recovery time of urine creatinine and drug concentrations can take up to 10 hours
“Dilute” Result Interpretation:

- Negative or none detected results should never be interpreted as indicating no drug use (abstinence), because if, in fact, drugs were present, they probably could not be detected by the test.

- Positive drug test results from a dilute sample however, are considered valid (donor was not able to dilute the sample sufficiently to deceive the test).
Creatinine Sanctions

- verbal warning
- community service
- write paper on how the kidney works
- increased surveillance (therapeutic response)
- loss of privileges
- jail time
Dilutes & Therapeutic Goals

- Honesty – touchstone concept
- Dishonesty is a learned behavior
- Honesty is a proximal goal
- Honesty is a behavior that your clients can control
- Honesty should be a critical goal for phase advancement
Two final thoughts about dilute urine samples . . . .

- A creatinine of less than 20 mg/dL (associated with a drug test) is nearly always an attempt by the donor to avoid drug use detection - REGARDLESS of how much liquid was consumed in order to achieve this result.

- Place a dilute sample prohibition in your client contract and sanction for repeat dilute samples.
Participant Contract
Paint Roadmap for Success

- Upon entering the Drug Court, participants receive a clear and comprehensive explanation of their rights and responsibilities related to drug and alcohol testing.

- Outcomes are significantly better when Drug Courts specify their policies and procedures clearly.

- Participants are significantly more likely to react favorably to an adverse judgment if they are given advance notice about how such judgments are made.
The Importance of “Specificity” in a Client Contract:

• “I understand . . . . . . .”

• I will be tested for the presence of drugs in my system on a random basis according to procedures established by the Drug Court Team and/or my treatment provider.

• I understand that I will be given a location and time to report for my drug test.

• I understand that it is my responsibility to report to the assigned location at the time given for the test.
The Importance of “Specificity” in a Client Contract:

- I understand that if I am late for a test, or miss a test, it will be considered as a positive test for drugs/alcohol and that I may be sanctioned.

- I understand that if I fail to produce a urine specimen or if the sample provided is not of sufficient quantity, it will be considered as a positive test for drugs/alcohol and that I may be sanctioned.

- I understand that if I produce a dilute urine sample it will be considered as a positive test for drugs/alcohol and that I may be sanctioned.
The Importance of “Specificity” in a Client Contract:

• I have been informed that the ingestion of excessive amounts of fluids can result in a diluted urine sample and I understand that my urine sample will be tested to ensure the sample is not dilute.

• I understand that substituting or altering my specimen or trying in any way to modify my body fluids for the purposes of changing the drug testing results will be considered as a positive test for drugs/alcohol and will result in sanctioning and may be grounds for immediate termination from drug court.
Specimen Tampering
Basics of Specimen Tampering - The Three Approaches

- dilution
- adulteration
- substitution
Urine Specimen Adulteration

- addition of foreign substances designed to “mask” drug presence
- post-collection tampering
- low-tech adulterants that cause “pH shift” (lime, vinegar, bleach, ammonia, lemon, drano)
- low-tech adulterants that disrupt testing chemistry (salt, methanol, detergent)
- “high-tech” adulterants
Urine Specimen Substitution

- replacing donor urine sample with another drug-free specimen
- biological substitution - someone else’s “clean” urine
- non-biological substitution - replacing urine with urine “look-a-like” sample (diet Mountain Dew, water with food coloring)
- non-biologicals can be detected with creatinine testing
If you want to buy Sub Solution, then the only place I recommend you buy it is testnegative.com. It's $75 on there, but it's the company who make it, and you know you're getting quality product.

Yes it's expensive, and so I want to tell you a way you can actually lower the cost of buying Sub Solution to pass a urine drug test.

Testnegative have actually just launched a new synthetic urine called Quick Luck urine.
Quick Fix Synthetic 2oz

$29.95

Need accessories? You might also like:

- **Synthetic Urine Belt**
  - $34.95

- **The Stash Leg Strap**
  - $19.95

- **Sticky Hand Warmers**
  - $1.95

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Add to Cart

Place your order in the next 4 hours, 10 minutes, 10 seconds and receive it Monday if you select Overnight Shipping.

Don't forget to check the Stash products to stash you Quick Fix, like our Stash Undies and Stash Strap. If you need a life like urinating penis, check out the Piss Perfect Urination Device.

The Quick Fix Synthetic Urine 6.2 formulation is the #1 selling patented synthetic urine kit created for Spectrum Labs 25 years ago. Since its creation, Quick Fix Synthetic urine has stayed ahead of the curve to be the best synthetic urine on the market by keeping its formulations current with testing standards and it's been so effective of a product it's been adopted by the wet sex community as fake urine alternative for real urine and various labs and universities use it since it mimics human urine perfectly.

This laboratory designed synthetic urine creates a toxin free clean urine that can be used by males and females and is balanced for pH, specific gravity, creatinine, urea, and several other urine characteristics.

With this premixed synthetic urine, you don't have to worry about mixing, it's as simple to use in four easy step:
Specimen Validity Tests (SVT)

- creatinine, UUN
- specific gravity
  - pH
- nitrites
- gluteraldehyde
  - pyridine
- chromium

Request SVT from testing laboratory or use dip-stick SVT products for on-site testing.
Controlling Specimen Tampering

- develop challenging collection strategy - ie. make the testing unannounced and RANDOM!

- directly observed collections is the most effective approach to preventing adulteration and substitution

- inspect sample - train collection staff

- keep abreast of tampering techniques

- take temperature measurements (90° - 100° F)

- use laboratory employs specimen validity tests & use with on-site devices
Myth or Fact

• I tested positive because of a poppy seed bagel.
Myth or Fact

- Vigorous working out will clear drugs from my system.
Myth or Fact

• THC can stay in your system for a month.
Myth or Fact

• I haven’t had any pot. It was secondhand smoke.
Frequency Guidelines

• Twice per week until all other requirements have been reduced.

• When testing is reduced, near the end, the participants should still have enough time in the program to assess the impact of the reduction.
Question Time