"Urine Luck"
Overview of New Drug Testing Technologies and Conundrums

Greg Skipper, MD
Medical Review Officer
Fellow, American Society of Addiction Medicine
Director, Professional Health Services,
Professionals Evaluation and Treatment Programs at Promises
Santa Monica CA
gregory.skipper@gmail.com
310-633-4595
Disclosures

• Director, Professionals Health Services, Promises Treatment Centers – employee
• Affinity Online Solutions – tertiary MRO consultant
• Consultant to numerous regulatory boards, courts, and other agencies
Background

• Innovator of EtG as an alcohol biomarker with Friedrich Wurst MD from Switzerland in 2001
• Assisted the initial lab in the USA, NMS near Philadelphia, to start performing EtG testing
• Participated in both SAMHSA committees that developed Advisories re new alcohol markers in 2006 and 2012
• Accepted as an expert regarding alcohol markers in administrative, criminal, family and federal courts
• Maintains website: www. ethylglucuronide.com
• Copy of this slide show is posted at gregskippermd.com
Overview

• Common MRO Q and A
• Overview of Drug Testing
• New alcohol biomarkers
  – Standard of care for use
  – To detect drinking and document abstinence
  – Used individually or together to enhance reliability
• New devices for monitoring alcohol use
  – Comparison to biomarkers
  – Used with biomarkers
Difficult Cases

• Patient prescribed hydrocodone
  – Urine test negative for opioids
  – Urine test positive for hydromorphone only?
  – Oxymorphone?
  – Codeine?
Difficult Cases

Not comprehensive pathways, but may explain the presence of apparently unprescribed drugs

*6-MAM=6-monoacetylmorphine*
Difficult Cases

• Patient prescribed oxycodone
  – Urine test negative for opioids
  – Urine test positive for hydrocodone
  – Oxymorphone?
  – Codeine?
Anomalous observations of hydrocodone in patients on oxycodone.

BACKGROUND: Oxycodone preparations are known to have small amounts of hydrocodone as an impurity estimated to be <0.1%. We established the concentration of unexpected hydrocodone in patients taking oxycodone.

METHODS: 30,000 pain patients

CONCLUSIONS: When oxycodone is >100,000ng/ml, hydrocodone should be <1500ng/ml. When oxycodone is <100,000ng/ml then hydrocodone should be <500ng/ml. Values greater than these indicate non-prescribed hydrocodone use. Clinicians and laboratories testing urine for drugs should be aware of the possibility of low concentrations of hydrocodone in the urine of patients taking high doses of oxycodone.
Difficult Cases

• Patient prescribed diazepam
  – Urine test positive for oxazepam only
  – Temazepam
Difficult Cases

• Patient on alprazolam clonazepam
  – Urine test negative for benzo’s?
  – Hair test negative for benzo’s?
Matrices

Figure 3. Relative detection times of drugs in biologic specimens

- Blood
- Saliva
- Urine
- Sweat
- Hair
MRO function

• Is there a cause for positive other than illicit use?
  – Legitimate prescription
  – False positive – at least two types
Legitimate Use?

- Coca tea?
- Cocaine positive from sex?
- ENT procedure?
- Hemp oil? Hemp cereal? Hemp cosmetics? Hemp granola bars? Hemp lip balm?
- Sprained ankle and was given heroin while visiting Great Britain?
- THC? Ever legal in US?
  - Passive inhalation
- Poppy seeds
Poppy Seeds

• Over 1,000 species of poppy seeds
• Used in cooking
  – Baking
  – Salad dressings
  – Curry sauces
• Morphine level >1,000, >2,000, >5,000, >15,000 ????
• Urine concentration can be a clue
Accidental Exposure

- Marijuana brownie
- Someone else’s medication
- Took pill and didn’t know what it was
- Drank punch and didn’t know it had alcohol in it
- Vacuuming up someone else’s cocaine and turned vacuum cleaner on reverse and blew it into the air
## Crossreactivity

<table>
<thead>
<tr>
<th>Interfering drug</th>
<th>Immunoassay affected*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quinolone antibiotics (eg, levofloxacin, ofloxacin)</td>
<td>Opiates</td>
</tr>
<tr>
<td>Antidepressant trazodone</td>
<td>Fentanyl</td>
</tr>
<tr>
<td>Antidepressant venlafaxine</td>
<td>Phencyclidine</td>
</tr>
<tr>
<td>Atypical antipsychotic quetiapine</td>
<td>Methadone</td>
</tr>
<tr>
<td>Antiretroviral efavirenz</td>
<td>THC</td>
</tr>
<tr>
<td>Diet pills (eg, clobenzorex, fenproporex)</td>
<td>Amphetamine</td>
</tr>
<tr>
<td>Promethazine (for allergies, agitation, nausea, vomiting)</td>
<td>Amphetamine</td>
</tr>
<tr>
<td>l-methamphetamine (over-the-counter nasal inhaler)</td>
<td>Amphetamine</td>
</tr>
<tr>
<td>Dextromethorphan</td>
<td>Phencyclidine</td>
</tr>
<tr>
<td>Proton pump inhibitors (such as pantoprazole)</td>
<td>THC</td>
</tr>
</tbody>
</table>
Positive Amphetamine

• Vics inhaler, selegiline, EMSAM patch
  – D & L Isomer test
    • >80% l-amphetamine consistent w/
• Pseudoephedrine converted to amphetamine inside the GC/MS machine
  – Retest
Dilutes

- Creatinine <20 mg/dl and sp gr <1.003
  - Creatinine <20 but >10 mg/dl can be from innocent excess water
  - Creatinine <10 mg/dl but >5 mg/dl not likely innocent
  - Creatinine <5 mg/dl probably substitution
  - Creatinine <2 mg/dl definitely substituted
Federally Regulated Testing

• 1986 – Ronald Reagan
• Executive Order #12564 - Drug Free Federal Workplace
• Regulated Federal Industries
  – DOT, NRC, FAA, FHWA, FRA, FTA, RSPA, USCG, etc
  – “Sensitive Positions”
• Non-Regulated Testing – everyone else
Is Drug Testing Necessary?
Purposes of Drug Testing

• Diagnosis – substance use disorders
• Accountability - improves outcomes
• Documentation of recovery - advocacy
• Detection of relapse – early intervention
• Prevention – deterrence
• Drug treatment studies – to verify abstinence
Purposes of Drug Testing – Additional Reasons in Professional Monitoring Programs

All the above plus:

• Malpractice liability protection – defense
• Patient protection – gives boards confidence
• To gain support to return to work – partners, etc
Drug Testing

• Any tissue can be tested – (matrix)
  – Urine, blood – most available
  – Hair – excellent – “repository matrix”
  – Fingernails – similar to hair
  – Oral Fluids – less invasive/intrusive
  – Sweat – sweat patch – artificial repository matrix

• But not all drugs show up in every test
  – For example, Alcohol testing is very limited – (EtG testing has changed this)
Matrices and Drugs

• Urine
  – Most everything shows up in urine
  – Fermentation can cause + urine alcohol
  – Some drugs are best identified by their metabolites (e.g. cocaine – benzoylecognine, alcohol – EtG or EtS)
  – Sometimes you only see metabolites (e.g. hydromorphone, oxazepam)
Matrices and Drugs

• Blood and Oral Fluids
  – Shorter “window of detection”
  – Good for alcohol – but short-lived
  – Blood is good for Phosphatidylethanol (Peth)
Matrices and Drugs

• Hair and Nails
  – Great for opiates
  – Poor for marijuana
  – Subject to external contamination (e.g. cocaine, anesthetic drugs, etc.)
  – Not effective for alcohol but good for EtG (metabolite of alcohol)
Benefits of Drug Testing

• Binary – positive or negative
• Objective – on paper
• Science based - authoritative
• Addiction thrives in secret
  – Dishonesty = hallmark of addiction
  – Honesty = hallmark of recovery
• Drug testing “induces” honesty
Drug Testing – Emerging Technologies

• Quick Test Kits
• Better confirmation tests: LC/MS/MS
• More extensive testing panels
• Increased Use of Flex Testing
• Improved testing for ethanol (EtG, EtS, etc)
• Devices: TAD, SCRAM, Soberlink
Hair Testing

Trace amounts of chemical substance entrapped in cortex

Cuticle
Skin
Vein
Artery

Illustration of Human Hair
Nail Testing

• Good alternative to hair testing
• Similar repository window
• Less prone to adulteration from chemicals
• Thicker than hair
Oral Fluids Testing

- DHHS - 5 DRUGS, ALCOHOL
- SIMILAR TO PLASMA
- INCREASINGLY USED

(ie dilute urines)
Sweat Testing

- DHHS - 5 DRUGS
- PAROLE/PROBATION
- Less invasive than hair testing
Terms

• MRO – Medical Review Officer
• NIDA Five (SAMHSA) – Opiates, MJ, Amphetamines, Cocaine, PCP
• TPA – Third Party Administrator
• DOT Certified Lab –> SAMHSA Certified
• LC/MS/MS – Liquid chromatography tandem mass spectroscopy
• ELISA – Enzyme Linked Immunosorbent Assay
TPA – Third Party Administrator

• Notification
• Mass purchase lab testing
• Collection site setup, maintenance, QA
• Collect reports from lab
• Report storage, display, etc
• Billing
• MRO services
• Other
Notification (for testing)

- Website login – PIN or PW
- 800 number call in daily - Color
- Shorter notice the better
  - Less time to prepare to dilute or substitute
- Call-in time can be helpful to know in some situations – ie dilutes
Collection

• The weakest link
• Facilities – labs, hospital, clinics, etc
• Personnel
  – Direct Observation – 100% ?
  – Temp – Substitution (90-100 degrees or within 1.8 degrees of body temp)
  – Obvious Adulteration – Manipulation (Color, odor, objects, etc..)
  – Shy Bladder - <30cc Urine
    • 45oz of water over 3 hours
All Labs are not the same!
Lab

• Chain of custody
  – Signatures
  – Seals
  – Delivery

• Screen – RIA – Radioimmunoassay, ELISA

• Confirmation – GC/MS – Gas Chromatography/Mass Spectroscopy

• LC MS/MS

• Cut offs
Reports

• Negative
• Positive – Confirmed by GC/MS
• Other
  – Unable to test – Invalid - ?Medication (which interfere w/ testing) - ?Adulterant
  – Substituted (Creat <5 and SpGr <1.001 or >1.020)
  – Adulterated – Nitrite >500, pH <3 or >11 or others identified adulterant (gluteraldehyde, clorox, oxidase peroxidase, pyridinium hypochlorate, drano, etc.)
MRO Verification

- Food – Hemp Oil, Coca Tea, Poppy Seeds
- Rare Prescriptions – Marinol, Heroin, PCP
- Verify the legitimacy of a positive urine and/or eliminate legitimate use
- Sort out complicated results
Substitution

• Detection
  – Temp
    • Immediately provide 2\textsuperscript{nd} urine under direct observation
  – Creatinine & Specific Gravity
    • (Dilute vs inconsistent with human urine)

• Methods
  – Water or other liquid
  – Someone else’s urine or artificial urine
  – Substitution devices, self cath, ?
Adulteration

- **Detection**
  - Nitrate concentration $\geq 500$ ug/mL
  - PH $\leq 3$ OR $\geq 11$
  - Gluteraldehyde, Stealth or other oxidizing agents

- **Methods**
  - Nitrites – Klear (KNO$_3$),
  - PH – Urine Luck – (was HCl now Pyridium Chlorochromate), Drano,
  - Other oxidizing agents - Stealth (Oxidase Peroxidase), Urin Aid – glutaraldehyde,
  - Methods
    - Soap
    - Clorox
    - Ginseng Tea
    - Water

**CLOROX**
Cottage Industry of Drug Testing
Subrogation

Kevin Launius / Grants Pass Daily Courier
Hey, man. . .
when you get caught
with your pants down. . .
Urine Luck™!

Order Over the Internet
FREE!
Shipping+Handling

You can trust
Tommy Chong’s brand of Urine Luck

Tommy Chong,
formerly of 'Cheech & Chong'
and his wife, Shelby.

Complete Line of Detoxifying Products
Click on Products for More Information
$20.00

• Flushes all unwanted toxins in under 3 hours.
• Extended effectiveness for up to 5 hours.
• Contains vitamin B-complex and creatine.
• Made with safe, all-natural, herbal ingredients.
• More convenient than teas - no preparation needed.
Never worry about a drug test again.
Mystique's Urine Transport System "UTS"

DON'T GET PEE'D OFF!!!

Can't urinate on command?

Can't urinate on the spot?

Need to find a job?

Need to keep a job?

UTS Unit $79.95 Complete Unit with 3 Heating Pads
ANYTIME, ANYWHERE...  
LET IT FLOW!

ORIGINAL

WHIZZINATOR

- UNDETECTABLE!
- FOOLPROOF!
- RE-USABLE!

The WHIZZINATOR is an easy to conceal, easy to use urinating device with a very realistic prosthetic penis. It has been extensively tested and proven to work under real-life conditions! It has no batteries to run out at critical times, no wires to break, no retail to set off detectors. Other devices can leave you hanging after only four hours, but the WHIZZINATOR is designed to be comfortably worn as an undergarment for extended periods of time! Used with our organic heat pads, it is GUARANTEED to maintain body temperature for EIGHT HOURS! And our quality production and materials assures you that the WHIZZINATOR will let it flow, again and again, anytime, anywhere you need it!

SO REAL WE CAN'T SHOW

YOU THE WHOLE THING!

COMES IN NATURAL, IFELIKE SKIN TONES:

White  Tan  Brown  Black

The WHIZZINATOR comes complete and ready for testing with a fully adjustable latex-free elastic belt (sizes 28 to 52), 4 oz. vinyl bag, prosthesis, one sample of concentrated toxin free urine and...
COMES IN 4 NATURAL, *LIFELIKE* SKIN TONES:

| White | Tan  | Brown | Black |

The Whizzinator  $149.95
Alcohol - number one drug of abuse!

Drug of Choice for Physicians

<table>
<thead>
<tr>
<th>Drug</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>49</td>
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<tr>
<td>Opioids</td>
<td>35</td>
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<td>Stimulants</td>
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<td>Sedatives</td>
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<tr>
<td>Marijuana</td>
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<tr>
<td>Hallucinogens</td>
<td>0.2</td>
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<tr>
<td>Other</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Drug of Choice for All People Entering Treatment

<table>
<thead>
<tr>
<th>Drug</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>38</td>
</tr>
<tr>
<td>Opioids</td>
<td>16</td>
</tr>
<tr>
<td>Stimulants</td>
<td>19</td>
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<tr>
<td>Sedatives</td>
<td>1</td>
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<tr>
<td>Marijuana</td>
<td>14</td>
</tr>
<tr>
<td>Hallucinogens</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>1.8</td>
</tr>
</tbody>
</table>
Alcohol ‘legal’ – but not for everyone!

• Alcoholics in recovery
• Others in recovery from drug addictions
• Custody cases involving alcohol abuse
• Underage (under 21 in most jurisdictions)
• Parole or probation when abstinence is ordered by judge
• Liver transplant clinics
• US military
• Race horses
In the beginning...until 2001

- Blood alcohol
- Breath alcohol
- Urine alcohol
  - Limitations when used for alcohol monitoring
- GGT, MCV
- Carbohydrate Deficient Transferrin
Current Technologies

• New markers
  – EtG – EtS – PEth
  – Urine – Hair/Nails – Saliva – Blood

• Random field breathalyzer

• Multiple daily ID home breathalyzer

• Transcutaneous alcohol monitoring
Problems w/ Previous Markers

• Blood alcohol – short duration
• Urine alcohol – short duration, fermentation
• All
  • Lacked acceptable time spectrum for detection
  • Lacked sensitivity and specificity
  • Influenced by
    – age,
    – gender
    – a variety of substances
    – non-alcohol-associated diseases and
    – other factors (i.e. in vitro fermentation)
Alcohol Metabolism

- Ethanol
  - MEOS (CYP2E1)
  - ADH
    - Acetaldehyde
      - ALDH
        - Acetate
          - Carbon dioxide
          - Water

ADH  – alcohol dehydrogenase
ALDH – acetaldehyde dehydrogenase
MEOS – microsomal ethanol oxidizing system
(CYP2E1 – cytochrome P450 isoform)
Direct metabolites of alcohol

**OXIDATIVE**
- Ethanol
  - alcohol dehydrogenase
  - MEOS
  - catalase
  - acetaldehyde
    - acetaldehyde dehydrogenase
    - acetate
  - phosphatidyl choline
  - phospholipase D
  - phosphatidyl ethanol

**NON-OXIDATIVE**
- fatty acid
  - FAEE synthase
  - AEAT
  - ethyl glucuronide & ethyl sulfate
  - fatty acid ethyl esters
  - UDP glucuronic acid
New Markers with Potential

• **Ethyl glucuronide (EtG)** – 1-5 days*
• Ethyl sulfate (EtS) – 1-5 days*
• Phosphatidyl ethanol (PEth) – (7 drinks) - 2 weeks
• Carbohydrate deficient transferrin (CDT) – weeks

• Fatty acid ethyl esters (FAEE) – 1 day
• Ethyl phosphate (EtP) – 1-2 days
• HTOL/HIAA ratio – serotonin metabolites – 1 day

* Suitable for abstinence monitoring
Ethylglucurononide (EtG)

Formation

- via conjugation of ethanol with activated glucuronic acid in the presence of membrane bound mitochondrial UDP glucuronyl transferase (UGT)

*Stephan Seidl* et al.

![Chemical reaction diagram](image)

**Figure 1.** Formation of ethyl glucurononide (EtG) by conjugation of UDP-glucuronic acid and ethanol.

Ethylglucuronide (EtG)

• A few hours after alcohol consumption, EtG in urine will be positive

• Detectable up to 1-5 days after the complete elimination of alcohol from the body

(Schmitt et al., 1997, Wurst and Skipper, 1999, 2001; Seidl et al., 1998)
Ethyl glucuronide in urine after intake of 9 g of ethanol – single subject (27y/o 72kg male)
UEtG concentration over 4 days in 15 alcohol detoxification subjects
Stability of ethyl glucuronide

Anders Helander, Helen Dahl.

Urinary Tract Infectin: A Risk Factor for False-Negative Urinary Ethyl Glucuronide but not Ethyl Sulfate in the Detection of Recent Alcohol Consumption.

Clinical Chem 2005
False-negative EtG (but not EtS) from in-vitro bacterial degradation
And then later
False-positive EtG (but not EtS) from in-vitro bacterial synthesis

Ethyl sulfate

\[ \text{C}_2\text{H}_6\text{O}_4\text{S} \]

126.1313
Urine Concentrations of EtG/EtS

- Comparable cutoffs by LC/MS/MS?
  - 100 ng/mL / 25 ng/mL
  - 250 ng/mL / 50 ng/mL
  - 500 ng/mL / 100 ng/mL
  - 1000 ng/mL / 200 ng/mL

Comparable detection timeframes
Ethyl sulfate

- direct ethanol metabolite
- **1959** first reported: formed via conjugation of activated sulfate and ethanol by rat liver: Vestermark and Boström
- formed by sulfotransferases (polymorphism but different than EtG)
- molecular weight: 126 g/mol (smaller molecule than EtG)
- molecular formula: C$_2$H$_5$SO$_4$H
- enzymatic breakdown: via sulfatase
- Determination: LC/MS-MS with d$_5$-EtS as internal standard
Incidental Exposure to alcohol - Concepts

Defining terms
• Cutoffs – primary vs secondary
• “Incidental” exposure
• “Accidental” exposure
• Clinical assessment
  – Exposure studies (in or out-patient)
  – Auto-brewery syndrome testing
  – Antabuse
  – SCRAM and TAD
  – Addiction evaluation/polygraph
  – Digital Photo Breathalyzer
Sources of incidental exposure to alcohol

• Foods
  – Deserts
  – Cooking sherry and wine vinegar, flambé desserts
  – Vanilla extract (especially if used in large amounts, e.g. in drinks)

• Hygiene Products
  – Mouthwash (Examples)
    • Listerine Original - 26.9%
    • Listerine Fresh Burst - 21.6%
    • Scope - 14.3%
    • Cepacol - 14%
Sources of incidental exposure

• OTC Meds (Examples)
  – Nyquil Nighttime - 25%
  – Vick’s Formula 44 - 10%
  – Etc

• Other
  – Communion Wine
  – “Alcohol-free” Beer and Wine
# Products Containing Ethanol

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Ethanol Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off! Skintastic IV</td>
<td>90-95</td>
</tr>
<tr>
<td>Purell Instant Hand Sanitizer, Original</td>
<td>62</td>
</tr>
<tr>
<td>Purell Instant Hand Sanitizer Dry Hands Formula</td>
<td>62</td>
</tr>
<tr>
<td><strong>Purell Instant Hand Sanitizer</strong></td>
<td>62</td>
</tr>
<tr>
<td>Purell Instant Hand Sanitizer with Aloe, Moisturizers &amp; Vitamin E</td>
<td>62</td>
</tr>
<tr>
<td>Purell Instant Hand Sanitizer Packets</td>
<td>62</td>
</tr>
<tr>
<td><strong>Purell Kids Own Berry Blast</strong></td>
<td>62</td>
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<tr>
<td>Lysol Brand Antibacterial Hand Gel</td>
<td>63</td>
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<tr>
<td>Static Guard</td>
<td>70</td>
</tr>
<tr>
<td>Radio Shack 951 Low Residue Soldering Paste Flux</td>
<td>73</td>
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<tr>
<td>Invisible Shield Surface Protectant-04/11/2002</td>
<td>78</td>
</tr>
<tr>
<td>Lysol Brand II Disinfectant Spray-Country Scent (aerosol)</td>
<td>79</td>
</tr>
<tr>
<td>Lysol Brand Disinfectant Spray, Antibacterial, Original Scent</td>
<td>79.0</td>
</tr>
<tr>
<td>Fire Up II Firestarter</td>
<td>&lt;85</td>
</tr>
<tr>
<td>Lysol Brand II Disinfectant Plus Fabric Refresher 12 oz</td>
<td>85</td>
</tr>
<tr>
<td>Rain X The Invisible Windshield Wiper</td>
<td>86</td>
</tr>
</tbody>
</table>
Products Containing Ethanol

**Off Skintastic Insect Repellent for Kids**  
>90

- Avon NATURALS Body Spray, Lily  60-98
- Avon Dreamlife Eau de Parfum Spray  60-98
- Avon Radiant Moments Body Spray  60-98
- Avon NATURALS Body Spray, Almond  60-98
- Avon Black Suede Cologne Spray  60-98
- Avon Planet Spa White Tea Energizing Face and Body Mist  60-98
- Avon MUSK FOR BOYS  60-98

**Oust Air Sanitizer, Outdoor Scent**  
60-70

- Avon Perceive For Men Cologne Spray  60-98
- Avon Midnight Frost Fragrance Spray  60-98
- Avon Wild Country Outback Eau De Toilette Spray  60-98
- Avon Perceive Eau de Parfum Spray for Women  60-98
- Avon Memorable Eau de Parfum Spray  60-98
Products Containing Ethanol

Avon WILD COUNTRY Cologne Spray 60-98
Avon Passion Dance for Men 60-98
Avon Lil Hugs Gentle Splash 60-98
Avon Vintage Cologne Spray 60-98
Avon NATURALS Body Spray, Vanilla 60-98
Avon Intrigue Cologne Spray 60-98

Avon NATURALS Body Spray, Raspberry 60-98
Avon Haiku Eau de Parfum Spray 60-98
Avon Simply Radiant Shimmering Body Spray 60-98
Avon NATURALS Body Spray, Peach 60-98
Avon Far Away Sensual Embrace Eau de Parfum Spray 60-98
Avon RARE GOLD Eau de Parfum Spray 60-98
Avon NATURALS Body Spray, Cucumber Melon 60-98
Avon Prospect Eau de Toilette Spray 60-98
Avon Black Suede After Shave 60-98
Avon Pink Suede Eau de Toilette Spray 60-98
Avon Moisture Effective Eye Makeup Remover Lotion 60-98
Products Containing Ethanol

Avon NATURALS Body Spray, Gardenia 60-98
Avon Mesmerize for Men Cologne Spray 60-98
Avon Wild Country Outback After Shave Lotion 60-98
Avon Passion Dance for Women 60-98
Avon Little Black Dress Eau de Parfum Spray 60-98

**Avon WILD COUNTRY After Shave** 60-98

Avon Night Evening Magic Cologne Spray 60-98
Avon NATURALS Body Spray, Sea 60-98
Avon Imari Eau de Cologne Spray 60-98
Avon NATURALS Body Spray, Plumeria 60-98
Avon Ginger Scents Spray Ginger Fresh Body Mist 60-98
Avon RARE PEARLS Eau de Parfum Spray 60-98

Rain-X Anti-Fog 70-99
Rain-X Windshield Wax 70-95
Rain X Marine Windshield Treatment 70-95

**Oust Bathroom Outdoor Scent Fan** 40-60

Clorox Spring Mist Disinfecting Spray-Floral Fresh 18 Oz. (aerosol) 60-80
Products Containing Ethanol

Cutter Unscented Insect Repellent 37
Cutter All Family Insect Repellent Mosquito Repellent Pump Spray 39
LOreal Pumping Curls for Curly Hair 41
Repel Insect Repellent Sportsmen Max Formula, 40 Percent DEET 43.7
Repel Insect Repellent Family Formula Spray Pump, 23 Percent DEET 44
Cutter Unscented Outdoorsman Insect Repellent II Pump Spray 44
Repel Hunters' Insect Repellent with Earth Scent, 55 Percent DEET <45

**Repel Insect Repellent Scented Family Formula Aerosol, 23 Percent DEET** 48.3

Cutter Skinsations Insect Repellent 1, Aloe & Vitamin E, Clean Fresh Scent 50
Bulls Eye Clear Shellac 55
Repel Insect Repellent Sportsmen Formula Spray Pump, 25 Percent DEET 55
KimCare Instant Hand Sanitizer 60
Paul Mitchell Freeze & Shine Super Spray >60
Paul Mitchell Freeze & Shine Super Spray (New) <60
Bath & Body Instant AntiBacterial Hand Gel-Freesia 60
Handsanitizing Gel
Hand Sanitizer

- Contains 62 - 90% ethanol
- Hand sanitizer (often a gel hand cleaner) that rapidly kills most germs
- Recently promoted in hospitals and everywhere as a means to reduce hospital acquired infections
- Used without a sink or towels
Research Questions

• Does Ethanol in Hand Sanitizer enter the body of the user?
• If so, how does the alcohol get in?
Methods

24 subjects were randomized into 4 groups

- **Both Skin & Inhalation**—sat in a bathroom for one hour; on cue every 4 minutes applied 4 squirts (2 cc) of Purell™ hand sanitizer (15 times)

- **Inhalation only**—sat in same bathroom within 2 feet of a Both subject and breathed the vapor

- **Skin only**—applied 4 squirts of hand sanitizer 15 times over one hour while hands were isolated in a laminar air flow chamber

- **Control**—no exposure to hand sanitizer.
Skin Only Condition: Applied hand sanitizer in laminar air flow chamber
Results

- The *Both Skin & Inhaled* group was significantly higher than control $p=0.0044$.
- The 30-minute post exposure EtG was significantly higher than baseline and 6 hours post exposure $p=0.0049$. 
Conclusion

- Hand sanitizer is primarily absorbed via inhalation rather than through the skin.
- Recovering alcoholics, especially those who are subject to urine monitoring for EtG, should avoid breathing vapor of alcohol-based hand sanitizer.

www.ethylglucuronide.com – download paper (top of first page)
A “high” positive (e.g., >1,000 ng/mL) may indicate:
- Heavy drinking on the same day or previously (e.g., previous day or two).
- Light drinking the same day.

A “low” positive (e.g., 500–1,000 ng/mL) may indicate:
- Previous heavy drinking (previous 1–3 days).
- Recent light drinking (e.g., past 24 hours).
- Recent intense “extraneous” exposure (within 24 hours or less).

A “very low” positive (100–500 ng/mL) may indicate:
- Previous heavy drinking (1–3 days).
- Previous light drinking (12–36 hours).
- Recent “extraneous” exposure.
Benefits of EtG/EtS

• Better than other markers for detecting recent alcohol use
• Present in urine and hair
• Better to document abstinence (advocacy)
• Better to discourage drinking (deterrence)
• Better to detect relapse (detection)
• Better to R/O false positive urine alcohol (in vitro fermentation) (confirmation)
• Useful in association with transcutaneous alcohol sensors (such as the TAD – device – from BI.com) (confirmation)
Standard Use of Alcohol Markers
Survey of all PHPs (March 2013)

1. All programs use EtG
   – 47% have EtG on a standard panel
   – 53% have EtG on a separate panel

2. 85% use EtS
   – 82% use it because it automatically comes with EtG

3. 76% use blood PEth
   Of those 24% who don’t use it:
   – 50% don’t know why they don’t use it
   – 50% don’t use it because there is not yet adequate science to support its use – 3 programs
Standard Use of Alcohol Markers

4. EtG cutoffs:
   a. 100ng/ml – 7%
   b. 250ng/ml – 34%
   c. 500ng/ml – 57%

5. Reporting of EtG to regulatory board:
   a. Always – 18% - N=8 programs
   b. Depends on circumstances – 58% 25 programs
Standard of Use of Alcohol Markers

7. About ½ of programs have used hair or nail EtG.

8. Most common reasons for use of PEth test
   - 60% After positive EtG/EtS if drinking is denied
   - 63% If drinking is highly suspected
   - 23% of programs use it randomly
Ethylglucuronide (EtG)

- Sensitivity of EtG (19 subjects, 1-6 drinks, all urine tests were negative after 26 hours)

Conclusion

• EtG/EtS are the best markers for early detection of drinking and for documenting abstinence but:
  – Probably miss most minor drinking episodes
  – Can be positive from recent extraneous exposure
Phosphatidylethanol

48 homologues
Phosphatidylethanol

- A direct biomarker that incorporates into cellular membranes.
- Takes much more alcohol to cause positive (~14 drinks within 2 weeks) – more than possible from incidental or extraneous exposure
- Longer detection window - not metabolized rather degraded (2+ week duration) – half-life 4.4 days
- Once in red cell membrane - stays there until cells die
Phosphatidyl Ethanol (PEth)
Combination Strategies

• Using PEth to confirm drinking following positive EtG/EtS when drinking denied

• Study: 18 positive EtGs

<table>
<thead>
<tr>
<th>Finding</th>
<th>#</th>
<th>%</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted drinking after positive EtG/EtS</td>
<td>8</td>
<td>44</td>
<td>Drinking</td>
</tr>
<tr>
<td>Admitted drinking after PEth explained</td>
<td>3</td>
<td>17</td>
<td>Drinking</td>
</tr>
<tr>
<td>Admitted drinking after positive PEth</td>
<td>1</td>
<td>6</td>
<td>Drinking</td>
</tr>
<tr>
<td>Denied drinking after positive PEth</td>
<td>1</td>
<td>6</td>
<td>Drinking</td>
</tr>
<tr>
<td>Denied drinking - negative PEth</td>
<td>5</td>
<td>28</td>
<td>Not Drinking</td>
</tr>
</tbody>
</table>
Devices for monitoring alcohol use

- Breathalyzer – administered by technician
- Home breathalyzer
- Transcutaneous
Frequent / Random Breathalyzer

- 24/7 Program in South Dakota
- Random testing field programs
  - BAT Mobile
24/7 South Dakota

- House bill 1072
- Rules:
  - Type, frequency, time, location, fees ($1 for each breath test), consequences
  - Usually twice a day on site in local police dept
- Results - 2007
  - 1,021 participants, 165,456 tests, 359 no shows = 99.8% show rate
  - Of 165,456 tests 534 failed tests
24/7 South Dakota

- Of 165,456 tests 534 failed tests
- Rate of improvement for individuals - good
Transcutaneous Monitors

- SCRAM
- TAD
Intermittent Transcutaneous Alcohol Monitoring
TAD device – BL.com
MEMS 3000 is an efficient monitoring unit, integrating highly accurate breath alcohol testing (BAT), video identity verification and radio frequency (RF) presence monitoring in a single home unit.

MEMS 3000 monitoring application is offered either on a stand-alone, on-site host for independent data ownership and management or through secure remote hosting and Internet access.

Simple to use

MEMS 3000 transfers the breath alcohol test results and participant’s image to a monitoring center at the push of a button.

MEMS 3000 requires minimal training of both agency staff and program participants.
Positive ID Home Breathalyzers

• New home breathalyzer technologies
  – MEMS 3000
  – Smart Start In-Hom
  – Mobile Breath
SOBERLINK Solution

Wireless alcohol testing on Verizon’s Private Network

- SL2 Cellular Breathalyzer sends results instantly on Verizon’s Network
- Facial Recognition Software verifies it’s the right person testing
- Discreet, convenient, real-time monitoring
SLBLUE easily “pairs” with participants’ Apple device (iPhone / iPad)
Tests can be sent via Wi-Fi or cellular connection
Ideal for clients with poor cell coverage or for International use
Monitoring Web Portal

- Participant prompted to retest upon a positive test
- Retests validate consumption vs. environmental exposure (i.e. mouthwash)
- Real-time alerts sent to Contacts upon positive test for swift intervention
Client Education

**SOBERLINK*CLIENT* AGREEMENT**

**Participant Name:** ________________________
**Date Placed on Program:** ____________________

I, ________________________, have been placed in the Sobelink Program. As a condition of being allowed to participate in this Program, I agree to comply with all Program requirements set forth in this Agreement and to strictly follow these instructions. I understand that any failure by me to comply with this Agreement or the instructions will be considered a violation of my supervision and may result in adverse legal consequences.

As a condition of my participation in the Program, I agree to properly use the Sobelink equipment provided to me. In that regard, I will carry with me, at all times, the Sobelink device for the duration of the Program. I understand that I will need to, at pre-programmed times and at random intervals, use Sobelink to test for the presence of a positive blood alcohol concentration by the measurement of my breath. When the Sobelink device detects the presence of alcohol, it will record a positive reading and will transmit an alcohol alert to predetermined contacts. Upon a positive detection of alcohol, I agree to retest as instructed until my BAC registers as a compliant test. Failure to retest as instructed may be considered a “positive” reading and may be considered breach of this contract as a “failure to comply.”

I acknowledge receipt of:

- Sobelink Device ID# ________________________
- 1 Power Cord Initial Here
- 4 Mouthpieces ________
- 1 Carrying Case

An additional fee will be assessed if the device malfunctions as a result of the device and or equipment being dropped, submerged, or intentionally damaged. I also understand that I will be held responsible for damage, other than due to normal wear, to the equipment. I also understand that if I do not return the equipment in good working condition, I will be charged for the repair or the replacement of the equipment as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Replacement of Sobelink device</td>
<td>$</td>
</tr>
<tr>
<td>Full Replacement of the carrying case</td>
<td>$</td>
</tr>
<tr>
<td>Full Replacement of the Charger</td>
<td>$</td>
</tr>
</tbody>
</table>

I acknowledge receipt of the above.

As a condition to being allowed to participate in the Program, I agree to allow authorized personnel to inspect and maintain the Sobelink device and, if required, I agree to pay the above replacement costs.

- Client agreement should be signed and understood by participants
Pilot Study Comparing 4 x Daily Photo Cellular Breathalyzer v Random Weekly EtG

- 12 subjects – social drinkers
- Kept log of drinking x 5 weeks, blew in Soberlink 4 times daily, submitted random weekly urine EtG, completed questionnaire
- 84 drinking episodes
- 55 EtGs collected of possible 60
- 1609 breath tests of possible 1680
Results

• Only 1 positive EtG
• Photo Cellular Breathalyzer detected all 84 drinking episodes (100%)
• Subjects all preferred using PCB to submitting urine tests
  – “It’s much easier to take 30 seconds 4 times per day than to drive to a collection site and wait sometimes ½ hour to submit a urine sample.”
  – “Much more convenient to blow in the Soberlink from home than to go to a collection site.”
  – “Embarrassing to submit a urine. Easy to blow in Soberlink device.”
  – “Much prefer blowing in Soberlink device.”
  – “No comparison. Prefer blowing instead of peeing.”
  – “More trouble to drive somewhere and wait to give urine sample.”
Questions?