



Blinded by the Dose

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Drug Facilitated Sexual Assault: Overview and Emerging Challenges

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Introduction

- Increased reports of drug-facilitated crimes (DFCs) in the media, scientific, and medical literature
- Belief that DFCs have increased
 - Rise in commission?
 - Greater awareness?
 - Increased reporting?
- True prevalence of DFCs will never be known
 - Pharmacodynamic effects
 - Delayed reporting
 - Statistically capturing DFCs

One in nine women say they have had their drink spiked, poll finds

Exclusive: Four in 10 women said they do not think police officers would take them seriously if they reported it

HOME / LIFE / HEALTH & FITNESS

“Drink spiking” search is up 809% – everything you need to know about the UK spiking surge



SALLY HEATH
27/10/2014 6:12 PM

Incapacitated and Forcible Rape of College Women: Prevalence Across the First Year

Kate B. Carey Ph.D.^a, Sarah E. Durney^a, Robyn L. Shepardson Ph.D.^b, Michael P. Carey Ph.D.^c

Date Rape Among Adolescents and Young Adults

V.I. Rickert Psy.D.^a, C.M. Wiemann Ph.D.

Learning Objectives

- Define drug-facilitated crimes (DFCs)
- Recognize common signs and symptoms reported by victims of DFCs
- Understand roles of surreptitious and voluntary administration of drugs
- List four major challenges encountered DFC investigations
- Describe why central nervous system (CNS) depressants tend to be used in DFCs
- Explain what is meant by a low-dose CNS depressant
- Define and appreciate the importance of pharmacokinetics of the drugs used in DFCs
- Recognize important pharmacodynamic effects of CNS depressant drugs used in DFCs
- Appreciate the impact these drugs have on the victim's reporting of DFCs
- Explain why specimen collection and laboratory selection can impact DFC investigations

Drug-Facilitated Crimes

- Victim subjected to crime in which the pharmacological effects of a drug or drugs help the perpetrator carry out the crime
- Usually strong, CNS depressants
- Types:
 - Robbery
 - Human trafficking / kidnapping
 - Neglect by caregiver
 - Sexual Assault



Common symptoms and signs heard from victims of DFSA

- Recalls having drink but cannot recall what happened afterwards
- Suspects someone had sex with them but may not fully remember the incident
- Felt far more intoxicated than their usual response to same amount of alcohol

How do perpetrators of
DFCs administer the
drugs to the victim?



MICKY FINN

Bartender / Owner of the Lone Star Saloon and Palm Garden

Located in the "Whiskey Row" section of Chicago's State Street from 1896 to 1903

Finn or one of his employees would slip chloral hydrate concoction into the drink of unsuspecting patrons.

In December of 1903, the bar lost its license

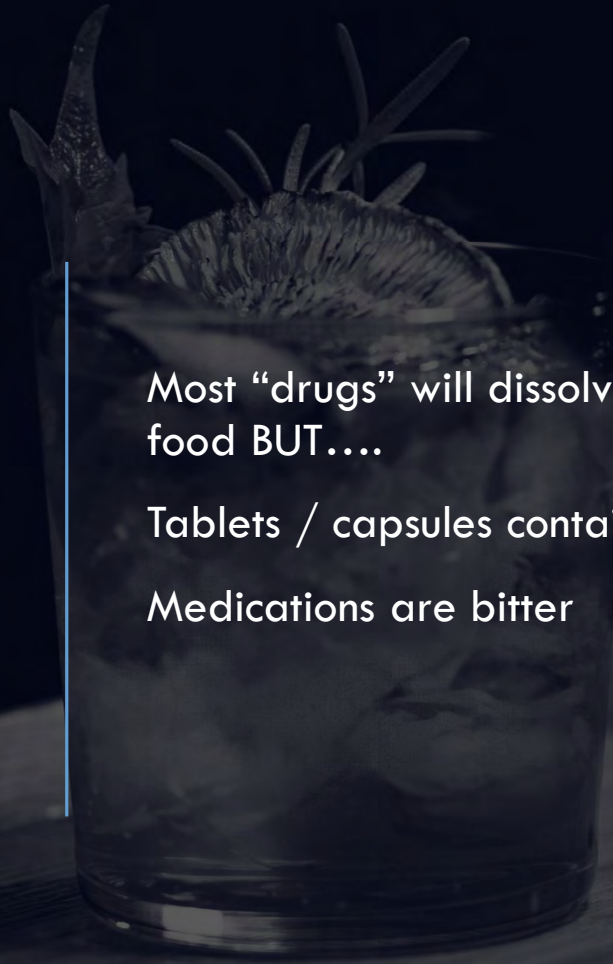
GAINS.
LONE STAR SALOON, 527 State street, managed by "Micky" Finn, closed by order of Mayor Harrison, revoking the license held in the name of Kate Rose.
SALOONKEEPER A. LEWANDOWSKI, 406 Elston avenue, indicted for selling liquor to minors, and recommendation from the grand jury that his license be revoked.
LOSSES.

WHY IS IT DIFFICULT TO SURREPTITIOUSLY ADMINISTRATION DRUGS IN A DRINK?

Most “drugs” will dissolve or disperse in beverages or food BUT....

Tablets / capsules contain insoluble fillers

Medications are bitter





**MANY OF THESE CASES INVOLVE PERPETRATORS
TAKING ADVANTAGE OF AN OPPORTUNITY!**

Matthew P. Juhascik,^{1,†} Ph.D.; Adam Negrusz,¹ Ph.D.; Diana Faugno,^{2,‡} M.S.N.; Linda Ledray,³ Ph.D.; Pam Greene,^{4,‡} M.D.; Alice Lindner,⁴ B.S.N.; Barbara Haner,⁵ M.N.; and R.E. Gaensslen,¹ Ph.D.

An Estimate of the Proportion of Drug-Facilitation of Sexual Assault in Four U.S. Localities*

ABSTRACT: In recent years, drugs including flunitrazepam, gamma-hydroxybutyrate, ketamine, and ethanol, have become popularly associated with drug-facilitated sexual assault. Other drugs are also candidates as factors in “drug facilitated sexual assault” (DFSA). The true extent of DFSA is not known, and is difficult to estimate. We recruited sexual assault complainants at four clinics in different parts of the U.S. to anonymously provide urine and hair specimens, and to answer questions about suspected drugging, drug use, and the sexual assault incident. Urine and hair specimens were tested for 45 drugs, including ethanol, and those pharmacologically capable of inducing sedation, amnesia, or impairment of judgment. Analytical test results were used to estimate the proportion of subjects, and the proportion of all complainants to the clinic in the same time period, who were victims of DFSA. Overall, cases of 43% of 144 subjects, and 7% of 859 complainants, were characterized as DFSA. Subjects underreported their use of drugs. The role of toxicological results and history in characterizing DFSA cases is discussed.

KEYWORDS: forensic science, sexual assault, drug facilitated sexual assault

Less than 5% of “DFSA cases” involved surreptitious administration of drug

When voluntary drug use by victim is considered, over one-third of cases in the study may have been facilitated by drugs



CHALLENGES SURROUNDING DFC INVESTIGATIONS

CHALLENGES SURROUNDING DFC INVESTIGATIONS

Drugs

Reporting

Specimens

Labs



CHALLENGES SURROUNDING DFC INVESTIGATIONS

Drugs

- Dosages
- Number of Candidates
- Pharmacokinetics
- Pharmacodynamics



**WHAT IS A LOW-DOSE
CNS DEPRESSANT?**



1 milligram = 1/1000 of a gram

**WHAT ARE THE POPULAR
DRUGS USED IN THESE CRIMES?**



Toxicological findings in 1000 cases of suspected drug facilitated sexual assault in the United States

Taís Regina Fiorentin^a , Barry Kerr Logan^{a, b} 

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<https://doi.org/10.1016/j.jflm.2018.11.006> 

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1000 consecutive cases received
from March 2015 to June 2016

From 37 U.S. states and 1 territory
(Puerto Rico)

78.4% were positive for one or
more intoxicating substances

Nearly 100 different intoxicating
substances identified

DRUGS REPORTEDLY USED TO COMMIT DFSA

Ethanol

Benzodiazepines

- Flunitrazepam
- Clonazepam
- Lorazepam
- Alprazolam
- Triazolam
- Chlordiazepoxide
- Diazepam
- Temazepam

Zolpidem

Barbiturates

GHB and analogs

Ketamine

Opiates

Antihistamines

Hallucinogens

Sedative Antidepressants

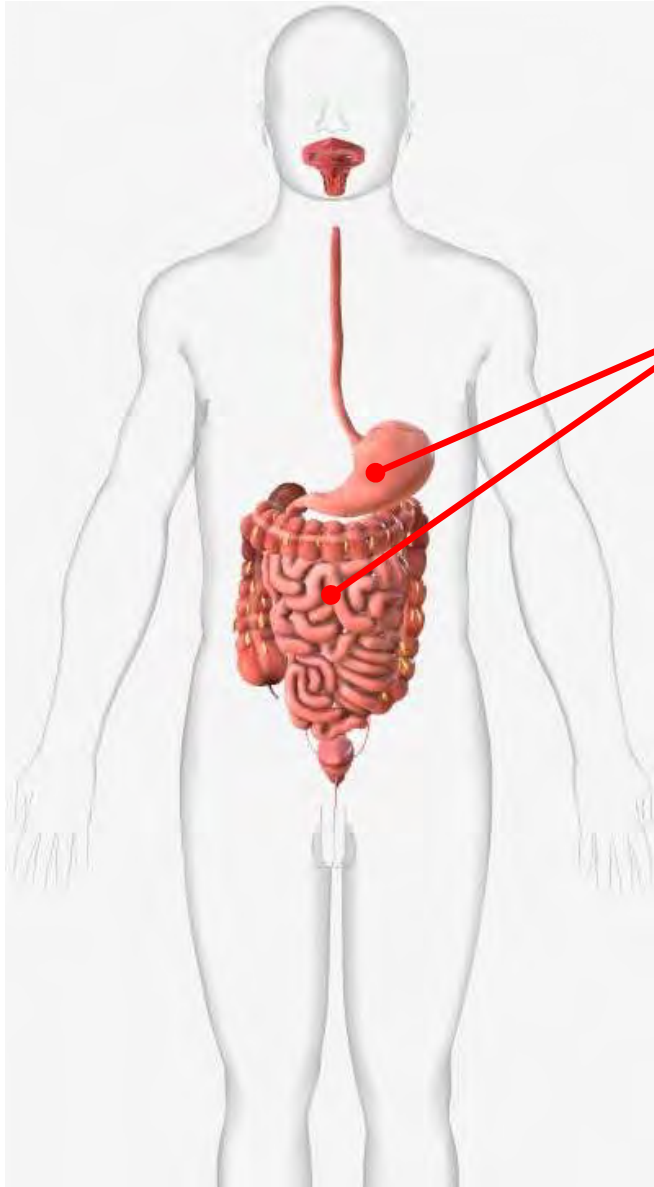
Chloral Hydrate

Muscle Relaxants

Scopolamine

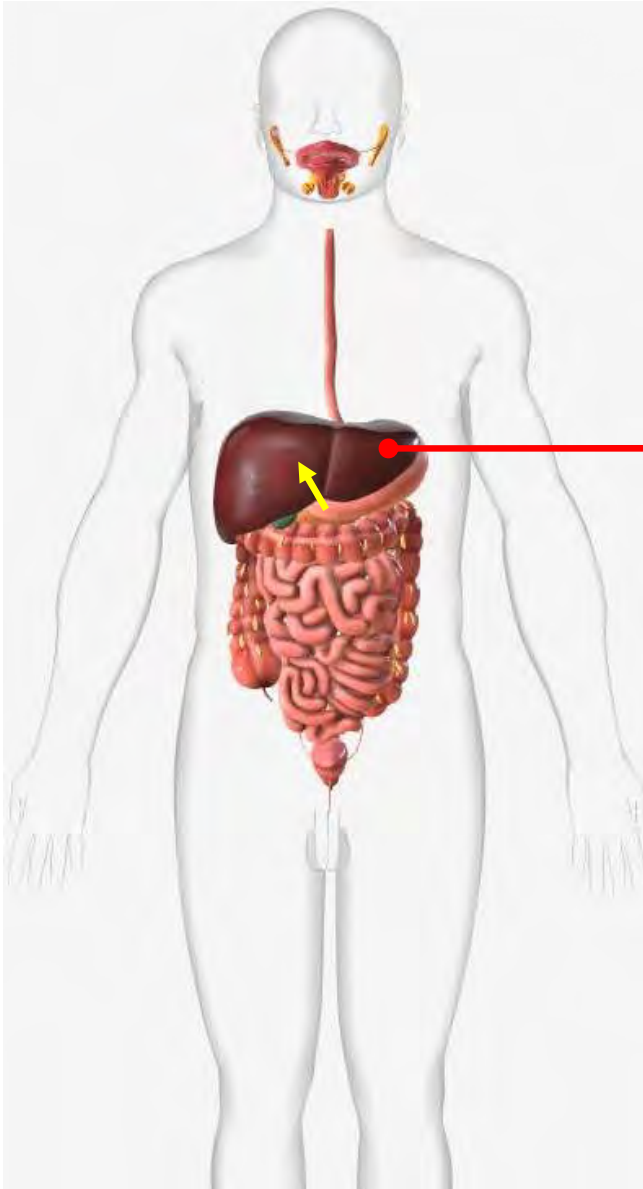
Herbal Sedatives

Inhalants



Pharmacokinetics

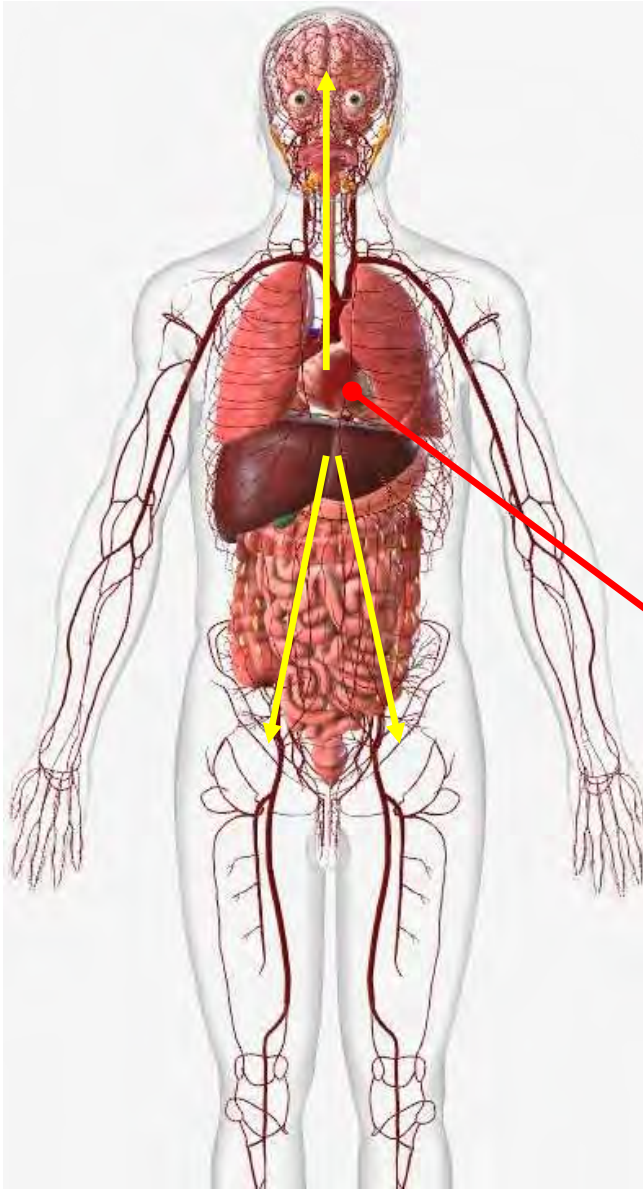
Absorption: Parent drug passes through membranes in stomach and small intestine to enter the bloodstream



Pharmacokinetics

Absorption: Parent drug passes through membranes in stomach and small intestine to enter the bloodstream

Metabolism: Parent drug is modified into a different chemical substance (metabolite) that generally makes it more hydrophilic. Most metabolism occurs via enzymes located in the liver or in the blood.

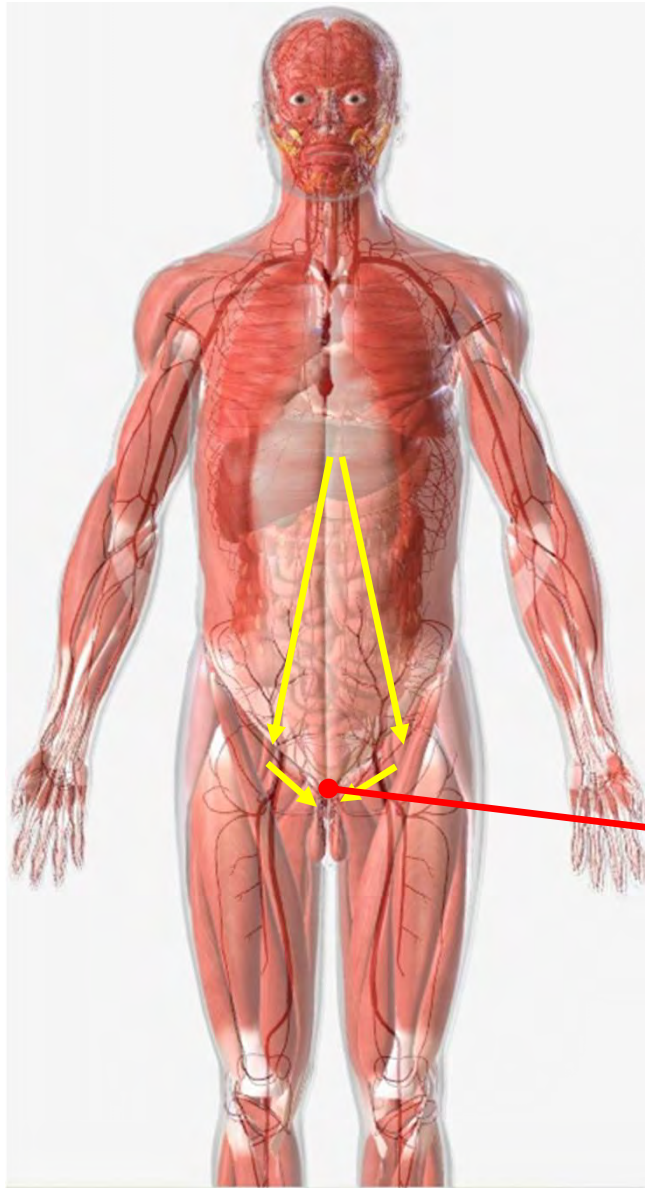


Pharmacokinetics

Absorption: Parent drug passes through membranes in stomach and small intestine to enter the bloodstream

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Distribution: Drug is transported throughout the body to different organs where it can move into the tissues to have an effect



Pharmacokinetics

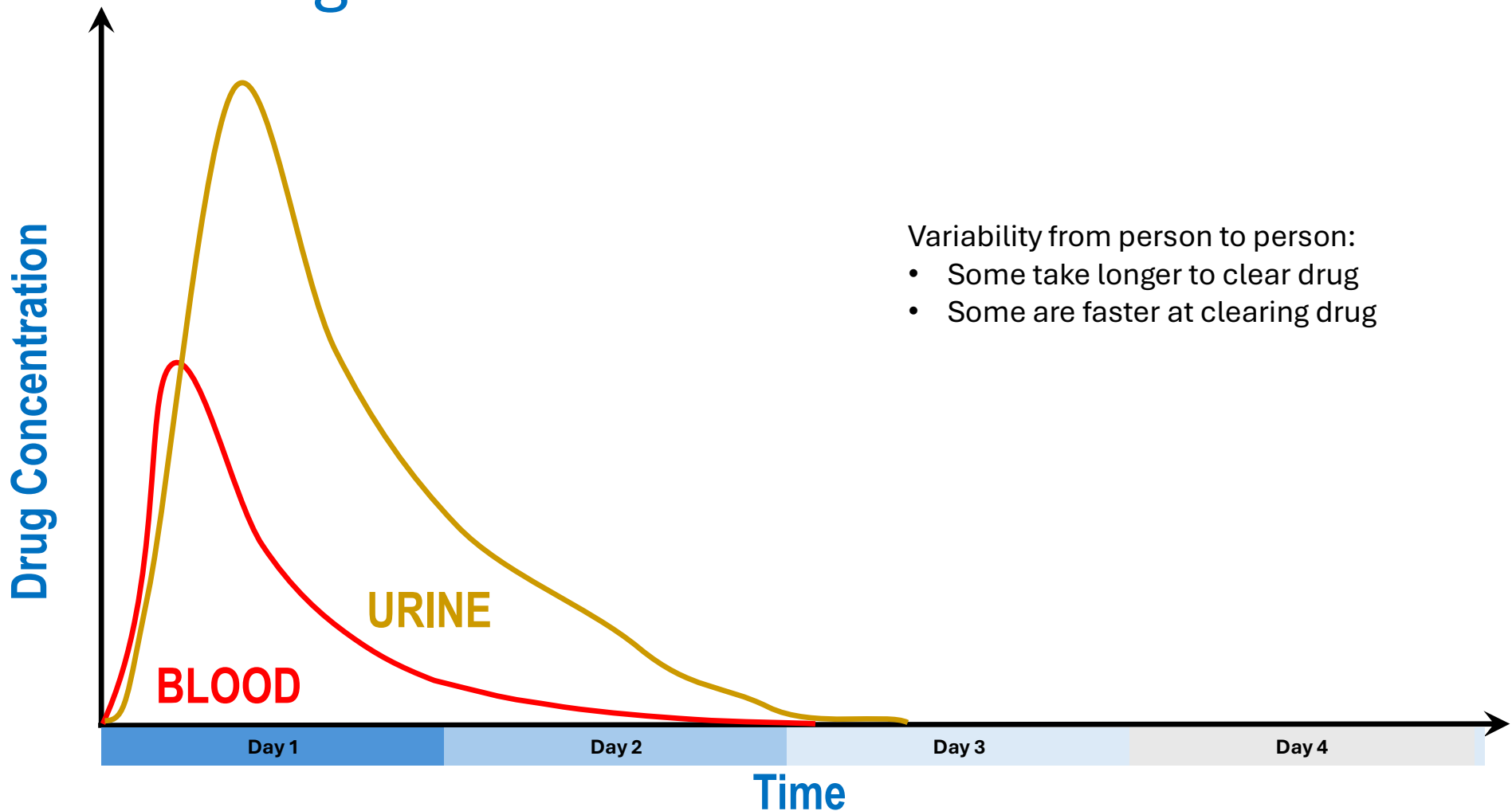
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Distribution: Drug is transported throughout the body to different organs where it can move into the tissues to have an effect

Excretion: Parent drug and metabolites are leave the body, most often through urine

Drug Concentrations in Blood and Urine





Variation in speed DFSA drugs are absorbed, metabolized, and eliminated



Wide window of time after ingestion
drugs detected in samples

Presence may only be detectable 4 hours
For others, the drug is detectable for weeks



Not knowing drugs used makes it very difficult to interpret a negative
toxicological finding

PHARMACOKINETICS OF DFSA DRUGS

HOW DOES A PERSON
UNDER THE INFLUENCE
OF A CNS DEPRESSANT
APPEAR?

PHARMACODYNAMIC EFFECTS



Most DFSA drugs are strong, fast-acting CNS depressants



Effects mimic severe intoxication or general anesthetics

Includes amnesia and unconsciousness



DFSA cases less likely to be reported compared to forcible rape



Some victims may not even know they were assaulted

CHALLENGES SURROUNDING DFC INVESTIGATIONS

Drugs

- Dosages
- Number of Candidates
- Pharmacokinetics
- Pharmacodynamics



CHALLENGES SURROUNDING DFC INVESTIGATIONS

Reporting

- Reported?
- Time elapsed?
- Honesty?



CHALLENGES SURROUNDING DFC INVESTIGATIONS

Specimens

- Right one(s)?
- Enough?
- Preservation?



CHALLENGES SURROUNDING DFC INVESTIGATIONS

Labs

- Many tests
- Sensitivity
- Right lab?



CHALLENGES SURROUNDING DFC INVESTIGATIONS

Drugs

Reporting

Specimens

Labs

VICTIM REENGAGEMENT

Attempt to reclaim lost dignity

Denial that the rape happened

Foggy memories

Easier to accept you were mistaken rather than to be a rape victim

The National
Center for the
Prosecution of
Violence
Against Women

THE voice

Helping
Prosecutors Give
Victims a Voice



American Prosecutors
Research Institute
The Research and
Development Division of NDAA
Volume 1, Number 1

Understanding the Non-Stranger Rapist

BY
VERONIQUE N. VALLIERE, PSY.D.¹

The following hypothetical scenario is used by the author to provide concrete examples of several points made about offenders throughout the article. Prosecutors should remember that while the examples given here are sound, the facts of each case are individual and unique, so prosecutors should consult with offender experts whenever necessary. All names have been changed, and any resemblance to real or imaginary figures is unintended.

SCENARIO

Dr. John Smith, a wealthy, attractive physician, is charged with the rape of Jane Roe, who works as a secretary for an office-supply company. The two met at a speed-dating event at a bar. Smith approached Roe at the bar, where she had already ordered a drink. He ordered himself a drink and purchased several more drinks for Roe over the course of the night (over her protestations even after she told him that she felt drunk). Smith and Roe danced throughout the night and shared several kisses on the dance floor.

Roe refused Smith's offers of a ride home, but after she tried unsuccessfully to flag down a cab, she finally accepted. He asked if he could come in to use the bathroom. Roe allowed this, but only had one bathroom in her house. She vomited in the kitchen sink while Smith was in the bathroom. Smith came out, saw that Roe had vomited, and told her to go clean up in the bathroom and take some Tylenol. When Roe returned, Smith asked if he could sleep on the couch, and Roe reluctantly agreed. They kissed for a few minutes, and then Roe went into her bedroom alone to go to sleep.

Roe woke up during the night to find Smith having sex with her. She tried to push him off, and asked what he was doing. Smith told Roe to just relax, because he was almost done. Roe kept struggling, then stopped moving and started to cry when Smith grabbed her neck and squeezed tightly to stop her from resisting. After raping her, Smith asked Roe "What's your problem?" Roe told him to leave, which he did after dressing.

Roe called in sick to work the next day, and told a friend what had happened. The friend convinced Roe to go to the hospital. Roe blamed herself for the assault, and therefore told the hospital nurse that she did not want to report. Mandatory reporting by the nurse resulted in law enforcement involvement.² Law enforcement interviewed Roe briefly at the hospital; Roe explained that she didn't report because she didn't think she would be believed.

Smith, while giving a voluntary statement to law enforcement, said that Roe was interested in him because he was an anesthesiologist and wealthy. Roe asked him for a ride home, invited him in, and he agreed. Roe seduced him, and invited him to sleep over. Smith stated that all their sexual activity was consensual, and that Roe was lying about the rape because she was crazy. Smith said he based that conclusion on the bottle of Ativan³ he found in Roe's bathroom medicine cabinet while she was vomiting in the kitchen. Smith also said Roe probably felt guilty about having a one-night stand. Smith insisted that the bartender would say that Roe had been throwing herself at him all night. Law enforcement interviewed the bartender, who said that Smith is a frequent customer and a very good tipper. The bartender also stated that women were always throwing themselves at Smith, and he was always buying women drinks.



Photo by Adam Wilson on Unsplash

THE ALCOHOL CONNECTION IN DRUG-FACILITATED CRIMES



Introduction

Most common drug linked to rape

Victims commonly consume voluntarily

Can be administered in a social environment without suspicion

Can cause blackouts and unconsciousness

Less likely to be reported

Prosecution more challenging than with others

Learning Objectives

- Society's view of using alcohol to get sex
- Standard alcoholic drinks versus the reality of what we consume
- Alcohol pharmacokinetics and the importance of rate of absorption
- Widmark-based estimations
- Dubowski's Stages of Alcohol Intoxication
- Alcohol-induced blackouts

WHAT PHARMACOLOGICAL
EFFECTS ARE DFC
PERPETRATORS HOPING FOR?

ETHANOL IS A CNS DEPRESSANT, BUT IT IS NOT ADMINISTERED OR USED IN “LOW DOSES”



STANDARD ALCOHOLIC DRINKS

12 oz



5%

5 oz



12%

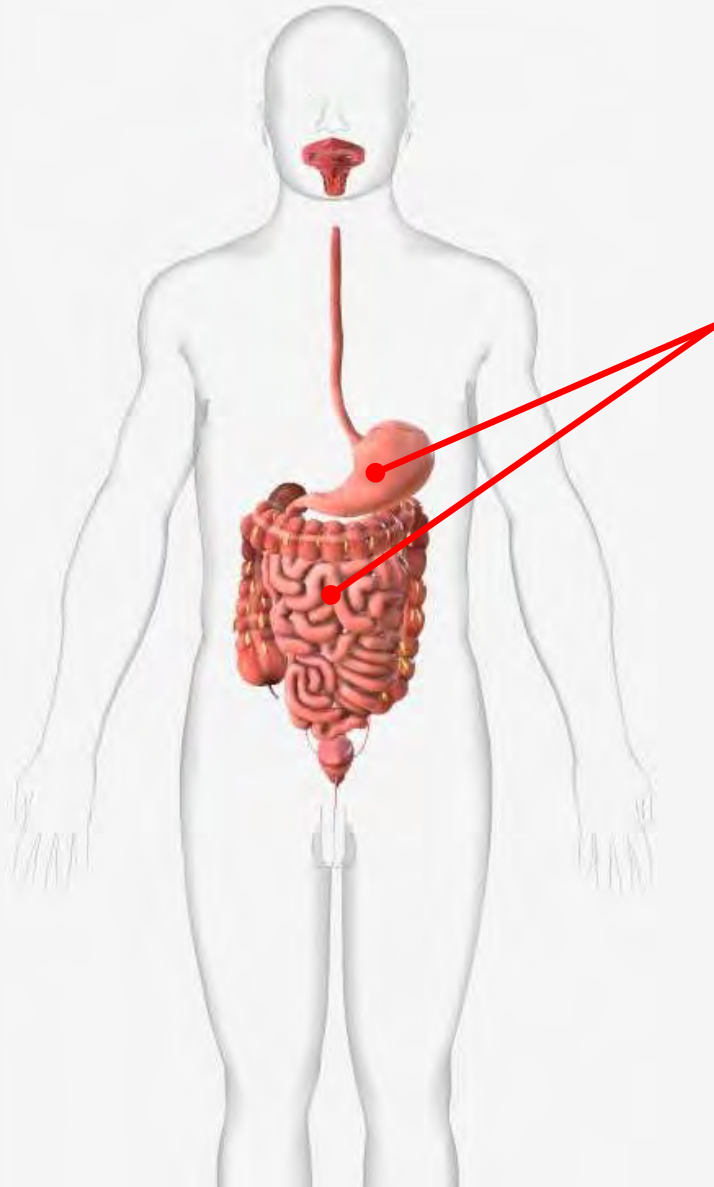
1.5 oz



80 proof
(40%)

EACH CONTAIN ABOUT 14 GRAMS (0.6 OUNCES) OF PURE ETHANOL

Pharmacokinetics



Absorption: Parent drug passes through membranes in stomach and small intestine to enter the bloodstream



ABSORPTION OF ETHANOL

Begins as soon as drinking starts

Absorption starts in the mouth and stomach but most occurs in small intestine due to larger surface area

Factors influencing gastric emptying have a major influence on the rate of absorption

It may take up to 2 hours for complete absorption of alcohol after the last drink

Peak BAC tends to occur at 30 to 90 minutes after last drink when absorption and metabolism are about equal

Absorption rates are highly variable and not linear

Numerous variables affect speed that alcohol is absorbed into the bloodstream

- Fast absorption means blood alcohol concentration rises faster than if absorption is slow

Some variables are easy to control while others are not

- Eating before going out to drink

WHAT ARE SOME OTHER
VARIABLES THAT WILL
AFFECT THE SPEED THAT
ALCOHOL IS ABSORBED
INTO THE BLOODSTREAM?

FACTORS THAT AFFECT ETHANOL'S ABSORPTION INTO THE BLOOD

Enhances Absorption:

Faster drinking

Carbonated beverages

Moderate ethanol concentration

No to low sugar content

Being dehydrated

Recent exposure to higher altitudes

Inflammation of GI tract

Medications that speed up gastric emptying to help control acid reflux or to prevent nausea/vomiting (i.e. prokinetics) such as Propulsid (cisapride) or Reglan (metoclopramide)

Empty stomach*

Slows Absorption:

Slower drinking

“Fatty” beverages

Low or high ethanol (neat) concentration

High sugar content

Being well hydrated

Acclimation to higher altitudes

Medications that slow down gastric emptying (e.g., opioids, calcium channel blockers, diphenhydramine, tricyclic antidepressants, aluminum hydroxide antacids, phenothiazines)

Eating before or while drinking*

- **Amount eaten is probably more important than composition of protein, fat, or carbohydrates**

DON'T FORGET THE OTHER KEY FACTORS THAT IMPACT ETHANOL ABSORPTION

Remember to ask:

- What did they drink?
- How many did they drink?
- What size were the drinks?



WIDMARK FORMULA TO ESTIMATE A BAC

$$BAC = \frac{D}{V_d * w}$$

BAC = blood alcohol concentration (g/L)*

D = dose of alcohol (g)

V_d = volume of distribution (L/kg)

w = weight (kg)

* BAC is typically expressed as g/dL, so proper conversion is important

Useful exercise to evaluate the role that ethanol may have played in contributing to the symptoms that the DFC victim described

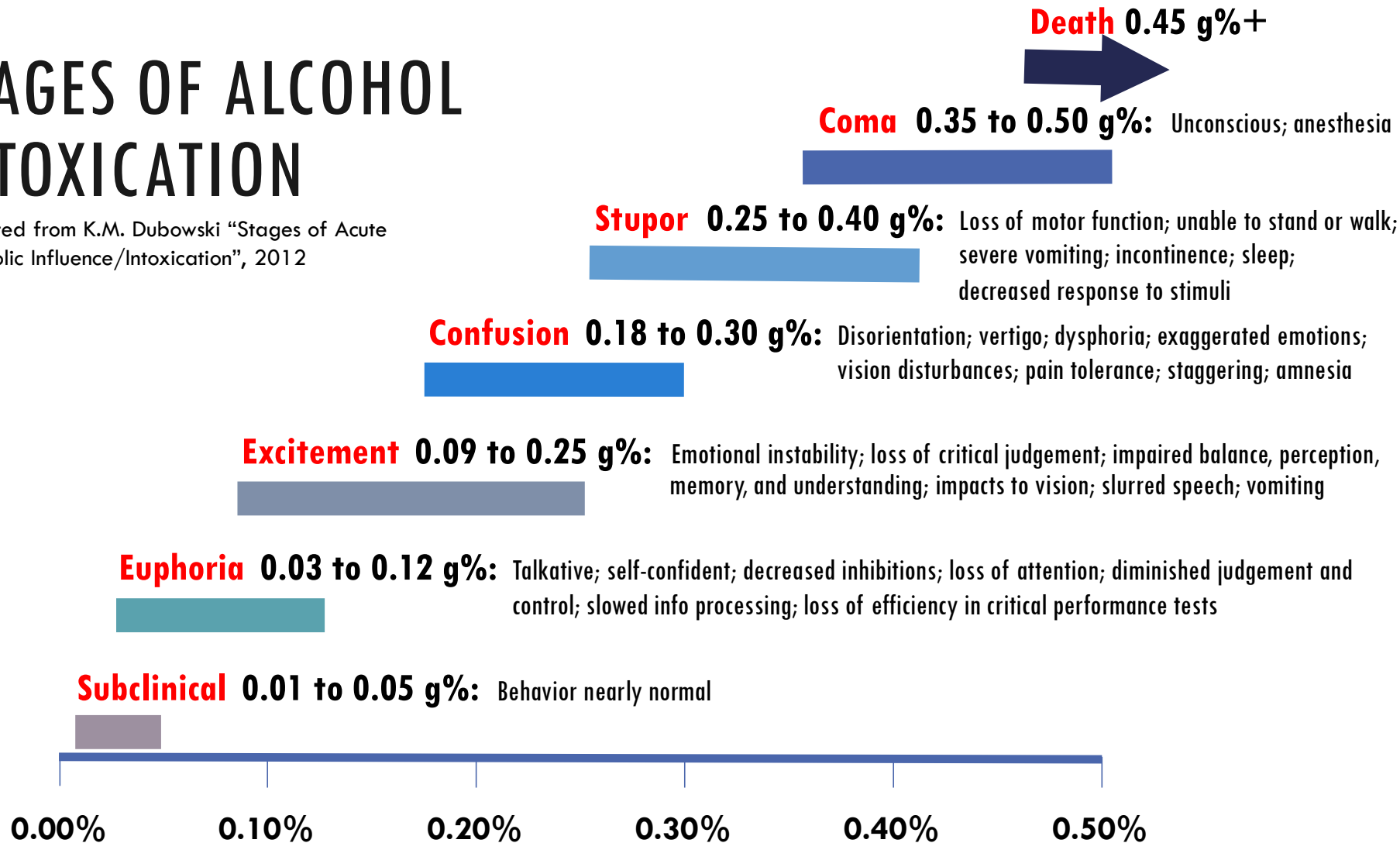
CNS DEPRESSION OF ETHANOL

General relationships between BAC and the CNS depressant effects on the brain

Alcoholics become habituated to ethanol so can function at high BACs, particularly when performing relatively simple tasks

STAGES OF ALCOHOL INTOXICATION

Adapted from K.M. Dubowski "Stages of Acute Alcoholic Influence/Intoxication", 2012



AT WHAT BAC DOES A PERSON APPEAR VISIBLY INTOXICATED?

Many factors contribute to a person appearing to be intoxicated

Historically, exaggerated behaviors were considered:

- Staggering gait
- Incoherent speech

Intoxication became synonymous with drunk!





SIGNS AND SYMPTOMS OF INTOXICATION

Decreased Inhibitions

- Doing things that would typically not be done when sober
- Saying things that would typically not be said when sober
- Boisterous
- Argumentative
- Confrontational
- Obnoxious
- Annoying to others
- Hanging on to people or intruding on their personal space
- Animated or exaggerated actions
- Rapid drinking
- Acting silly or “cutesy”
- Complains about the strength of drinks or service
- Bravado



SIGNS AND SYMPTOMS OF INTOXICATION

Psychomotor Impairment

- Slurred, mumbled, or incoherent speech
- Slow speech
- Swaying while sitting, standing, or walking
- Staggering, stumbling, holding onto objects for balance
- Difficulty reaching for and picking up objects (e.g., money, food, drinks)
- Inability to maintain direct eye contact (lack of focus or wandering gaze)
- Head on bar or asleep
- Falling off stools or chairs
- Bumping into objects or people while walking
- Leaning for support while standing or sitting
- Exaggerated hand or arm gestures
- Spilling food or drinks
- Falling down or losing balance



SIGNS AND SYMPTOMS OF INTOXICATION

Cognitive Impairment

- Loss of concentration or train of thought
- Delayed response to questions
- Illogical comments or answers to questions, non-sequiturs
- Impaired short- or long-term memory
- Lighting more than one cigarette at a time
- Lighting the wrong end of a cigarette
- Lighting a cigarette but not smoking it
- Excessively quiet, sullen
- Denial of impaired driving ability
- Consumption of large amounts of alcohol without thinking
- Trouble counting money or with basic math
- Difficulty following instructions or directions



RELIABILITY OF PEOPLE ASSESSING INTOXICATION

Numerous studies have evaluated the reliability of observers to detect intoxication (e.g., social drinkers, bartenders, police officers, mental health therapists, alcohol counselors, etc.)

Most studies suggest that BACs that impair driving in violation of drunk driving statutes (0.080 to 0.100 g%) do not produce reliable signs of visible intoxication in most subjects

Half to two-thirds of drinkers with BACs between 0.080 and 0.120 g% were not visually identified as intoxicated.

Visible intoxication was only reliably detected when BACs were very high, typically above 0.150 g%

AT WHAT BAC IS A PERSON SO IMPAIRED THAT THEY CANNOT CONSENT?

When intoxication is visible, the BAC is almost always well above the legal definition for intoxicated driving in the U.S. (0.08 g%)

The majority of drinkers (>50%) with BACs of about 0.150 g% will show one or more reliable signs of visible intoxication (even alcoholics)

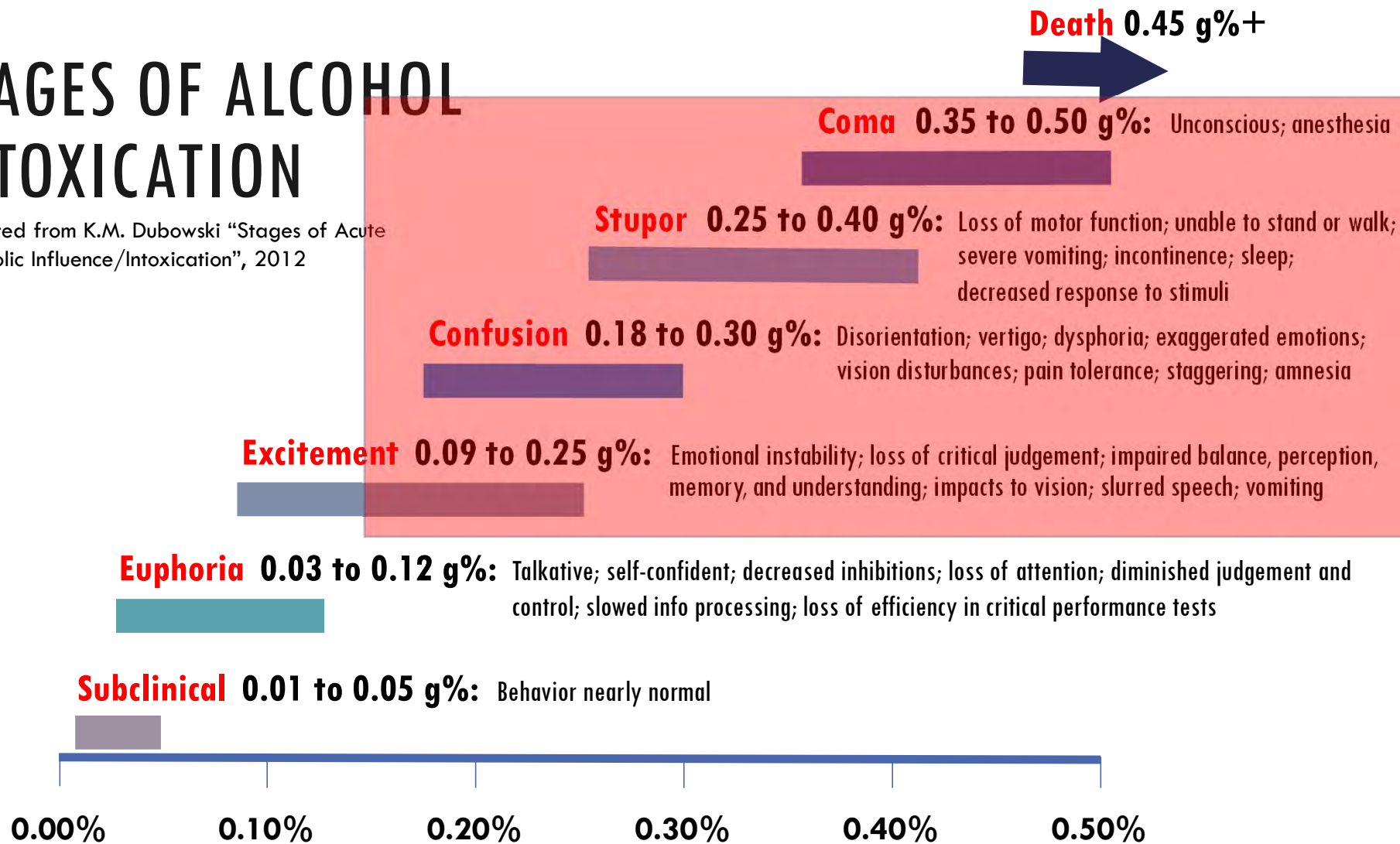
As BACs increase, the probability of visibly detecting intoxication also increases

Nearly all drinkers are visibly intoxicated at BACs of 0.200 g% or higher



STAGES OF ALCOHOL INTOXICATION

Adapted from K.M. Dubowski "Stages of Acute Alcoholic Influence/Intoxication", 2012



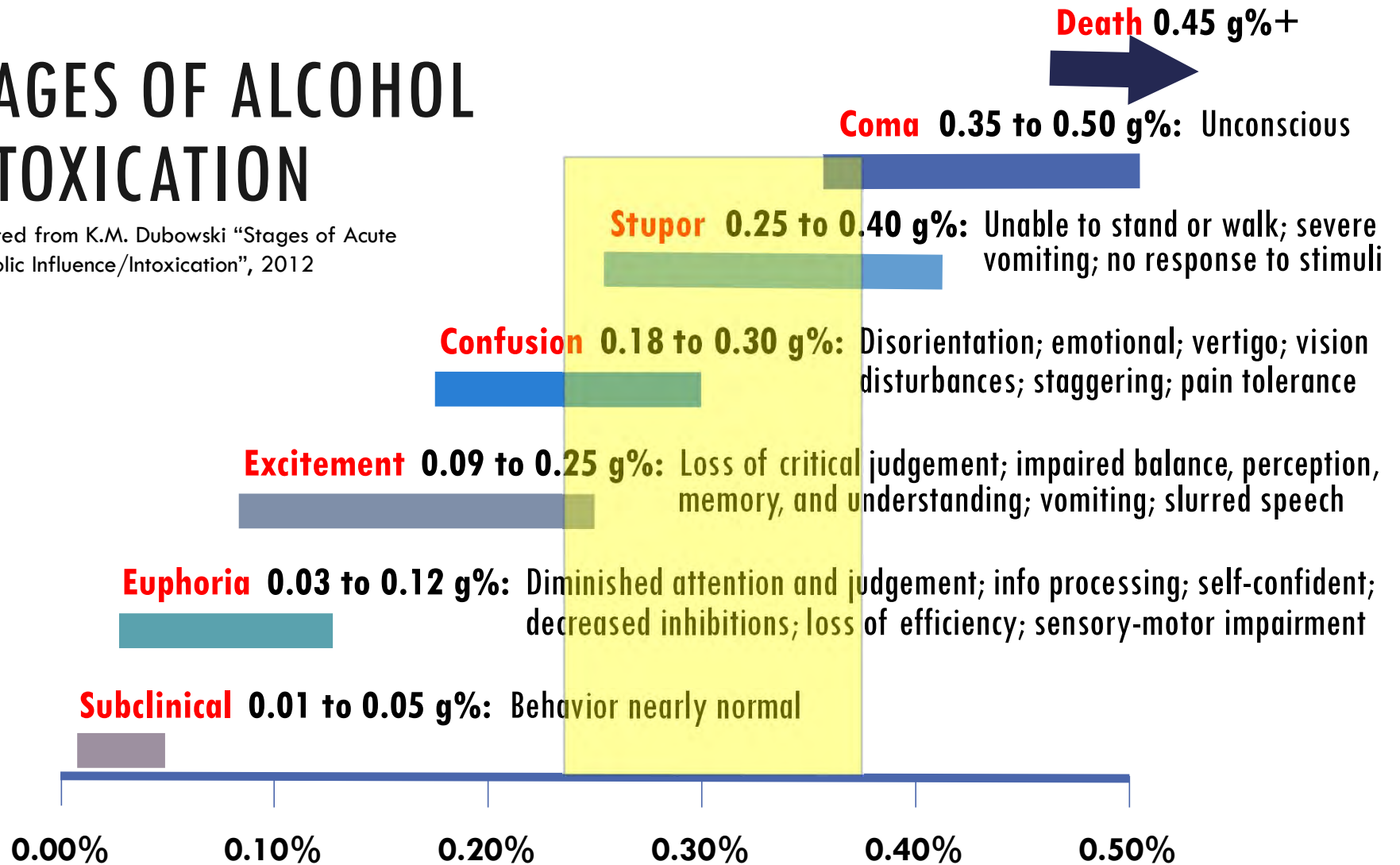
FACTS FOR CALCULATIONS

21-year-old female (5'6" / 140 lbs) consumed 11 bottles of Bud Light and 2 Kamikaze shots between 7:00 PM and 1:00 AM.

What could her BAC have been?

STAGES OF ALCOHOL INTOXICATION

Adapted from K.M. Dubowski "Stages of Acute Alcoholic Influence/Intoxication", 2012

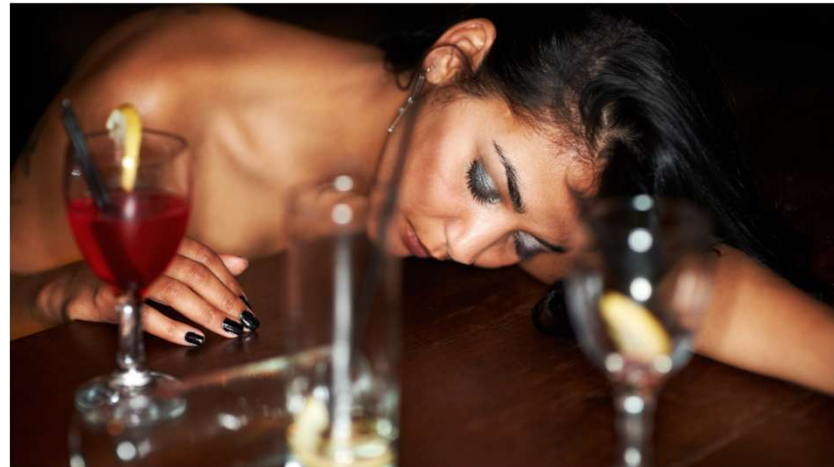


ALCOHOL BLACKOUTS vs PASS OUTS

Blackout (Amnesia)



Pass Out (Unconscious)



ALCOHOL-INDUCED BLACKOUTS

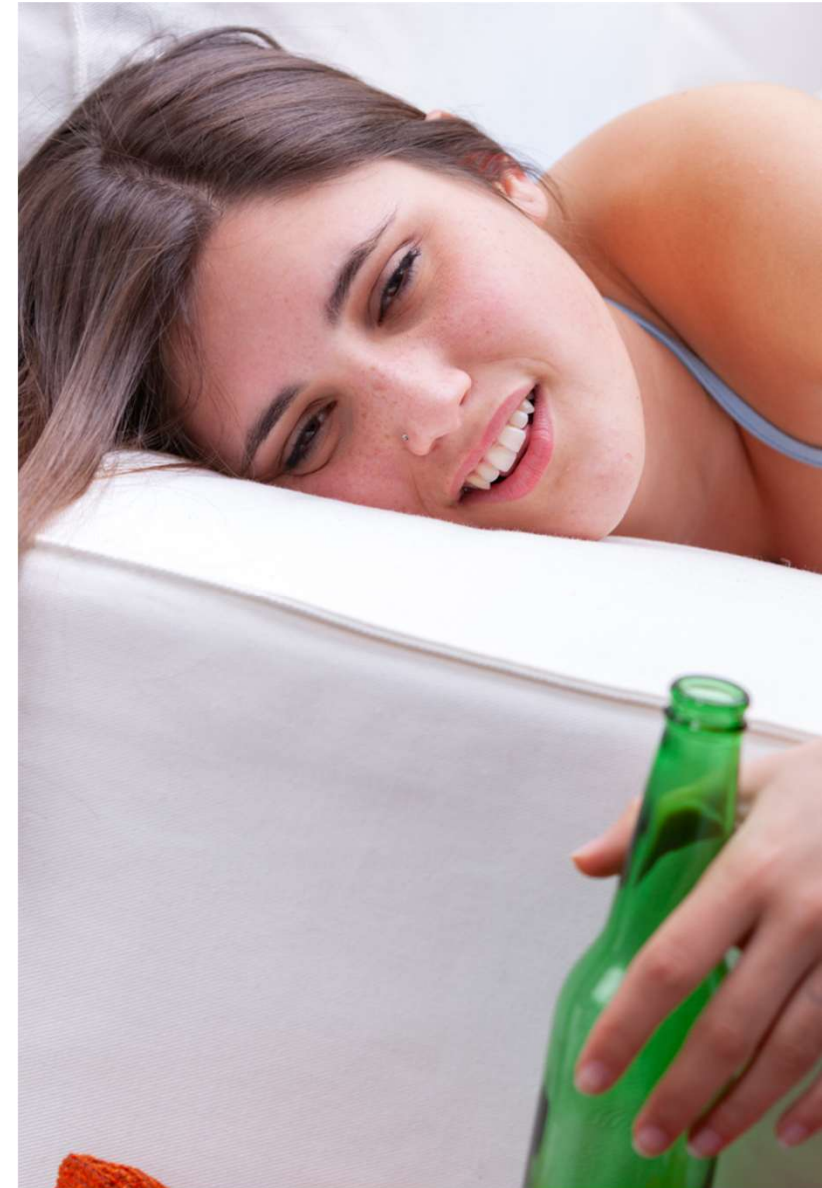
Memory loss (anterograde amnesia) that occurs during any part of a drinking episode without loss of consciousness

Will be awake and conscious, MAY be engaged in activity or conversation, and MAY appear to be somewhat oriented

Memory loss may be significant, but may be reversible

- Information may be recalled later, sometimes spontaneously

Women seem to be more susceptible to blackouts and undergo a slower recovery from cognitive impairment than men



AMNESIA

Retrograde

- Loss of earlier memories
- Usually from cerebral injuries or disease states
- Far more common

Anterograde

- Impaired information acquisition, consolidation, and storage
- Alcohol and some CNS depressants cause
 - Likely due to impact on GABA-receptor complex
- Less clear when these end because people tend to fall asleep before they are over

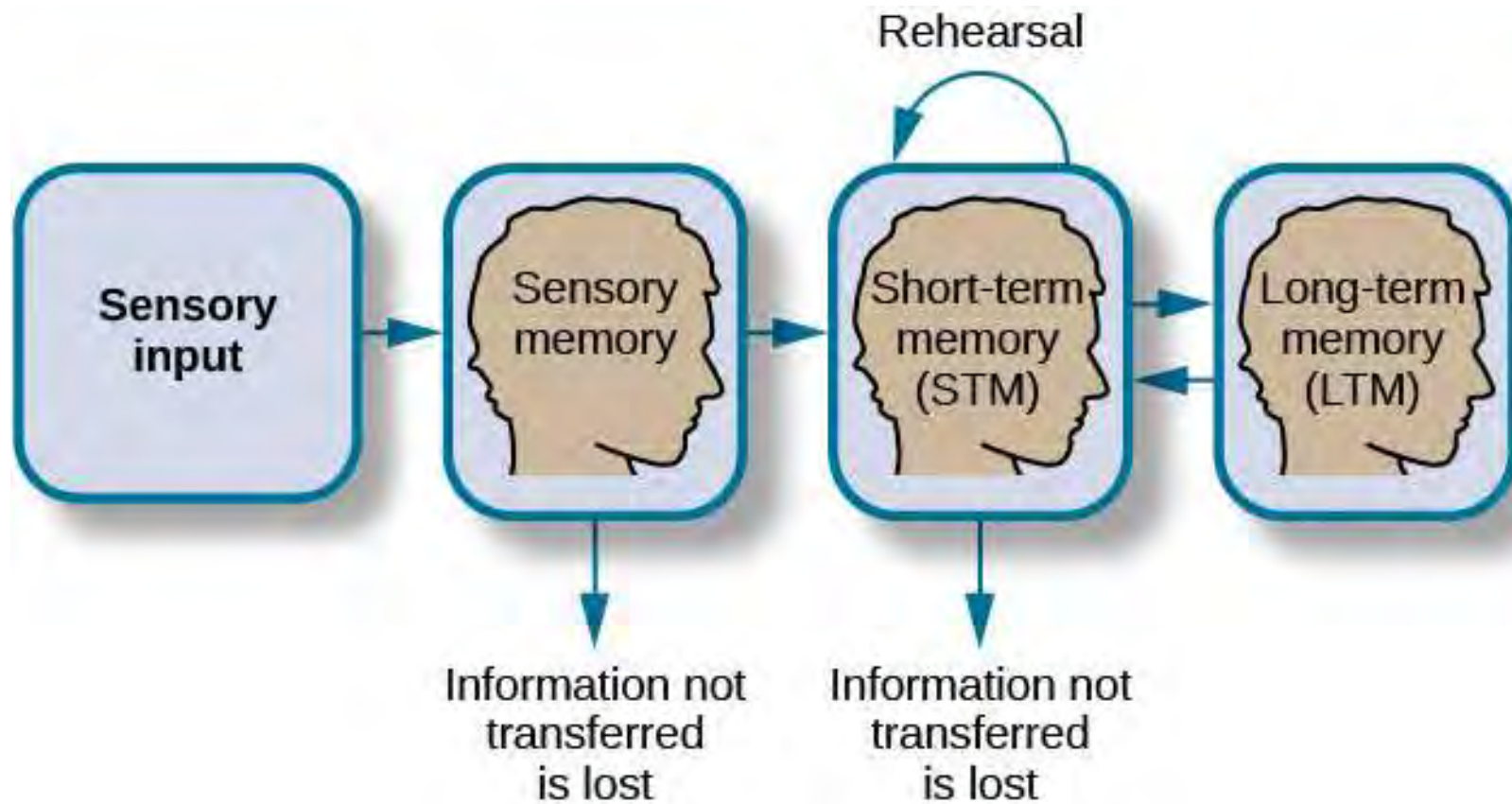
Goodwin, D.R. et al. *Am J of Psychiatry* 66 (1975)

ALCOHOL- INDUCED BLACKOUTS

Two types of alcohol blackouts

- Complete (en bloc)
 - Begins and ends at definitive points
 - Full permanent amnesia
 - Loss of time
 - Requires high BACs to disrupt memories from encoding
- Fragmentary (Gray Out)
 - Memories often recalled when prompted
 - Occur more often
 - Experienced over wider range of BACs

MEMORY



ALCOHOL-INDUCED BLACKOUTS

Two mechanisms:

- Encoding deficit
 - Alcohol temporarily inhibits biochemical processes in brain needed to form new memories
- Retrieval deficit
 - Information stored as a memory while intoxicated is inaccessible when the individual is sober

Ingestion of large amounts of alcohol may have more significant effect on input, acquisition, or processing of new memories

Research suggests alcohol-induced blackouts disrupt transfer of information from short-term to long-term storage





COMMON DRUGS SEEN IN DRUG-FACILITATED CRIMES

Learning Objectives

- Compare and contrast the more commonly-used drugs in DFCs, as well as “off-the-radar” drugs used
 - Pharmacokinetics
 - Pharmacodynamics
 - Challenges
- Case Reports



ZOLPIDEM

“Z” DRUGS

Zolpidem (**Ambien**[®], Stilnox[®])

Zopiclone (Zimovane[®], **Lunesta**[®])

Zaleplon (**Sonata**[®], Starnoc[®])

THE “Z” DRUGS

Very low-dose medications

Available in the US as early as 1993 (zolpidem)

Binds to the GABA_A receptor to enhance GABAergic inhibition of neurotransmission

CNS depressant effects (e.g., euphoria, drowsiness, muscle relaxation, feeling of drunkenness, hallucinations, and strong sedation)

Side effects may include memory loss, anxiety, abnormal thoughts/behaviors

Complex sleep behaviors have been reported (sleepwalking, sleep-driving, engaging in other activities while not fully awake)

Declared one of the most frequently used drugs used to facilitate sexual assault in Paris and surrounding suburbs (Chèze et al. *Forensic Science International* (2005): 3-10)

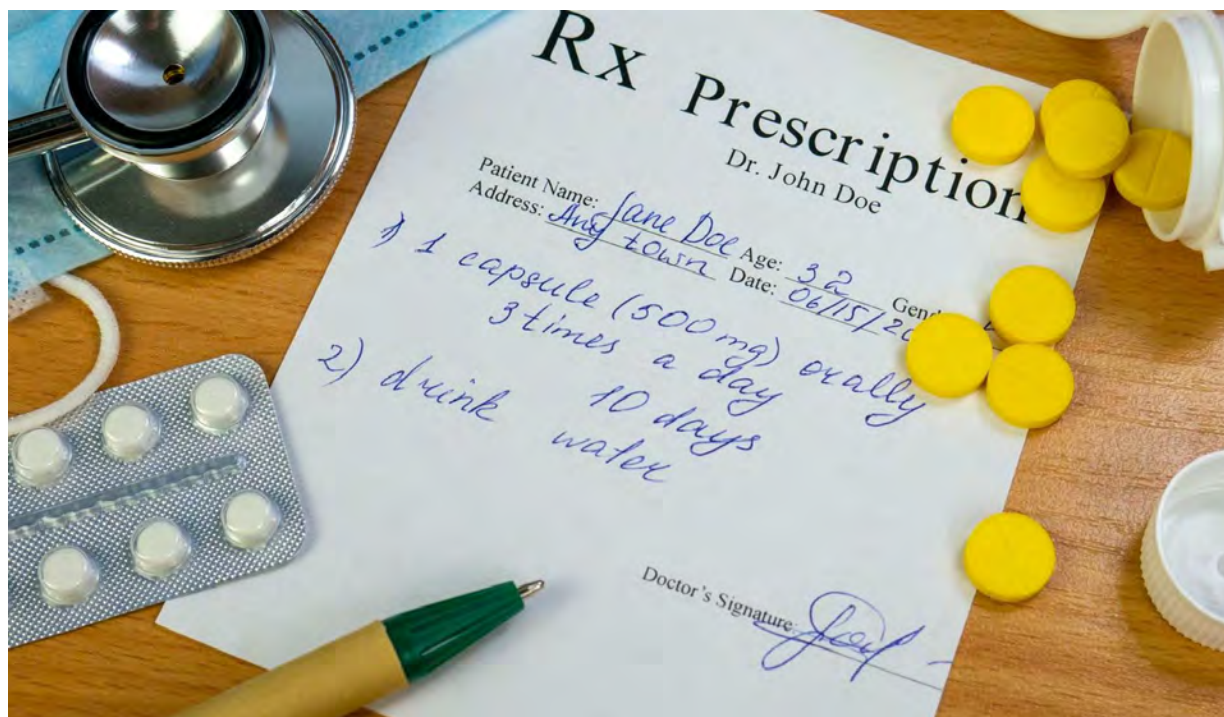


DIAZEPAM

$C_{16}H_{13}ClN_2O$

BENZODIAZEPINES

Alprazolam (Xanax®)
Chlordiazepoxide (Librium®)
Clonazepam (Klonopin®)
Diazepam (Valium®)
Lorazepam (Ativan®)
Triazolam (Halcion®)



POPULARITY OF BENZODIAZEPINES

- Pharmaceutical industry's top-selling family of prescription medications
 - Alprazolam among the industry's best-selling pills of all time
- Now over 90 million prescriptions for various benzodiazepines in the U.S. alone
 - One for every 3 citizens

MEDICAL USE OF BENZODIAZEPINES

- Benzodiazepines are effective for treating:
 - Sleep Disorders / Insomnia
 - Panic and Anxiety Disorders
 - Seizure Disorders
 - Alcohol Withdrawal
 - Anesthesia
 - Other Uses

KEY SIDE EFFECTS OF BENZODIAZEPINES

Slurred speech

Loss of inhibitions

Sedation and sleepiness

Memory impairment / anterograde amnesia



CLASSIFICATION OF BENZODIAZEPINES

Based on duration of action

- Short-acting ($\sim 1-12$ h) e.g., midazolam
- Intermediate-acting ($\sim 12-24$ h) e.g., oxazepam
- Long-acting (>24 h) e.g., clonazepam, diazepam
 - Long-acting benzodiazepines tend to exhibit a longer and more severe “hangover”



NON-CONTROLLED BENZODIAZEPINES

“Diverted” Benzodiazepines:

- Etizolam
 - Prescription med in Japan, India, and Italy
- Phenazepam
 - Approved for use in Russia
- Brotizolam
 - Approved in numerous European countries and Japan
- Flunitrazepam (Rohypnol®)
 - Approved for use in many countries

“Designer” Benzodiazepines:

- Clonazolam
- Deschloroetizolam
- Diclazepam
- Flubromazepam
- Flubromazolam
- Meclonazepam
- Nifoxipam
- Pyrazolam



Image Credit to Jermund9 (2015)
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FLUNITRAZEPAM (ROHYPNOL®)

Potent and long-acting

Onset 15-30 minutes, duration
2-12 hours

Used to treat severe insomnia
and as anesthetic adjunct

Impairs cognitive functions

- confusion, slurred speech,
anterograde amnesia,
respiratory depression



In 1990s, Rohypnol became popular drug to use in DFSA due to its strong sedative effect and ability to cause anterograde amnesia

Old tablets vs New Tablets

Blue dye in core is released when dissolved

Not incorporated into generic versions

FACT: Relatively few proven cases of this drug's use in DFSA

Other benzodiazepines more likely to be used



FLUNITRAZEPAM (ROHYPNOL®)



GHB AND GHB ANALOGS

Gamma Hydroxybutyrate (GHB)
Gamma Butyrolactone (GBL)
1,4-Butanediol (1,4-BD)

GHB AND ANALOGS

γ -Hydroxybutyrate (GHB) and its metabolic precursors may be among the most favored for DFSA

Hard to prove because of strong sedative, amnesiac effects and rapid elimination

Further complicated because it is a naturally-occurring metabolite of GABA

- Human urine and other biological specimens contain measurable amounts

Originally developed as a general anesthetic

- Now associated with recreational use and misuse, as well as for treatment of narcolepsy



Three groups have used GHB:

- Bodybuilders
- Recreational abusers
- Rapists / Robbers

HISTORY

GHB CLINICAL EFFECTS

Effects begin within the first 10 to 20 minutes after ingestion

Peak effects may take 30 to 60 minutes

Strong CNS depressant

- Confusion, dizziness, vomiting, respiratory depression, apnea, bradycardia, amnesia

Alert patients may show tachycardia, combativeness, hypertension, agitation, psychotic symptoms (paranoia and hallucinations)

- May be caused by a combination of fast metabolism and GHB-induced dopamine release

GHB-assisted sleep generally only lasts about 3-4 hours

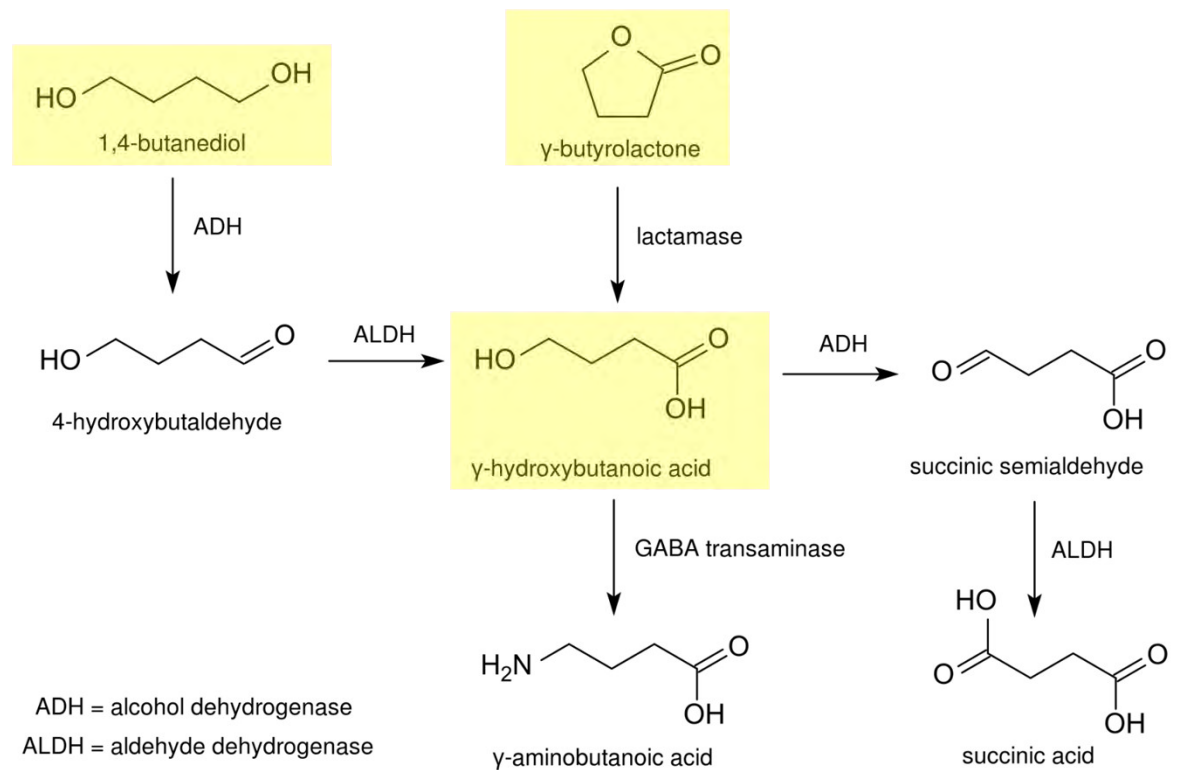
- People exposed to GHB usually wake up without a so-called “hangover” effect



GHB ANALOGS PHARMACOKINETICS

GHB analogs are quickly absorbed after ingestion and rapidly metabolized to GHB

If co-ingestion of 1,4-BD and alcohol, effects may be more severe and detection times may be slightly longer





KETAMINE

160MG Tablets

WARNING:

ADDICTION, ABUSE, and MISUSE: This drug exposes patients and other users to the risks of addiction.

TAKE 1 TABLET BY MOUTH 1
TIMES A DAY AS NEEDED

QTY 20

NO REFILLS - DR. AUTH REQUIRED

KETAMINE

Ketalar®





KETAMINE

Dissociative anesthetic

- Instead of a “sleep-like” state, one becomes disconnected with their body

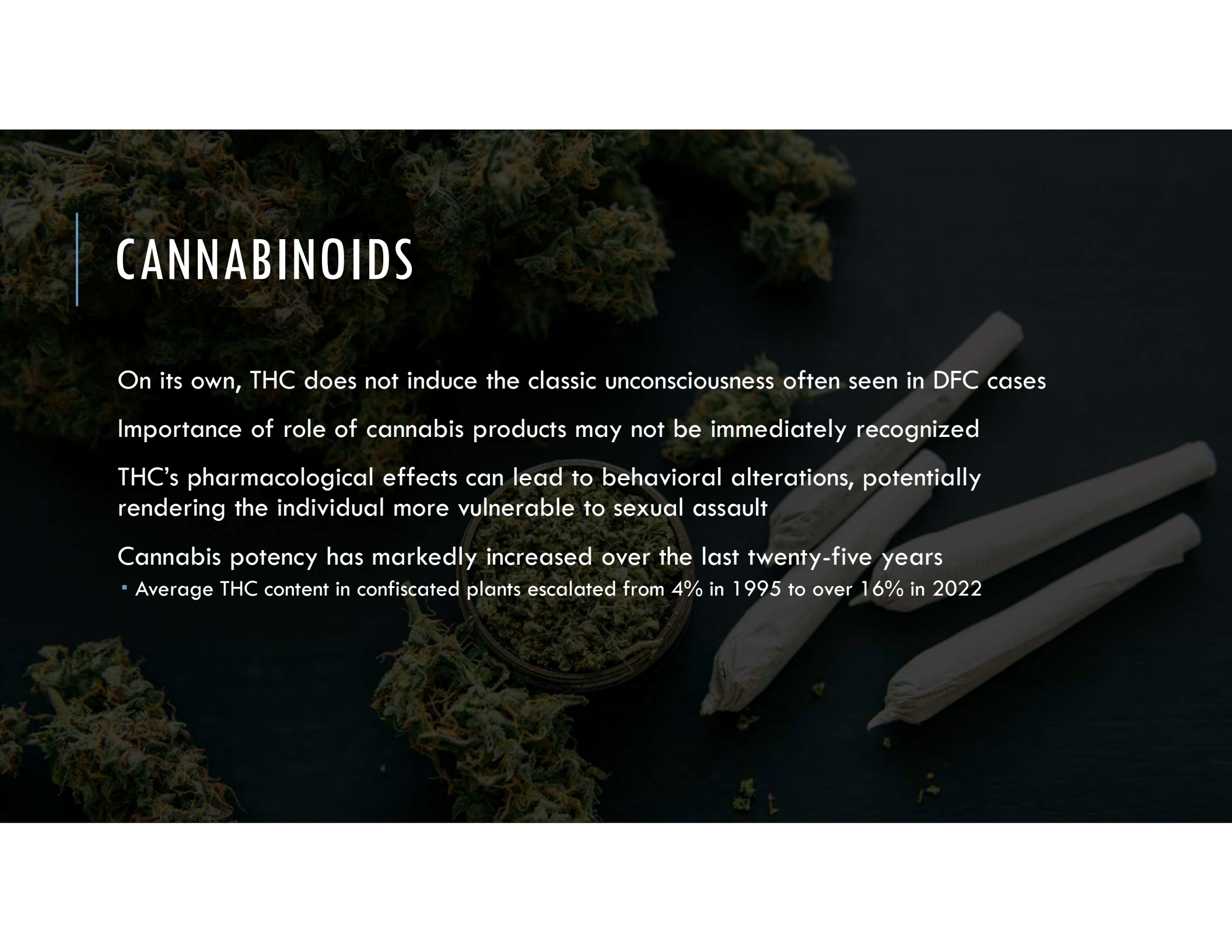
May also be used for pain management and for depression

Derived from and structurally similar to PCP

Snorted, injected, or taken orally



CANNABINOIDS



CANNABINOIDS

On its own, THC does not induce the classic unconsciousness often seen in DFC cases

Importance of role of cannabis products may not be immediately recognized

THC's pharmacological effects can lead to behavioral alterations, potentially rendering the individual more vulnerable to sexual assault

Cannabis potency has markedly increased over the last twenty-five years

- Average THC content in confiscated plants escalated from 4% in 1995 to over 16% in 2022

CANNABINOIDS

Legalization/decriminalization has expanded availability of products containing THC

Proliferation of cannabis-infused edibles and vaping products

- Concentrated products consumed without a clear understanding of the dosage
- Results in more pronounced pharmacological effects compared to smoking
- Edibles can be misrepresented as innocuous items, making surreptitious administration more likely than in the past

One of the most prevalent findings in DFC cases due to popularity and long detection window

Difficult to interpret – could be exposure days prior to the alleged offense

Few cases of cannabis only sexual assaults





OPIATES & OPIOIDS

Morphine

Codeine

Heroin

Oxycodone (Oxycontin[®], Percocet[®])

Hydrocodone (Vicodin[®])

Methadone (Dolophine[®])

Fentanyl (Sublimaze[®], Duragesic[®])

“NARCOTICS”

Narcotic means “sleep-inducing” or “numbness-inducing”

Opiates

Natural compounds extracted or refined from poppies:

- Opium
- Morphine
- Codeine
- Heroin

Opioids

Laboratory produced compounds:

Semi-synthesized:

- Hydrocodone
- Hydromorphone
- Oxycodone

Fully-synthesized:

- Dextromethorphan
- Loperamide
- Methadone
- Fentanyl / Carfentanyl
- Tramadol



PHARMACODYNAMICS OF OPIOIDS

Primary used as analgesics, cough suppressant, diarrhea treatment, replacement therapy for opioid addiction, and to reverse opioid overdose

Often abused for the euphoric effects or to prevent withdrawal from addiction

Side effects may include itchiness, nausea/vomiting, sedation, confusion, constipation, and respiratory depression

Long-term use can lead to tolerance and physical dependence

Women With Opioid Addiction Live With Daily Fear Of Assault, Rape

September 21, 2017 · 5:01 AM ET

Heard on [All Things Considered](#)

By [Martha Bebinger](#)



In Cambridge, Mass., a woman named Kristin sits down on a stone bench to talk about a common but rarely discussed injury that's starting to grow along with the opioid epidemic: rape.

We've agreed to use just Kristin's first name because she's a victim of this crime. Kristin says she, like many women who live on the streets, cope with the daily fear of an attack that they are too sedated to fend off, or of waking up to find their pants pulled down, bruises, and other signs of an assault.

It's an assault active drug users often don't report out of shame, distrust of police, or fear they'll be labeled a "cop caller" and have trouble buying heroin. It's an injury women say they can't figure out how to prevent. And it's one few doctors think to ask about, and thus rarely treat.

The road to trouble starts many mornings, says Kristin, when she wakes up, sick and desperate for heroin but afraid to shoplift, sell the goods, and seek a dealer on her own. So she finds a male buddy, someone she calls a running partner.

"It's just safer. People are less likely to beat you, rob you, sell you fake drugs if you've got a strong, well-known man with a reputation — a good reputation — you know," says Kristin, 32, who still has the lanky body of a high school backstroke champion. She's been addicted to opioids since she was 13 when they were prescribed to relieve pain after a shoulder surgery.

But sometimes that strong man with a good reputation turns out to be another danger. Kristin cringes at the memory of falling into a drug-induced sleep near a running partner she'd come to trust.

"I woke up to him on top of me, with my pants off, pretty much demanding that we have sex," Kristin says, the emotion draining from her voice. "I'm weak because of the drugs I've taken, so I'm trying to push him off. I can't do it. I grab my phone and just kind of barrel roll off the bed, pull my pants up, and run outside."



FIRST GENERATION ANTIHISTAMINES

- Brompheniramine
- Chlorpheniramine
- Dimenhydrinate
- Diphenhydramine
- Doxylamine
- Pheniramine
- Promethazine



FIRST-GENERATION ANTIHISTAMINES

Used to treat allergy symptoms

- Oldest and cheapest of the antihistamines on the market

As much as 50% of the population feel sleepy after consuming

Large doses or mixed with ethanol exacerbates the CNS depressant effect

Other side effects include euphoria, dizziness, blurred vision, ringing in the ears (tinnitus), incoordination, hallucinations, and psychosis

Readily absorbed after oral administration

Onset of action generally occurring within 1 hour

Detectable for hours to days



TRICYCLIC ANTIDEPRESSANTS

Amitriptyline (Elavil[®])
Clomipramine (Anafranil[®])
Desipramine (Norpramin[®])
Doxepin (Adapin[®])
Imipramine (Tofranil[®])
Nortriptyline (Pamelor[®])
Protriptyline (Vivactil[®])
Trimipramine (Surmontil[®])



TRICYCLIC ANTIDEPRESSANTS

In use since the 1950s

Today are prescribed AFTER newer antidepressants

Not only to treat depression

- May be used for anxiety disorders, social phobias, obsessive-compulsive disorder, panic, eating disorders, post-traumatic stress disorder, and many other medical disorders

Important side-effects include cognitive and/or memory impairment, drowsiness, and confusion

Combined with alcohol can intensify the CNS depressant effects



TETRAHYDROZOLINE |



TETRAHYDROZOLINE

OTC Eyedrops

Urban Legend: Causes diarrhea

When applied to the eye or in the nose it causes constriction of small vessels in nasal passages and conjunctiva

Oral doses may produce CNS depression with drowsiness, bradycardia, muscle flaccidity, shock-like hypotension, hypothermia, apnea, respiratory depression, and coma

A collection of laboratory glassware, including an Erlenmeyer flask, a beaker, a large conical flask with test tubes, a graduated cylinder, and a round-bottom flask, all containing liquids. The background is a dark blue with a subtle, swirling pattern. The text "LABORATORY TESTING" is overlaid in white, bold, sans-serif font, followed by a vertical line.

LABORATORY TESTING |

Learning Objectives

- Why labs are not created equally
- Things labs can do to manage and improve DFSA investigations
- Standardizing toxicological testing in DFSA
- Best specimens for toxicological testing in DFSA

CHALLENGES SURROUNDING DFC INVESTIGATIONS

Labs

- Many tests
- Sensitivity
- Right lab?



RECOMMENDATIONS FOR TOXICOLOGISTS

Develop a plan for DFSA cases coming into your laboratory

Know your limitations

Promote research to better understand DFSA

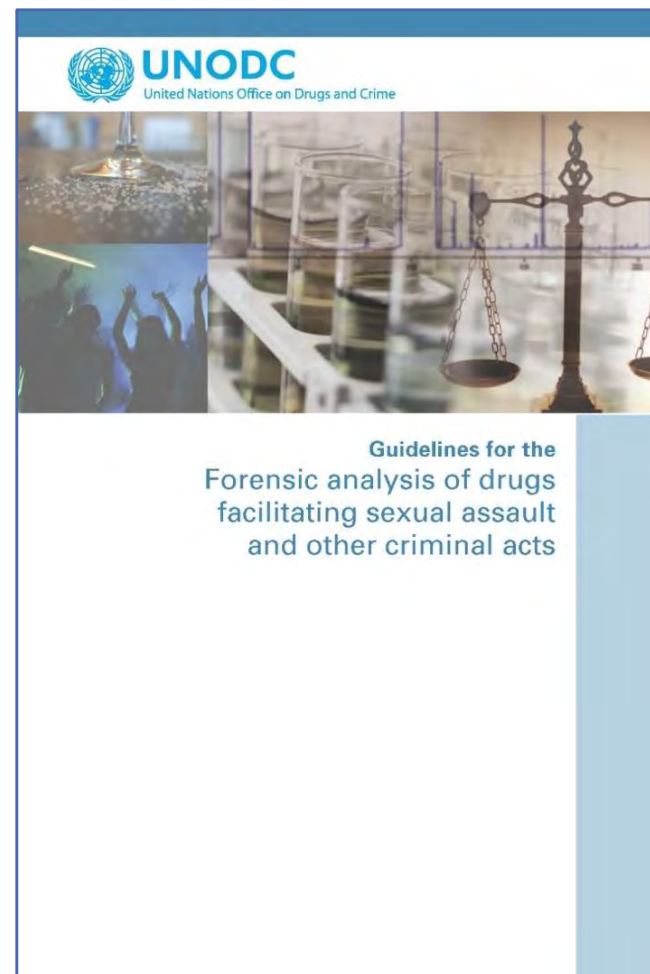
UNODC

Developed as practical guide of best practices and logical procedures

Assists investigation, analytical detection, and prosecution in cases of DFC

Intended for worldwide use

Provides list of recommended drugs/metabolites to screen for in urine samples



Increase specimen volume

Hydrolyze urine specimens for
benzodiazepine metabolites

Derivatives + selective detectors

LC-MS/MS (High Resolution)

**UNODC
RECOMMENDATIONS
TO IMPROVE
SENSITIVITY**

GATHERING CRITICAL INFORMATION

Must maintain good lines of communication between investigators and toxicologists

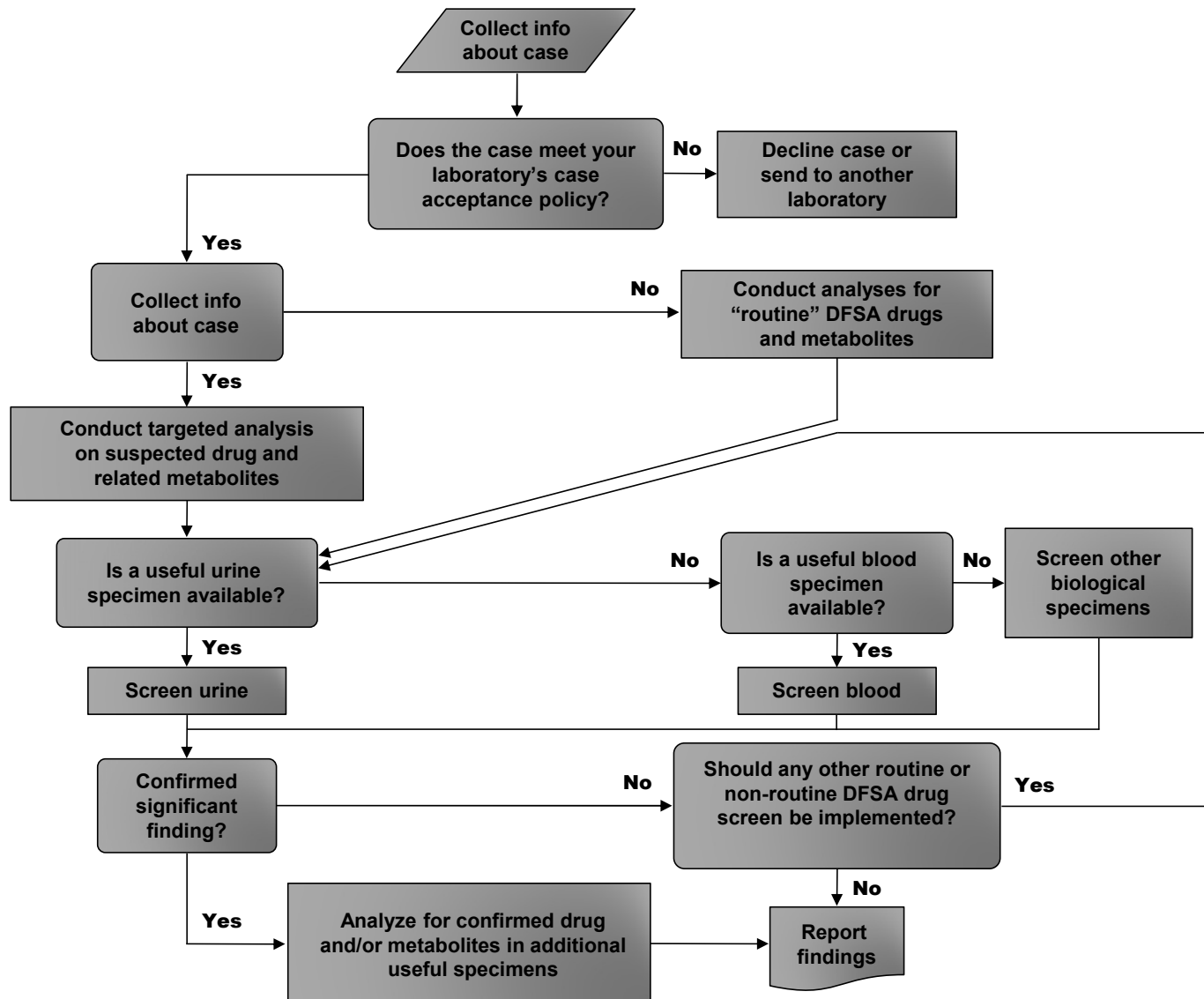
Toxicologists should develop a list of questions to ask of the investigator to serve as a “screen” for incoming DFSA cases

- Also helps prevent useless waste of valuable biological evidence

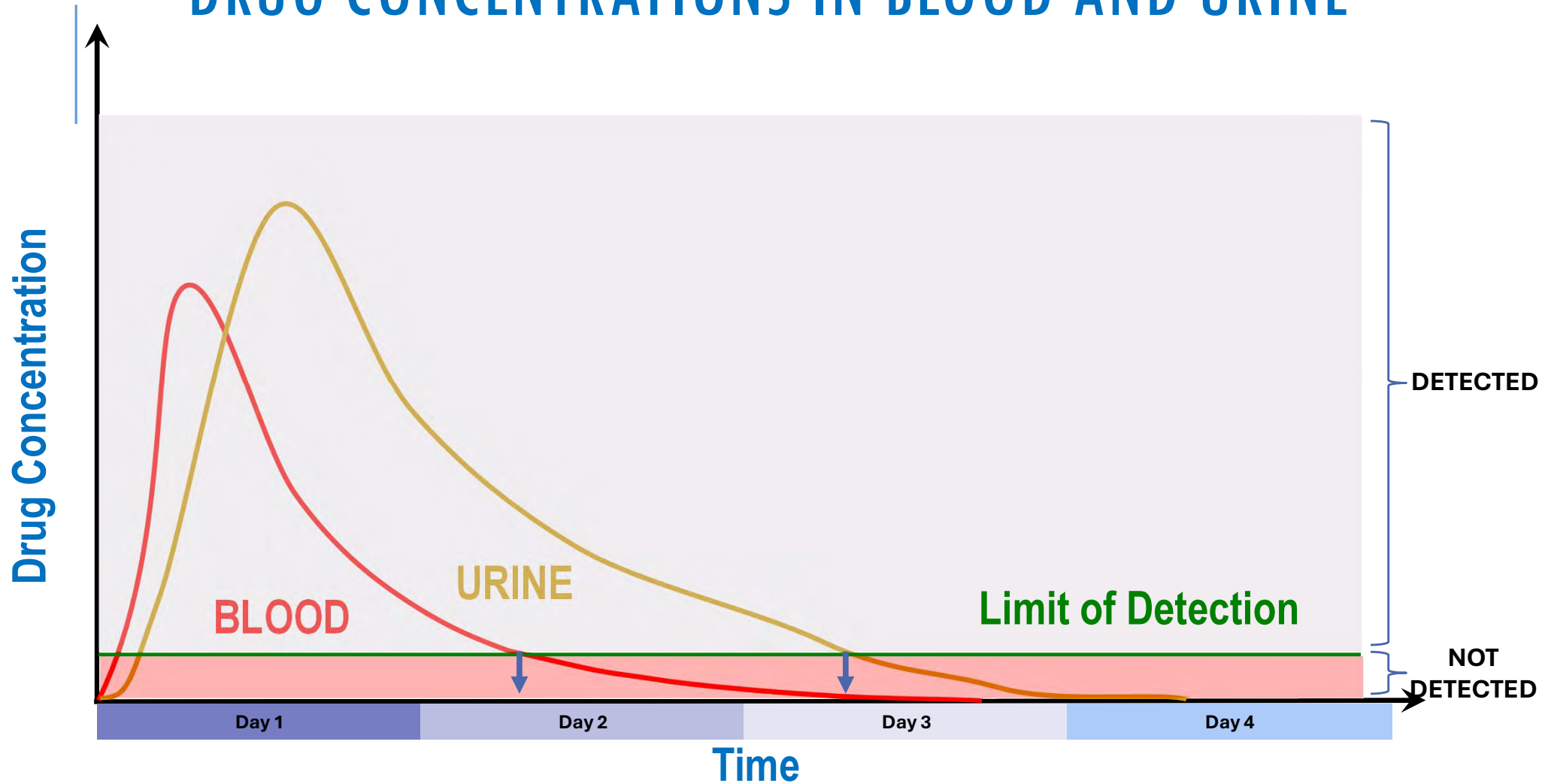
Annex 4. Example of information collection worksheet for DFSA cases

Reference: LeBeau M. A.: Laboratory management of drug-facilitated sexual assault cases; *Forensic Science Review*, 22:113:2010.

Drug-facilitated sexual assault information collection worksheet	
Agency: _____	City: _____
Contact Person: _____	Phone: _____
Name of Victim: _____	Name of Suspect (s): _____
Case Number(s): _____	Date and Time(s) of Assault: _____
Date of Contact: _____	Examiner Collecting Information: _____
1. Were any specimens collected and what were they? _____	
2. When were the specimens collected (date and times)? _____	
3. What symptoms did the victim describe? _____	
4. Were there any witnesses? If so, how did they describe the victim? _____	
5. How long did the victim have amnesia or was the victim unconscious? _____	
6. Did the victim consume any alcohol? If so, how much (types of alcohol, size of drinks, over how many hours, etc.)? _____	
7. Did the victim voluntarily take any drugs (recreational, prescription or over-the-counter)? If so, which ones, how much and when? _____	
8. Did the victim urinate prior to providing any specimens? If so, approximately how many times? Please indicate the time of the previous urination. _____	
9. What is known about the suspect in regard to occupation, hobbies, drug history and medical history? _____	
10. What recreational and prescription drugs does the suspect have ready access to? _____	
11. Additional notes of interest: _____	



DRUG CONCENTRATIONS IN BLOOD AND URINE





WHAT DOES A NEGATIVE
TOXICOLOGY RESULT MEAN?

ANSI/ASB Standard 119, First Edition
2021

**Standard for the Analytical Scope and Sensitivity of
Forensic Toxicological Testing of Blood in Medicolegal
Death Investigations**



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ANSI/ASB Standard 120, First Edition
2021

**Standard for the Analytical Scope and Sensitivity of
Forensic Toxicological Testing of Blood in Impaired
Driving Investigations**



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ANSI/ASB Standard 121, First Edition
2021

**Standard for the Analytical Scope and Sensitivity of
Forensic Toxicological Testing of Urine in Drug-
Facilitated Crime Investigations**



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Scope and Sensitivity Documents

Sets minimum testing expectations in different subdisciplines of forensic toxicology

Helps ensure some consistency in testing

Allows for better understanding of extent of problem with drugs on lists

Expect lists to grow with time

- Document does not address analysis of blood and other evidence that may be collected (but must have procedures to address)
- Urine specimen collected from an alleged victim of DFC within 120 hours (5 days) of the incident shall be tested
 - Case-specific circumstances may warrant testing of specimens collected past 5 days
- Toxicological testing of urine specimens collected from alleged victims of DFCs shall include, at a minimum, the compounds listed in Table 1.

REQUIREMENTS FOR FORENSIC TOXICOLOGICAL TESTING OF URINE SPECIMENS IN INVESTIGATIONS OF DRUG-FACILITATED CRIME

High-Dose Sedatives	
Ethanol (alcohol)*	0.01 g/dL
GHB**	10 µg/mL
Antidepressants	
Amitriptyline	10 ng/mL
Chlorophenylpiperazine	10 ng/mL
Desipramine	10 ng/mL
Imipramine	10 ng/mL
Nortriptyline	10 ng/mL
Antihistamines	
Brompheniramine	10 ng/mL
Chlorpheniramine	10 ng/mL
Diphenhydramine	10 ng/mL
Doxylamine	10 ng/mL
Norchlorcyclizine	10 ng/mL
Barbiturates	
Butalbital	100 ng/mL
Phenobarbital	100 ng/mL
Benzodiazepines	
α-hydroxyalprazolam	5 ng/mL
7-aminoclonazepam	5 ng/mL
Lorazepam	5 ng/mL
Nordiazepam	10 ng/mL
Oxazepam	10 ng/mL
Temazepam	10 ng/mL
Cannabinoids	
Carboxy-tetrahydrocannabinol (THC-COOH)	10 ng/mL

CNS Stimulants	
Amphetamine	25 ng/mL
Methamphetamine	25 ng/mL
MDA	25 ng/mL
MDMA	25 ng/mL
Benzoyllecgonine	50 ng/mL
Miscellaneous	
Cyclobenzaprine	10 ng/mL
Methorphan	10 ng/mL
Norketamine	10 ng/mL
Zolpidem carboxylic acid	10 ng/mL
Zopiclone	10 ng/mL
Carisoprodol	100 ng/mL
Meprobamate	100 ng/mL
Opioids	
Fentanyl	1 ng/mL
Norfentanyl	1 ng/mL
Codeine	10 ng/mL
Hydrocodone	10 ng/mL
Hydromorphone	10 ng/mL
Morphine	10 ng/mL
Oxycodone	10 ng/mL
Oxymorphone	10 ng/mL
Tramadol	10 ng/mL

* If more than 24 hours have passed between the alleged incident and urine collection, testing is not required

** If more than 12 hours have passed between the alleged incident and urine collection, testing is not required

- Analytical sensitivity shall meet or exceed (be lower than) the concentrations listed in Table 1.
- The table reflects total concentrations, which may be achieved via hydrolysis or direct analysis of conjugated compounds.
- May be met by testing internally, externally, or a combination of both
- Need to consider other potentially impairing substances based on regional trends and case history

REQUIREMENTS FOR FORENSIC TOXICOLOGICAL TESTING OF URINE SPECIMENS IN INVESTIGATIONS OF DRUG-FACILITATED CRIME

Recommended Minimum Performance Limits for Common DFC Drugs and Metabolites in Urine Samples

This is not a complete list of drugs encountered in DFC, just the more common ones. Use your specific case history and demographics to determine the most likely drug(s) in your case. This list was originally compiled by the DFSA Committee as a guidance document for laboratories performing analyses of samples from alleged DFSA victims, as well as for nurses, law enforcement, attorneys, and other users of forensic toxicology services. It was originally published in the December 2005 issue of ToxTalk. The DFC Committee periodically updates this list as new drugs are reported in DFC case work. Another purpose of this list is to improve the consistency in results generated by toxicology laboratories that analyze urine specimens from DFC cases. The detection limits are derived from the literature or are an estimated concentration from the use of a single dose. Further, these detection limits should be achievable using analytical instrumentation considered standard in most laboratories today. This list is designed to encourage laboratories to evaluate their current capabilities, make improvements where necessary and to communicate to their customers if they cannot meet the recommended detection limits. Questions or comments regarding this list can be directed to the Chair of the SOFT DFC Committee, Laureen Marinetti at LITOXIMP@gmail.com.

Parent Drug	Target Analyte(s)	Selected Trade Names and Street Names ¹	Recommended Min Performance Limits
Analgesics			
Buprenorphine	Buprenorphine Norbuprenorphine	Buprenex, Suboxone	1 ng/mL (ng/mL - nanograms per milliliter)
Fentanyl	Fentanyl Norfentanyl	Actiq, Duragesic, Fentora, Sublimaze	
Codeine	Codeine Morphine	Tylenol 3, Tylenal	10 ng/mL
Dihydrocodeine	Dihydrocodeine	Paramol, Remedeine	
Heroin*	6-monoacetylmorphine Morphine	Smack, horse, dope	
Hydrocodone	Hydrocodone Dihydrocodeine Hydromorphone Norhydrocodone	Anexsia, Hycodan, Lorcet, Lortab, Norco, Panacet, Vicodin, Zydane, Vics, Tabs	
Hydromorphone	Hydromorphone	Dilaudid, Palladone	
Meperidine	Meperidine	Demerol, Mepergan	

* Not legally available in the US

Society of Forensic Toxicologists (SOFT)

Drug-Facilitated Crimes Committee (DFC) formerly the DFSA Committee

Recommended Minimum Performance Limits for Common DFC Drugs and Metabolites in Urine Samples

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Parent Drug	Target Analyte(s)	Selected Trade Names and Street Names ¹	Recommended Min Performance Limits
	Normeperidine		10 ng/mL
Methadone	Methadone EDDP	Dolophine, Methadose	
Morphine	Morphine	Avinza, Astramorph, Duramorph, Kadian, MSIR, MS Contin, Oramorph, Roxanol	
Oxycodone	Oxycodone Noroxycodone Oxymorphone	Oxycontin, Oxyir, Percocet, Percodan, Percolone, Roxicet, Roxicodone, Tylox, <i>Oxy, Hillbilly heroin</i>	
Oxymorphone	Oxymorphone	Numorphan, Opana, <i>Blues, Oranges</i>	
Propoxyphene*	Propoxyphene Norpropoxyphene	Darvon, Darvocet, Wygesic	
Tapentadol	Tapentadol Desmethyltapentadol	Nucynta, Palexia, Tapal	
Tramadol	Tramadol <i>n</i> -desmethyltramadol <i>o</i> -desmethyltramadol	Ultram, Ultracet	
Antidepressants			
Amitriptyline	Amitriptyline Nortriptyline	Elavil, Endep	10 ng/mL
Citalopram Escitalopram	Citalopram	Celexa, Cipramil, Lexapro	
Desipramine	Desipramine	Norpramin, Pertofrane	
Doxepin	Doxepin Nordoxepin	Adapin, Prudoxin, Sinequan, Zonalon	
Fluoxetine	Fluoxetine Norfluoxetine	Prozac, Sarafem	

* Not legally available in the US

Society of Forensic Toxicologists (SOFT)
Drug-Facilitated Crimes Committee (DFC) formerly the DFSA Committee

Parent Drug	Target Analyte(s)	Selected Trade Names and Street Names ¹	Recommended Min Performance Limits
Imipramine	Imipramine Desipramine	Tofranil	10 ng/mL
Nortriptyline	Nortriptyline	Aventyl, Pamelor	
Norvenlafaxine	Norvenlafaxine	Pristiq	
Paroxetine	Paroxetine	Asimia, Paxil	
Sertraline	Sertraline Norsertraline	Zoloft	
Trazodone	Trazodone 1-(3-Chlorophenyl)piperazine (mCPP)	Desyrel	
Venlafaxine	Venlafaxine Norvenlafaxine	Effexor	
Antihistamines and cough/cold treatment			
Brompheniramine	Brompheniramine	Alatapp, Bromaline, Bromanate, Bromfed, Bromphen, Dimetane, Dimetapp, Myphetane, Polytine, Puretane	10 ng/mL
Carbinoxamine	Carbinoxamine	Arbinoxa, Palgic	
Cetirizine	Cetirizine	Zyrtec	
Chlorpheniramine	Chlorpheniramine	Aller Chlor, Chlor-trimeton, Coricidin, Deconamine, Efidac, Kronofed, Teldrin	
Dextromethorphan	Dextromethorphan Dextrorphan	Benylin, Delsym, Romilar	

Society of Forensic Toxicologists (SOFT)
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Parent Drug	Target Analyte(s)	Selected Trade Names and Street Names ¹	Recommended Min Performance Limits
Diphenhydramine	Diphenhydramine	Banophen, Belix, Benadryl, Dermarest, Excedrin PM, Hydramine, Sleepinal, Sleep-Eze 3, Tylenol PM, Unisom Sleep Gels	10 ng/mL
Doxylamine	Doxylamine	Bendectin, Unisom	
Hydroxyzine	Hydroxyzine Cetirizine Norchlorcyclizine	Atarax, Vistaril	
Meclizine	Meclizine	Antivert	
Promethazine	Promethazine	Phenergan, Zipan	
Tetrahydrozoline	Tetrahydrozoline	Murine, Visine	
Antipsychotics			
Chlorpromazine	Chlorpromazine	Thorazine	10 ng/mL
Clozapine	Clozapine Norclozapine	Clozaril, Leponex	
Olanzapine	Olanzapine	Zyprexa	
Quetiapine	Quetiapine Norquetiapine 7-Hydroxyquetiapine	Seroquel	
Thioridazine	Thioridazine	Mellaril	
Ziprasidone	Ziprasidone	Geodon, Zeldox	
Barbiturates			
Amobarbital*	Amobarbital	Amytal	25 ng/mL
Butalbital	Butalbital	Esgic, Fioricet, Fiorinol, Fiorpap	
Pentobarbital	Pentobarbital	Nembutal	
Phenobarbital	Phenobarbital	Luminol, Phenobarbitone	
Primidone	Primidone, Phenobarbital	Mysoline	
Secobarbital	Secobarbital	Seconal, Tuinal	

* Not legally available in the US

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Parent Drug	Target Analyte(s)	Selected Trade Names and Street Names ¹	Recommended Min Performance Limits
Benzodiazepines Many benzodiazepines are bio-transformed into glucuronide-conjugated metabolites. To improve detection limits and extend detection time, it is recommended that laboratories use instrumental techniques that will detect the glucuronide metabolites or hydrolyze urine specimens to free the conjugate before extraction.			
Clonazepam	Clonazepam 7-aminoclonazepam	Clonopin, Klonopin, Rivotril	5 ng/mL
Flunitrazepam*	Flunitrazepam 7-aminoflunitrazepam	Rohypnol, Roofies	
Triazolam	Triazolam α -hydroxytriazolam	Halcion	
Alprazolam	Alprazolam α -hydroxyalprazolam	Niravam, Xanax, Bars	10 ng/mL
Bromazepam*	Bromazepam α -hydroxybromazepam	Lectopam, Lexillum, Lexotan	
Clordiazepoxide	Chlordiazepoxide Nordiazepam	Libritabs, Librium	
Clobazam	Clobazam	Onfi, Urbanol	
Clorazepate	Nordiazepam Oxazepam Temazepam	Azene, Tranxene, Clorazepic acid	
Clotiazepam*	Clotiazem	Clozan	
Diazepam	Diazepam Nordiazepam Oxazepam Temazepam	Diasat, Dizac, Valium	
Estazolam (desmethyralprazolam)	Estazolam	Prosom	
Etizolam*	Etizolam	Etilaam	
Flubromazepam*	Flubromazepam	Novel psychoactive substance	

* Not legally available in the US

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Parent Drug	Target Analyte(s)	Selected Trade Names and Street Names ¹	Recommended Min Performance Limits
Flurazepam	Flurazepam Desalkylflurazepam	Dalmane	10 ng/mL
Loprazolam*	Loprazolam	Dormonox, Havlane, Somnovit	
Lorazepam	Lorazepam	Ativan	
Lormetazepam* (methyl-lorazepam)	Lormetazepam	Dilamet, Ergocalm, Loramet, Noctamid	
Midazolam	Midazolam α -hydroxymidazolam	Versed	
Oxazepam	Oxazepam	Serax	
Phenazepam*	Phenazepam	Fenazepam (used in Russia) available on the internet	
Prazepam*	Prazepam	Centrac, Centrax	
Temazepam	Temazepam Oxazepam	Normison, Restoril	
Tetrazepam*	Tetrazepam	Clinoxan, Relaxam, Spasmorelax	
High Dose Sedatives			
Ethanol	Ethanol	Alcohol, ethyl alcohol, Booze	0.01 gram percent (grams per 100 milliliters)
Gamma-hydroxybutyrate (GHB)	GHB	Xyrem, Easy, Lay, G, Georgia Home Boy, Grievous Bodily Harm, Liquid E, Liquid Ecstasy, Liquid G, Liquid X, Salty Water, Scoop, Soap	10,000 ng/mL = 10 mcg/mL (micrograms per milliliter)
Gamma-butyrolactone (GBL)	GHB	Blue Nitro, G3, Gamma G, G.H. Revitalizer, Insom-X, Invigorate, Remforce, Renewtrient, Verve	

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Parent Drug	Target Analyte(s)	Selected Trade Names and Street Names ¹	Recommended Min Performance Limits
1, 4-Butanediol (1,4-BD)	GHB	<i>Enliven, Inner G, Revitalize Plus, Serenity, Somato Pro, Sucal B, Thunder Nectar, Weight Belt Cleaner, White Magic</i>	10,000 ng/mL = 10 mcg/mL (micrograms per milliliter)
Miscellaneous			
Carisoprodol	Carisoprodol Meprobamate	Soma	50 ng/mL
Clonidine	Clonidine	Catapres, Clorpres, Combipres, Duraclon	1 ng/mL
Cyclobenzaprine	Cyclobenzaprine Norcyclobenzaprine	Flexeril	10 ng/mL
Eszopiclone	Zopiclone Zopiclone-n-oxide	Lunesta	10 ng/mL
Gabapentin	Gabapentin	Neurontin	1000 ng/mL = 1 mcg/mL
Ketamine	Ketamine Norketamine	Ketalar, Ketaject, <i>Special K</i>	10 ng/mL
Meprobamate	Meprobamate	Equagesic, Equanil, Micrainin, Miltown	50 ng/mL
Phencyclidine (PCP)*	PCP	Sernyl	10 ng/mL
Phenytoin	Phenytoin	Dilantin, diphenylhydantoin	25 ng/mL
Pregabalin	Pregabalin	Lyrica	500 ng/mL
Suvorexant	Suvorexant	Belsomra	10 ng/mL
Scopolamine	Scopolamine	Isopto Hyoscine, Scopace, Transderm Scop	
Tetrahydrocannabinol (Δ9-THC)	11-carboxy-THC	<i>Cannabis sativa</i> , dronabinol, marijuana, Marinol	20 ng/mL
Topiramate	Topiramate	Topamax	50 ng/mL

* Not legally available in the US

Society of Forensic Toxicologists (SOFT)
Drug-Facilitated Crimes Committee (DFC) formerly the DFSA Committee

Parent Drug	Target Analyte(s)	Selected Trade Names and Street Names ¹	Recommended Min Performance Limits
Valproic Acid	Valproic Acid	Depacon, Depakene, Depakote, Valproate	5,000 ng/mL = 5mcg/mL
Zaleplon	Zaleplon	Sonata, Zereene	10 ng/mL
Zopiclone	Zopiclone Zopiclone-n-oxide	Lunesta, Zimovane	10 ng/mL
Zolpidem	Zolpidem Zolpidem-phenyl-4-carboxylic acid	Ambien	10 ng/mL
Stimulants			
Amphetamine	Amphetamine	Adderall	50 ng/mL
Cocaine	Cocaine Benzoylecgonine Cocaethylene Methylecgonine	Coke	
Methamphetamine	Methamphetamine Amphetamine	Desoxyn, Crystal Meth, Ice, Speed	
Methylphenidate	Methylphenidate Ritalinic Acid	Ritalin	
Methylenedioxymphetamine* (MDA)	MDA	Ecstasy	50 ng/mL
Methylenedioxymethamphetamine* (MDMA)	MDMA MDA	Ecstasy	

¹ For a more comprehensive list of slang terms, see also, **Drug Slang Code Words**, DEA Intelligence Report DEA-HOU-DIR-020-17, published May 2017. Accessed June 7, 2017 at <https://ndews.umd.edu/sites/ndews.umd.edu/files/dea-drug-slang-code-words-may2017.pdf>

* Not legally available in the US

BEST SPECIMENS FOR TESTING

Urine

- Limited interpretation
- Longer detection times
- Collect ~100 mL if within first 120 hrs
- Refrigerate

Blood

- Pharmacological interpretation
- Shorter detection time
- Collect at least 10 mL in within first 120 hours
- Preserve with sodium fluoride and potassium oxalate (gray-top tube)
- Refrigerate

SOME WORDS ABOUT HAIR IN DFSA CASES

Drugs can be trapped in hair from:

Blood

Sebum

Sweat

Environment

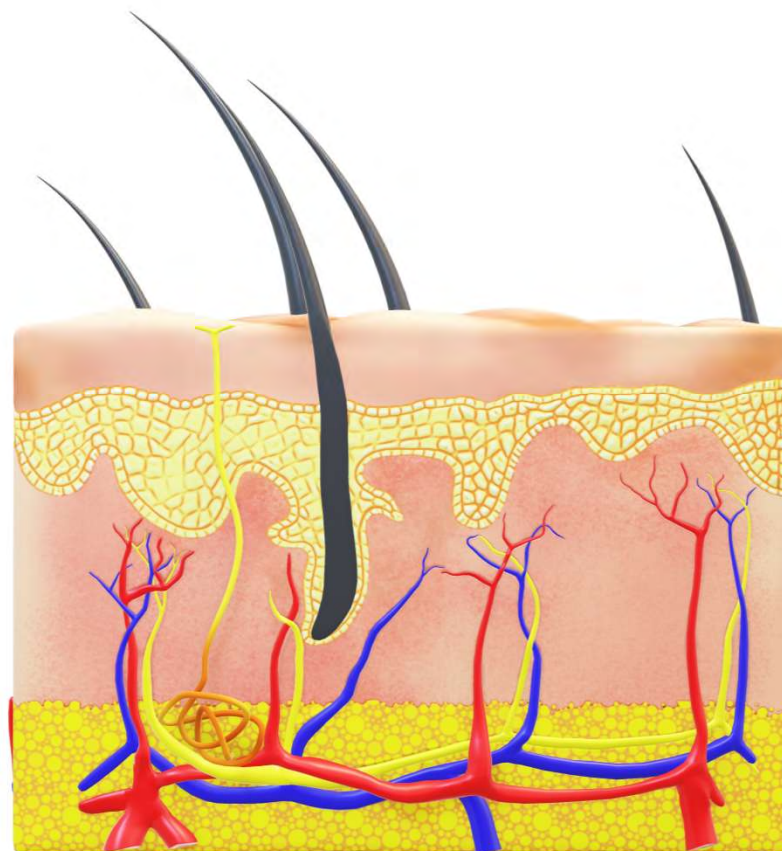
Useful when reporting is delayed
weeks or longer

Some drugs can remain in hair for
months or years

Hair grows about 0.5 inch per month

It takes about 2 weeks for drugs
deposited at hair root to emerge
above the scalp

Typically head hair is used



SOME WORDS ABOUT HAIR IN DFSA CASES

Best to wait 2 months or longer
before collection

Collect about 200 strands in a
bundle, cut close to the scalp

Width of a #2 pencil

Difficulties with hair:

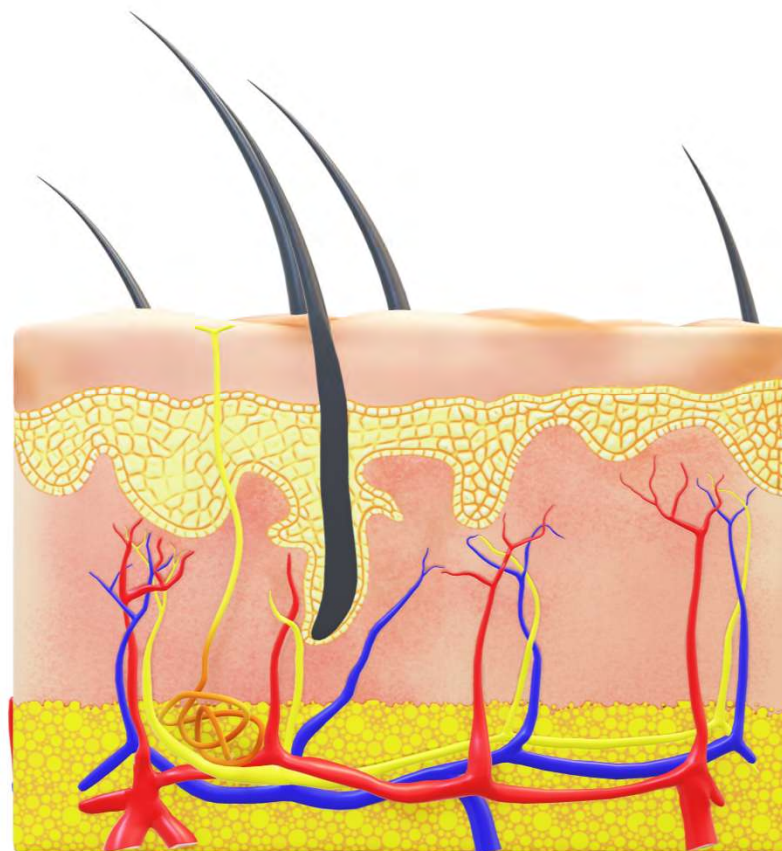
Assuming 1x exposure, it may be
difficult to detect

Negative results may be misleading

Doesn't always prove "ingestion"

Can't readily screen hair for multiple
drugs

Should be done by laboratory with
newer technology and experience with
hair





DRUG-FACILITATED SEXUAL ASSAULT: A FORENSIC HANDBOOK

The Victim - Abarbanel

The Perpetrators and Their Modus Operandi - Welner

Ethanol - Garriott and Mozayani

Rohypnol and Other Benzodiazepines - Robertson and Raymon

Gamma-Hydroxybutyrate (GHB) and Related Products - Ferrara, Frison, Tedeschi and LeBeau

Hallucinogens - Raymon and Robertson

Opioids - Jufer and Jenkins

Miscellaneous Prescription and Over-the-Counter Medications - Jones and Singer

Collection of Evidence from DFSA - LeBeau and Mozayani

Analysis of Biological Evidence from DFSA Cases - LeBeau and Noziglia

Sexual Assault Nurse Examiners - Ledray

Investigating DFSA Cases - Archambault, Porrata and Sturman

Prosecution of DFSA - Kerlin, Riveira and Paterson



Blinded by the Dose

October 2, 2025

Drug Facilitated Sexual Assault: Overview and Emerging Challenges

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