

LATEST TRENDS IN DRUG AND ALCOHOL TESTING

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'Improving health and safety in challenging times'

Trends In Drug Use

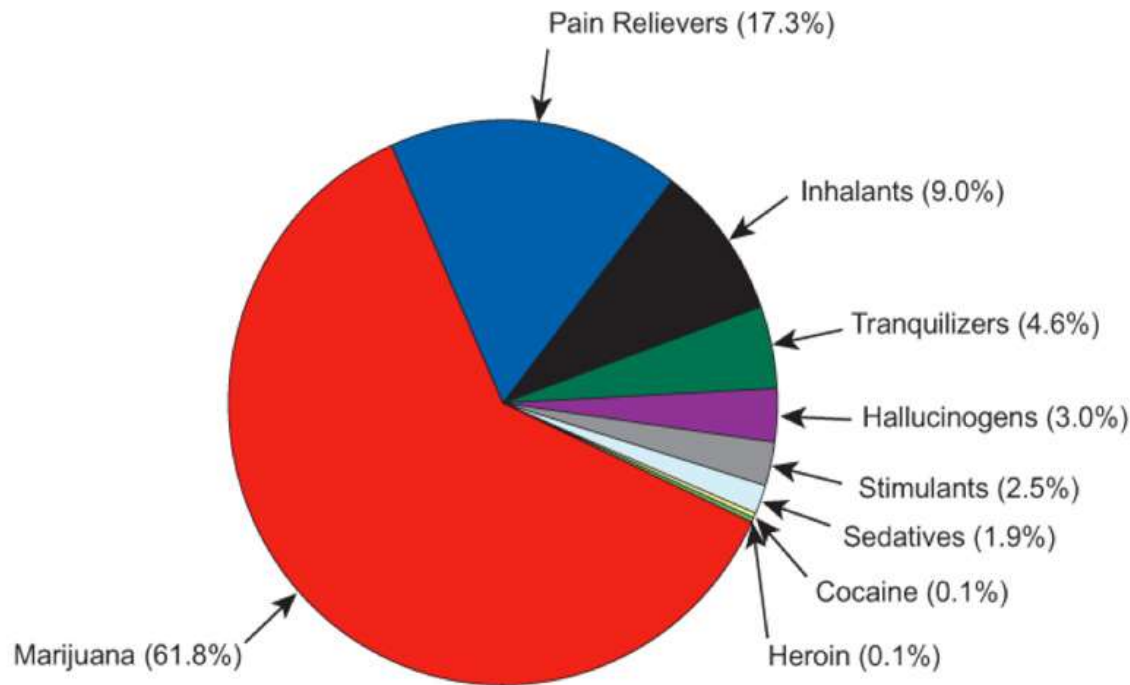
- **Drive to get high!**
 - People will seek any means to alter their state of consciousness



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Trends In Drug Use

- Treatment admissions for opiates other than heroin rose from 19,870 in 1998 to 111,251 in 2008, over a 450-percent increase

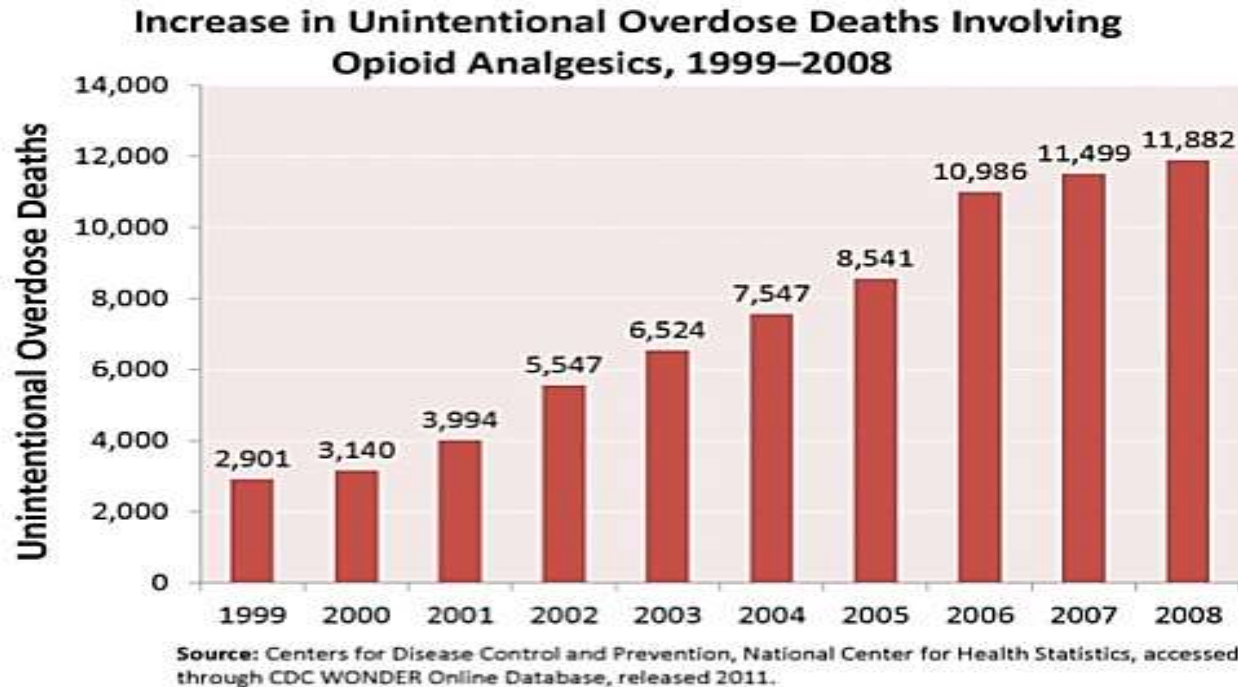


3.0 Million Initiates of Illicit Drugs



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Trends In Drug Use

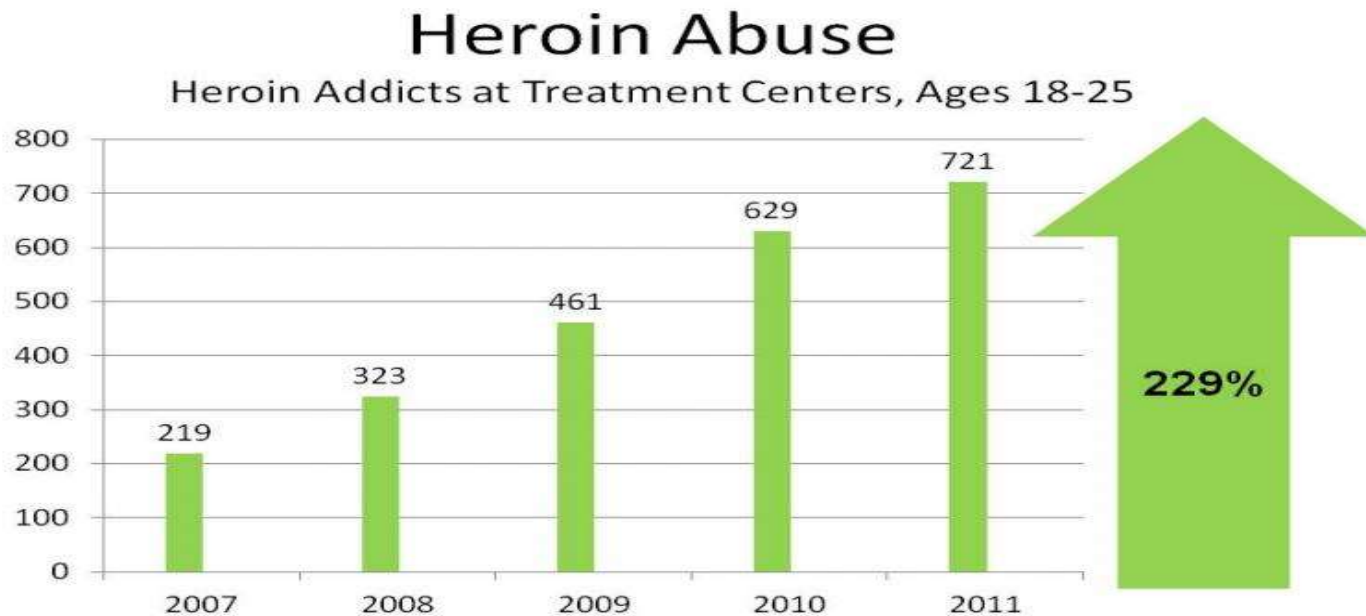


80% of the world's supply of opioid analgesics are consumed in the U.S, but we only have 5% of the world's population



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Trends In Drug Use



Source: County Health and Human Services Agency

California - Oxy abusers turning to heroin in San Diego County



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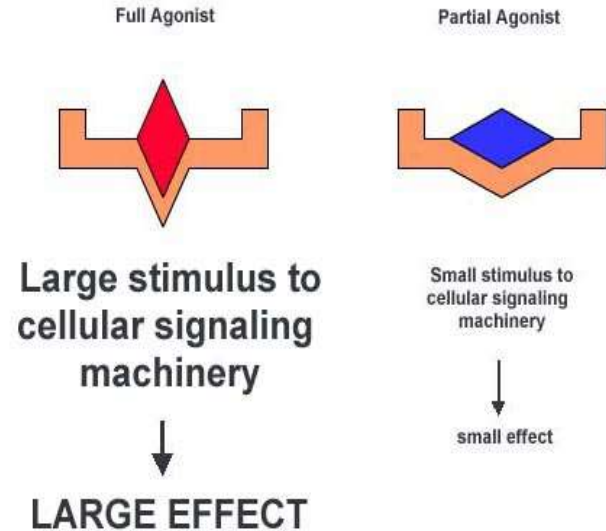
Designer Drugs

- Created (or reformulated, if the drug already existed) to get around existing drug laws (Controlled Substance Act in the USA, TGA Poisons Act Aust.), usually by modifying the molecular structures of existing drugs to varying degrees.
- What drives the production of designer drugs?
 - Consumer preferences
 - Law enforcement control



Designer Drugs

An agonist is a chemical that binds to a receptor and triggers a response – often mimicking the action of a naturally occurring substance.



Designer Drugs

- **Why Change the Key?**

- Prolong the effect of the drug
- Increase the potency of the drug
- “Select” the desired effect
- Make the drug more difficult to detect
- Avoid patent infringement
- Make an illegal drug “legal”



Spice/K2

- **No!**
**We are not
talking about
this!**



Spice / K2 / Kronik

- We are talking about this!



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Spice/K2 – Usage

- Commonly used in the mining industry as many mines still don't test for it yet, despite the fact that accurate, reliable tests **do** exist now.
- 2009 Survey in Frankfurt
 - Surveyed 1463 students aged between 15 and 18 at schools providing general and vocational training.
 - Prevalence of use was 6% of respondents reported using Spice at least once
- National Poison Data System in 2010 (Aurora, CO)
 - During the 9 month study period, there were 1898 exposures reported with a mean age of 22.5 years old
 - Most cases reported were in men.
- Community Epidemiologic Work Group (CEWG) noted K2 epidemic in Midwest US in 2010
- Appears to be shifting from marijuana to synthetic



Spice/K2

Listed Ingredients

- *Canavalia rosea*: beach bean or bay bean
- *Nymphaea caerulea*: Blue Egyptian water lily
- *Scutellaria nana*: Dwarf skullcap
- *Pedicularis densiflora*: Indian warrior
- *Leonotis leonurus*: Lion's Tail and Wild Dagga
 - Cannabis – like effect
- *Zornia latifolia*: is a perennial herb
- *Nelumbo nucifera*: Lotus
- *Leonurus sibiricus*: Honeyweed or Siberian motherwort
- Vanilla
- Honey



Spice/K2

Synthetic Cannabinoids Timeline

- First appearance on the Internet 2004
- Europe was original target market
- By 2008 widespread in Europe
- 2008 introduced into US
- Widespread in US by late 2008 - 2009
- Late 2008 University Hospital Freiburg, Germany first analysis of incense
- First email Spring 2009
- Laboratory testing available late 2010
- March 1, 2011 classified as Schedule I substance
- 2014 – approximately 700 known synthetic cannabis metabolites



Spice / K2

- K2 or “Spice” is an illicit drug that is comprised of a mixture of herbs and spices, typically sprayed with a synthetic compound.
- The most common chemical compounds of K2 include
 - JWH-018 , JWH-073, (early days)
 - UR144,
 - 5F-PB522, PB-22,
 - WH-250
 - AM-2201, AM-1248, AM-2233
 - AB-PINACA (most recent formulations)
- K2 is often marketed in head shops, tobacco shops, or over the Internet as incense or “fake weed.”



Spice/K2

- **Street names**
 - Black Mamba,
 - Bombay Blue,
 - Cloud Nine,
 - Fake Weed,
 - Genie,
 - Spice,
 - Zohai
- **Looks like**
 - K2 is typically sold in small, silvery plastic bags of dried leaves and marketed as incense that can be smoked. It is said to resemble potpourri.
- **Methods of abuse**
 - K2 products are usually smoked in joints or pipes, but some users make it into a tea.
- **Affect on mind**
 - Psychological effects are similar to those of marijuana and include paranoia, panic attacks, and giddiness.
- **False Positives**
 - Lamotrigine (Lacmictal)



Spice / K2

K2 Symptoms/Side-Effects may include;

- Increased respiration and elevated blood pressure (reported up to 200/100-medically dangerous)
- Often the systems mimic those of THC use.
- Elevated heart rate (reported up to rate of 150-medically dangerous)
- Increased level of anxiety/agitation leading to panic attacks (possible suicide attempts)



Spice/K2

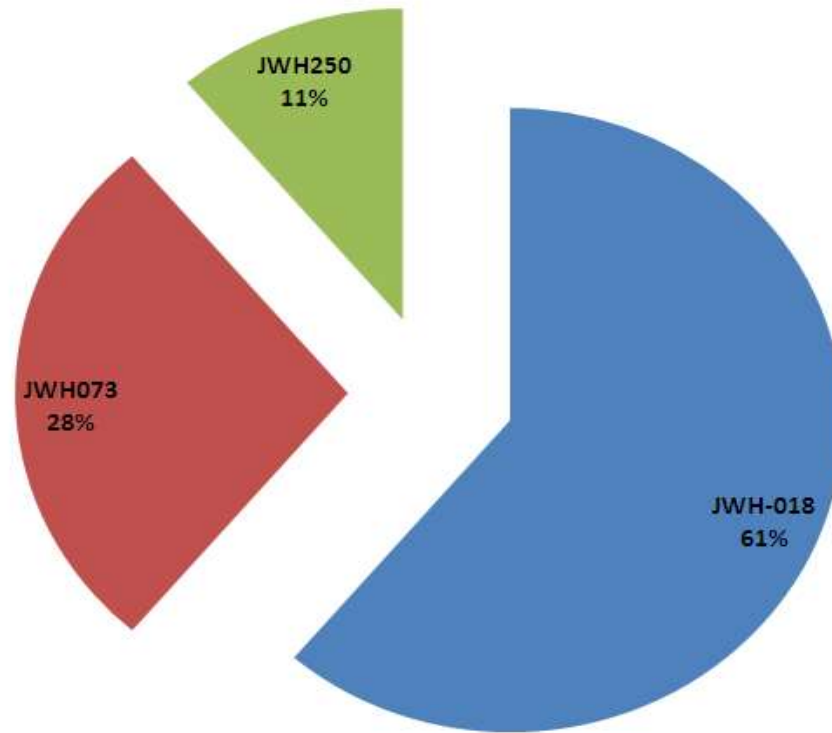
Compounds Detected

- JWH-018 N-propanoic acid
- JWH-018 5-pentanoic acid metabolite
- JWH-018 N-4-hydroxypentyl
- JWH-018 N-5-hydroxypentyl
- JWH-019 6-hydroxyhexyl
- JWH-019 5-hydroxyhexyl
- JWH-073 4-butanoic acid metabolite
- JWH-073 N-2-hydroxybutyl
- JWH-073 N-4-hydroxybutylamine
- JWH-122 N-4-hydroxypentyl
- JWH-122 N-5-hydroxypentyl
- JWH-200 6-hydroxyindole
- JWH-210 N-(5-carboxypentyl) metabolite
C₂₆H₂₅NO₃
- JWH-398 N-pentanoic acid metabolite
- MAM2201 N-pentanoic acid metabolite
- RCS-4 N-(5-carboxypentyl) metabolite
C₂₁H₂₁NO₄



Spice/K2

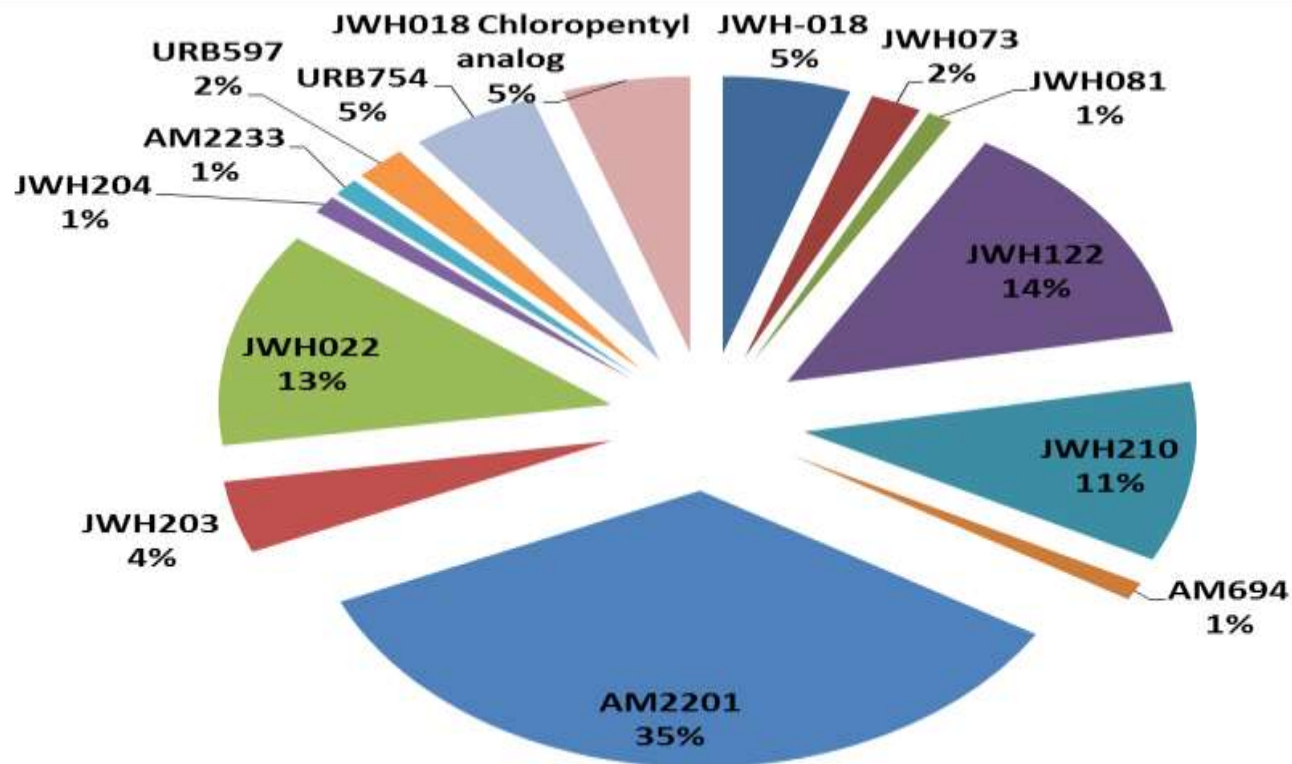
Chemical Prevalence: July – December 2010



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Spice/K2

Chemical Prevalence: Jan – March 2012



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Spice / K2 / Kronic

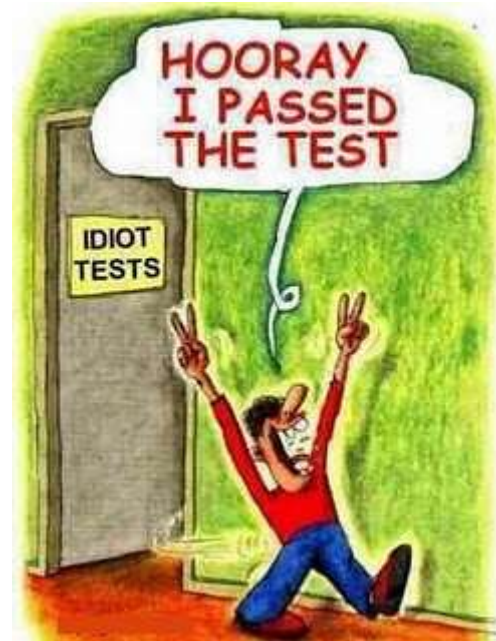
- 1.2% of Australians aged 14 years or older (about 230,000 people) had used synthetic cannabis in 2013.
- An online study recently conducted in 2012 found that of the people who use the drug:
 - The median age is 27 years
 - 70% are male
 - 78% are employed
 - 7% use daily
- According to Australian data from the Global Drug Survey, synthetic cannabis was the 20th most commonly used drug – 4.1% of respondents had used this type of drug in the last 12 months.



Spice/K2 - Drug Testing

Where Do We Go From Here?

- New on-site, rapid, instant tests
 - Difficult to keep up with the ever increasing number of new compounds although many are picked up indirectly through cross reactivity
 - Hard to develop perfect test due to ever changing compounds
 - Difficult to find one antibody which will detect all, moving forward may require 2/3 test lines for specific metabolites similar to Amphetamines
- Numerous laboratories employing LC/MS/MS technology
- \$\$\$ per sample
- Many unknowns regarding testing
 - Oral Fluid Test challenging due to number of compounds and choosing antibody to detect correct drug/s.



GHB

- What is GHB
 - GHB (gamma hydroxybutyrate) is in the class of drugs known as “club drugs.”
 - Central nervous system depressant that was originally developed as a sleep aid
 - Produces sedative/hypnotic-like symptoms.
- What does GHB look like?
 - GHB can be sold as a clear liquid,
 - White powder, tablet or capsule.
 - Colourless, odourless and has a salty taste that is virtually undetectable if diluted with liquid.
 - Usually mixed with beverages such as water, alcohol and juice.
- How is GHB used?
 - GHB is commonly abused as a recreational drug in the club scene.
 - Used by body builders to stimulate muscle growth.
 - GHB is sometimes referred to as the “date rape drug” because it can be slipped into someone’s drink without detection.
- Other Names
 - G, fantasy, grievous bodily harm (GBH), liquid ecstasy, liquid E, liquid X, Georgia Home Boy, soap, scoop, cherry meth, blue nitro.



GHB

- Effects of GHB
 - Begin 10 to 20 minutes after the drug is taken and can last 3 to 6 hours, depending on the dosage.
- Physical effects include:
 - Nausea, loss of muscle control and difficulty breathing (if used with other drugs such as alcohol)
 - Tremors
 - Sweating
 - Slurred speech
 - Headaches
- Psychological effects include:
 - Relaxation
 - Euphoria
 - Increased/Relieved anxiety
 - Insomnia
 - Difficulty thinking
 - Hallucinations
 - Amnesia
- Long-term effects include:
 - Dependence
 - Withdrawal symptoms



GHB

- Consequences of GHB
 - Large doses of GHB can result in sedative effects that induce sleep and eventually coma or death.
 - Chronic use of GHB can result in severe GHB dependence and prolonged withdrawal symptoms.
- The short half-life of GHB means it's very hard to detect – by the time a person presents to the ED they have metabolised it to levels that are virtually undetectable.



GHB

- **National**

- 0.9% of Australians aged 14 years and over have used GHB one or more times in their life.

- **Victoria**

- The number of GHB ambulance attendances in 2012/13 increased by 42% (up to 578 attendances) in metropolitan Melbourne and 3% (42) in regional Victoria from the previous year.

- **Young people**

- Young Australians (aged 14–24) first try GHB at 20.1 years on average



Fentanyl

Available forms: Buccal tablets, injection, lozenges (lollipops) and transdermal patches

Street Names: Apache, China Girl, China White, Dance Fever, Friend, Goodfella, Jackpot, Murder 8, TNT and Tango and Cash

Intoxication Effects

Sedation/drowsiness, reduced anxiety, feelings of well-being, lowered inhibitions, slurred speech, poor concentration, confusion, dizziness, impaired coordination and memory.



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Ambien

- Prescribed as a sleep medication
- Growing Threat of Prescription Drug Abuse
- Ambien CR is crushed into a powder, referred to as the "preferred" party enhancer
- Tasteless and has the added effect of memory loss
- Detected in urine for up to 60 hours



Ambien

- Ambien (Zolpidem) in the news:
 - Former NFL star Darren Sharper has surrendered to Los Angeles police on a fugitive warrant charging him with two counts of rape in New Orleans.
 - In all of the alleged instances, Sharper is accused of drugging his victims with the sleep-inducing drug Ambien, then having sex with them as they lay defenseless.
 - Sharper has pleaded not guilty and remains in jail pending a preliminary hearing September 16th



Ketamine

- Ketamine is a dissociative anesthetic, mostly used in veterinary practice.
- Ketamine is usually snorted or injected intramuscularly
- Ketamine is a dissociative anesthetic, so called because it distorts perceptions of sight and sound and produces feelings of detachment from the environment and self.
- Ketamine acts on a type of glutamate receptor (NMDA receptor) to produce its effects, which are similar to those of the drug PCP.
- Low-dose intoxication results in impaired attention, learning ability, and memory. At higher doses, ketamine can cause dreamlike states and hallucinations; and at higher doses still, ketamine can cause delirium and amnesia.



Methoxetamine

- Access via the internet
- “Legal ketamine” – ketamine analog
- Discovered in 2010
- Acts in 10 -15 minutes but can take 60 – 90 minutes
- Similar to ketamine effects, but are more intense and longer lasting
- Main Effects
 - Feelings of euphoria, warmth, ‘enlightenment’ and being detached from the world around.
 - Hallucinations – seeing and/or hearing things that aren’t there.
 - Feeling restless and on edge, and some people feel like they have extra energy.



Piperazine

- Piperazine class of drug that was originally used to fight parasitic infections.
- Still used as a pig wormer. Some piperazines are also used as tranquilizers.
- Biggest use is recreational.
- Amphetamine like – originally developed as an anthelmintic
- BZP, TMFPP – “legal ecstasy”



Dextromethorphan (DXM)

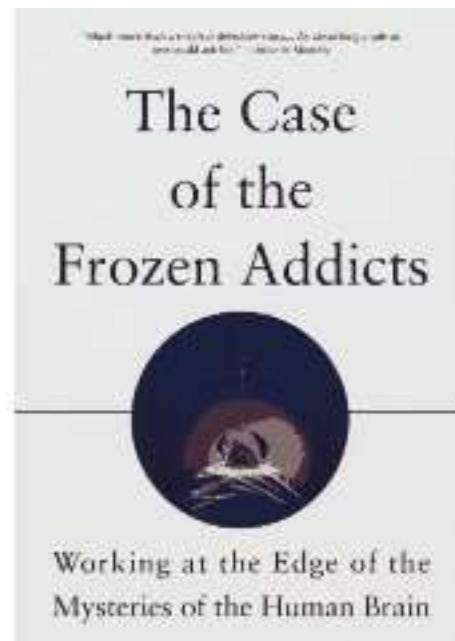
- Also called ROBO Tripping
- Synthetic substance most commonly found in a variety of over-the-counter (OTC) medicine
- Within the past few years, reports of illicit use and abuse of DXM have risen
- DXM is a dissociative anesthetic that at high doses can create powerful psychedelic effects
- Effects generally last for 6 hours



Synthetic Pethidine

Case of the Frozen Addicts

- Pethidine (Demerol, Meperidine)
- 1980s, young people started showing up in San Francisco hospitals with symptoms of shaking and muscle rigidity which looked like Parkinsons Disease
- Cases were traced back to an East Coast chemistry graduate student who had been trying to synthesize MPPP to prepare "Synthetic Heroin"
- Presence and activity of a neurotoxic by-product of illicit MPPP syntheses called MPTP
- Injection or inhalation of MPTP causes rapid onset of Parkinsonism, hence MPPP contaminated with MPTP will develop these symptoms.
- Concern over this particular neurotoxin, MPTP - discussion in Australian Therapeutic Goods Administration's *Scheduling Decisions February 2012*



Krokodil

- **Desomorphine Dihydrodesoxymorphine)** is an opiate analogue invented in 1932 in the United States that is a derivative of morphine
- Desomorphine has attracted attention in Russia due to its simple production, utilizing codeine, iodine, gasoline, paint thinner, hydrochloric acid, lighter fluid and red phosphorus.
- The street name in Russia for home-made Desomorphine made in this way is "**krokodil**" (crocodile), reportedly due to the scale-like appearance of skin of its users
- Since the mix is routinely injected immediately with little or no further purification, "Krokodil" has become notorious for producing severe tissue damage including injury to the veins (phlebitis) and gangrene. Other consequences of use have included severe withdrawal, spread of HIV through the use of contaminated needles and death.



Anabolic Steroids

Anabolic steroids (AAS's);

- Are used illegally to increase muscle, decrease fat, and enhance athletic performance and body appearance.
- Act by increasing the androgenic testosterone effects within the body.
- Lead to potentially fatal side effects. For Roid-Rage victims as well!! Fatal One-punch (Coward punches) crimes attract a mandatory 7 years now.
- Addictive, and users may go through withdrawal.
- Many different types of AAS's that have been manufactured over the past decades.
 - Testosterone
 - Androstenedione
 - Stanozolol
 - Durabolin
 - Dianabol
 - Nandrolone
- Rapid Test – Task seems simple!
 - growing number of AAS's
 - testing for anabolic steroids goes beyond looking for the specific synthetic AAS
 - needs to detect compounds naturally created by the human body, such as testosterone



Potentials on the Horizon

OXIDADO (OXI) or Rust

- Derived from Cocaine, may also contain
 - Kerosene or gasoline
 - Acetone
 - Battery Acid
 - Assorted other chemicals
- Oxi: Twice as powerful as crack cocaine
- Smoked and nearly instantaneous effect
- The majority of first-time users become addicted on their first contact with the drug. Most of them go seven to 10 days without sleeping, without eating. They start to go into a process of degeneration.
- After months of use ... they go into a state where they look like zombies, wandering ... in search of pleasure.
- In the past five years, its use has exploded and seen in large population centers of Brazil



Designer Stimulants

Sold as;

- Bath salts/Bath Bubbles
- Plant Foods/Plant vitamins
- Glass Cleaners/Pond Cleaners
- Soft Drink Additives
- “Novelty Collectors Item”



Designer Stimulants

Cases;

- A 36-year-old male in the Netherlands became acutely agitated and enraged after ingesting mephedrone along with cocaine, and subsequently lost consciousness and died despite resuscitation efforts.
- A 29-year-old male found unresponsive at a nightclub died of cerebral edema and brainstem herniation. Serum sodium was noted to be 125 mmol/L, later suggested by laboratory data to have resulted from water intoxication.
- The first synthetic cathinone-related death in the United States, described in the scientific literature, involved a 22-year-old male who was found unresponsive and subsequently died at the receiving hospital.
- One case of mephedrone-related myocarditis has also been reported in the literature. A 19-year-old male presented with crushing chest pain after ingesting mephedrone sold as “not for-human-consumption” plant food.



Designer Stimulants

Bath Salts

- Ivory Wave
- Ivory Pure
- Ivory Coast
- Purple Wave
- Vanilla Sky



Designer Stimulants

Mephedrone

- Reformulation of cathinone is a chemical found in the khat plant of Eastern Africa
Khat existence traced to 15th C. Ethiopia
- Grown in Somalia, Yemen, Kenya, Ethiopia
- Khat is banned in the U.S.



Designer Stimulants

- **Methylmethcathinone (Mephedrone)**

- Designer drug chemically similar to cathinone
- First synthesized in 1929
- Amphetamine-like properties
- Powerful synthetic stimulant
- “Rediscovered” by synthetic chemists in 2003
- Widespread in Europe, Australia, US



Designer Stimulants

What's in Bath Salts

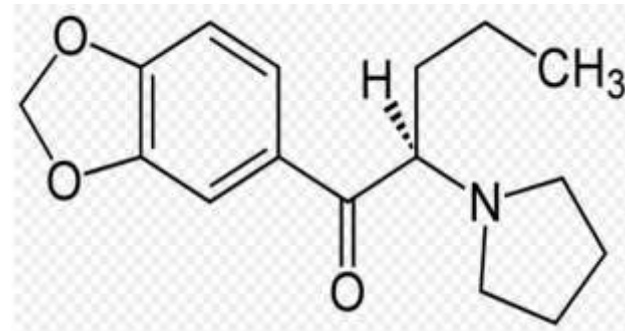
- Cathinone
 - Known for centuries
 - Active metabolite is cathine
 - Found in leaves and twigs of Khat plant (*Catha edulis*)
 - *Original synthetic cathinone is methcathinone*
 - Produced in 1928
 - Public Health hazard as per League of Nations in 1933
 - Schedule I drug in 1993
- Methylenedioxypyrovalerone (MDPV) is a psychoactive drug with stimulant properties which acts as both a norepinephrine-dopamine reuptake inhibitor (NDRI).
 - MDPV has four times the potency of Ritalin
 - MDPV - no history of FDA approved medical use
 - Sold since 2007 as a research chemical
 - *September 2011 – DEA Schedule I (mephedrone, methylone and MDPV)*



Designer Stimulants

- MDPV

- Currently popular in Europe, UK & Australia
- Is usually snorted - similar to cocaine
- Considered extremely addictive
- MDPV was "legal" - now Schedule I
- Adverse medical/psychiatric ramifications
- On-site or screening drug tests currently in development



Designer Stimulants

- **4-methylethcathinine (4-MEC)**

- Found commonly used as the active ingredient in "Ecstasy" pills in some countries such as New Zealand
- Referred to as "Molly"



Designer Stimulants

Bath Salts Usage

- UK online study of club-goers reported:
 - 41% tried methedrone
 - 10% tried methylone
 - 33% used in the last month
 - 14% used it weekly
- Blood samples from Finland were taken from 3000 drivers suspected to be under the influence
 - 286 (8.6%) had positive for bath salts

Administration – white/brown powder; capsules and tablets also available

- Oral (mouth, “bombing”)
- Intranasal (snorting, “keying”)
- Intramuscular
- Intravenous
- Rectal
- Gingival
- Inhalation via smoking



Designer Stimulants

Health Hazard?

- Bizarre behavior
- Phenomenal physical Strength
- Self mutilation
- Suicide
- Persistent paranoid psychosis
- Persistent symptoms of paresthesias and mood changes for days to weeks after using.

Ivory Wave drug implicated in death of 24-year-old man

Drug bought online as legal high following ban on mephedrone causing several hospitalisations and possibly one death

Sheriff: Scott County man high on bath salts fires 30 shots inside trailer

HALLUCINATING BOY RAN AMOK IN HOSPITAL

By Staff Reporter

The bride killed by bath salts - the new 'legal high' Ivory Wave drug that's sweeping Britain



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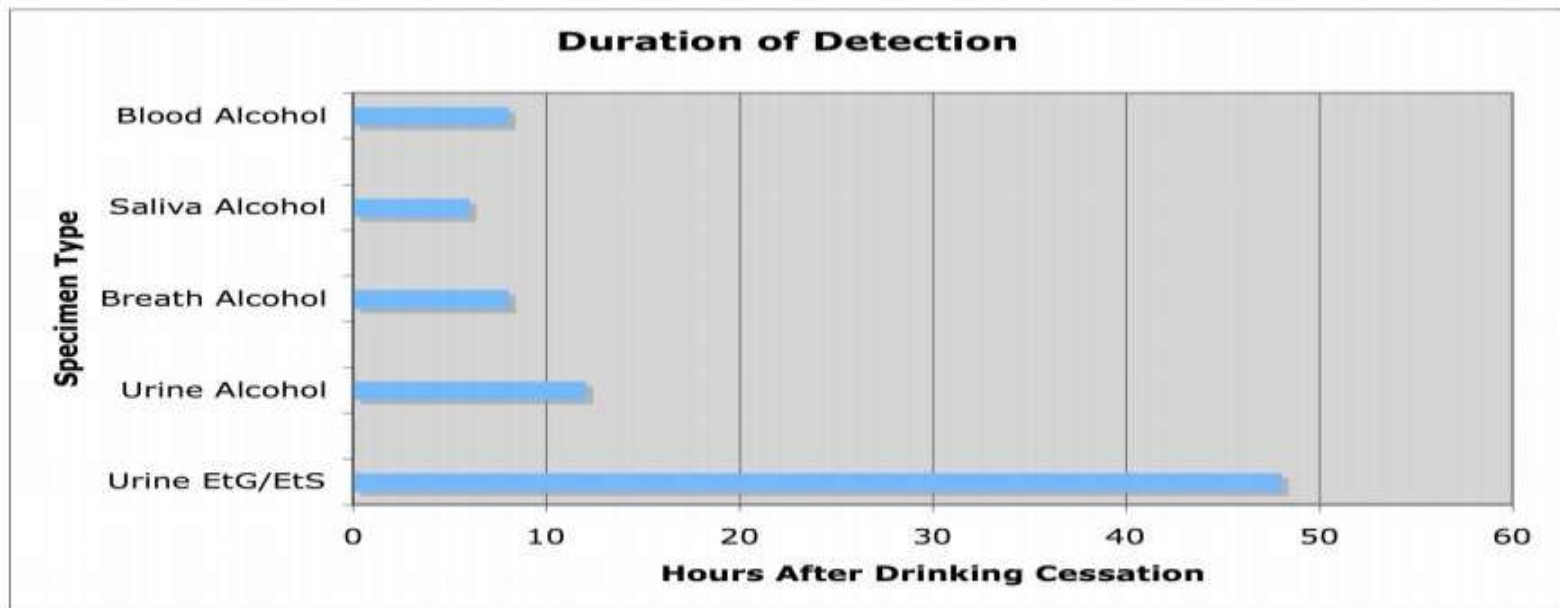
Alcohol Testing

- Short Detection Window
- Rapidly Cleared From Body
- Various Tests Available
- Detection Window
 - Breathalyzer up to 24 hours
 - Urine (traditional) 10-12 hours
 - Blood Test – 12 hours
 - Saliva – 6 – 8 hours



Alcohol Testing

Detection Window

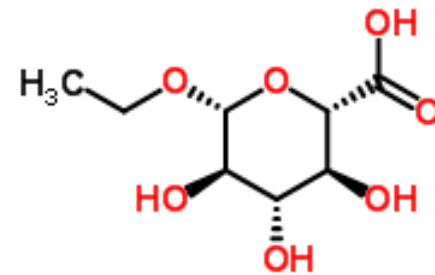


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Alcohol Testing - EtG

What is EtG

- EtG – C₈H₁₄O₇
- Metabolite of ethyl alcohol formed in the body by glucuronidation following exposure to ethanol
- Ethanol found in alcoholic beverages
- Non volatile, water soluble
- Unique Biomarker
- Detected in body fluid and hair
- Alcohol most commonly abused drug.



Why Test for EtG

- Unique Biomarker for Alcohol Use
 - Ethanol produced by the liver
- Detection window is 5 to 7 times longer than an alcohol test
- Not a test to detect for current impairment.
- Found in alcohol beverages
- EtG is not detected in the urine of abstinent subjects.
- Early warning mechanism to detect trends toward relapse



Alcohol Testing - EtG

Advantages and Disadvantages of EtG Testing

Advantages

- Abstinence monitoring tool
- Zero tolerance for abstinence monitoring
- Detects recent usage more accurately
- EtG is only evident when ethanol is ingested and not produced as a result of fermentation
- Stable in stored samples – non volatile

Longer Detection window than alcohol

Disadvantages

- Testing only available at few laboratories
- LCMS testing expensive
- Casual, inadvertent exposure to environmental alcohol
- Not a quantitative result



Alcohol Testing - EtG



- ***Worlds First and Only Rapid EtG Test***
- Remove Cap
- Dip into urine for 15 seconds
- Replace Lid
- Read Negatives – as soon as both test and control line develops
- Read Positives at 5 minutes
- Results stable for 2 hours



Alcohol Testing

EtG Rapid Test Studies

500 Clinical Samples Tested

- Positive - 48
- Negative - 444
- Compared to Commercial EIA
- Positives confirmed by LCMS
- No interference from other drugs

Beer Study

- 3 Goose Island Pale Ale – 5.9% Alcohol in one hour
- Results
 - Breathalyzer: Positive after 30 minutes up to 4.3 hours
 - Saliva Alcohol: Positive after 1 hour up to 4.3 hours
 - Urine Alcohol: Positive after 1.3 hours up to 4 hours
 - EtG: Positive after 3 hours up to 43 hours

Results		DrugCheck Rapid EtG Test		Total
		Positive	Negative	
Confirmed by EIA	Positive	48	2	50
	Negative	6	444	450
Sensitivity		96% (48/50)		
Specificity		98.67% (444/450)		



Alcohol - Trends

- Smoking Alcohol
 - Associated with teens
 - Inhaled directly into the lungs
 - Enters Bloodstream Faster
 - Lung damage and brain damage are possible because of high concentration of alcohol delivered
- Alcohol enema
- Vodka soaked gummy bears – more appealing to teenagers
- Vodka soaked tampons and butt chugging





That's all Folks!
Any Question?



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