Drugs of Abuse Across the Lifespan: Current Trends

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We Will...

• Look at stimulant vs. depressant drugs as to physiological effects
  - What are the trends of use and abuse?
• Look at abuse and misuse of prescription drugs
  - What are the trends here?
• How are drugs tested in the field?
• What do laboratory drug tests mean?
• What are common adulterants of drug tests?

Basics of Drug Law

• Controlled Substances Act
  - Schedules I to V and Rules
  - State laws cannot supersede Federal laws
• Pure Food and Drug Act
• Food, Drug and Cosmetic Act
• Prescription Drug Marketing Act
• Designer Analog Act
• Drug Addiction Treatment Act

Drugs of Abuse by Group

All Stimulants:

• Increase heart rate
• Increase blood pressure
• Increase respiration, body temp.
• Suppress appetite
• Cause euphoria
• Cause hypervigilance/paranoia
• Sensitivity to light/dilated pupils

Cocaine

• Activates the pleasure center in the brain more than any other drug
**“Cocaine Nose”**

- Hole in Soft Palate Due to Cocaine

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**Cocaine HCl**

- Not heat stable
- Often cut before sale
  - Diltiazem sometimes used
- Half to life of about 1 to 2 hours
- Elimination may take up to 4 days.
- Chest pain, anxiety, paranoia, and hallucinations
- Addiction treated with therapy; new treatments include disulfiram (Antabuse), topiramate (Topamax), and a vaccine

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**COCAINE HCl to COCAINE BASE (CRACK)**

- Cocaine HCl
- Baking Soda
- Water
- Stove/microwave
- Cooking pot/Container
- Spoon to Stir

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**Why Crack? Benefits to the Dealer**

- High is higher, faster, and wears off in 3 to 5 minutes, leaving a craving for more (smoking is fastest way to introduce a drug to the central nervous system).
- Cocaine is sold in grams (~$100). Few sellers would sell less.
- Crack brought minimum sale down to 50 mg for $10.00.
- Average addict will go through as much as 2 to 5 grams of crack a day if it is available.

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**Getting Drugs to the Central Nervous System:**

- Oral Ingestion: Swallowing the drugs in solid or liquid form. Time to effect central nervous system (CNS): 20 to 60 minutes.
- Insufflation (snorting): 3 to 5 minutes
- Intramuscular (IM) injection: 5 to 15 minutes
- Intravenous (IV) injection: 2 to 5 minutes
- Inhalation of vapor: (Smoking): 10 to 30 seconds
Smoking: the most efficient way to get a drug into the CNS....

Crack, Rock, Smoke, Wax

Trends in Cocaine/Crack
- US is the world’s largest cocaine market.
  - 36% of global consumption
  - Overall, use is on the decline

Treatment of Acute Cocaine/Crack Ingestion
- Mild overdose/ingestion—agitation, dizziness
- Severe overdose—hyperpyrexia, seizures, chest pain, dysrhythmias, stroke
  - Symptoms usually subside in 1 to 2 hours
- IV benzodiazepines may control anxiety and seizures. Diazepam also decreases BP and dysrhythmias.
  - Add phentolamine or nitroprusside if necessary for sustained high BP; hypertonic sodium bicarb may be used for prolonged QT interval
  - Supportive care such as cooling, aspirin

Cocaine Addiction
- Complete abstinence difficult to achieve; talk therapy the best
- Disulfiram shows some promise in reducing cocaine use among abusers
- Vigabatrin (Sabril)—seizure med somewhat effective in inducing abstinence...but has significant effects on vision
- Anticocaine vaccine? Stay tuned—some promising results
Synthetic Stimulants

- Do not require organic material.
- Effect is more physical than psychological.
- Lead to blood vessel erosion, heart damage, muscle deterioration, and extreme paranoia.
- Last longer than natural stimulants.

Methamphetamine

- Often referred to as the poor man's cocaine.
- Everything required to make meth can be purchased except the anhydrous ammonia.

What is Ice?

Use of Meth

- Meth is typically smoked.
- Causes the usual stimulant effects, but the high lasts longer than cocaine or crack.
- Withdrawal more severe.
- Acute violent behavior to psychosis.
- Long-term Parkinson-like effect.
- Hypertension, angina, dysrhythmias, renal failure, stroke.
- Methamphetamine Control Act of 1996.
Meth Bugs

Meth Mouth

Methamphetamine Uses and Trends
- Good news!!
- Use in the US has dropped by about 50% from 2006 to 2010.
  - Estimates at 731,000 in 2006 to 353,000 in 2010
  - Mostly related to new legislation
  - Worldwide, these drugs have increased in use.

Treatment of Methamphetamine Ingestion/Addiction
- Psychosis is more common with long term use than short term use. It resolves often upon discontinuance, but may be treated with haloperidol.
- Cardiovascular effects may be treated with phentolamine and labetalol.

Treatment of Methamphetamine Ingestion/Addiction
- Promising results in long to term treatment have been seen with the Matrix Model which combines talk therapy, family therapy, non to drug to related activities, drug testing.
  - Drugs with some success in suppressing cravings/withdrawal are bupropion and modafinil.

ECSTASY
- Methylene to dioxymethamphetamine
  - Schedule 1
  - Central Nervous Stimulant & Hallucinogen
  - High lasts 3 to 6 hours
  - Costs approx. $25 per pill
  - Avg Dose 80 to 100 mg of MDMA (plus binder)
  - Marketed with colorful designer logos targeting youth
Effects of Ecstasy

- Related to methamphetamine and mescaline
- Seizures, arrhythmias, paranoia, panic, bruxism, hyperthermia
- Permanent brain damage with long to term use
  - Due to destruction of serotinergic neurons
  - Dose to related memory impairment suspected

Treatment of Ecstasy Ingestion

- Correct hyperthermia
  - Cooling, rehydration
  - Administer Dantrolene to decrease skeletal muscle to induced heat generation and the risk of rhabdomyolysis.
- Watch for cardiac stimulation—beta blockers
- Seizure control

“Bath Salts”

- Contain stimulant compounds
  - 3,4 to methylenedioxypyrovalerone (MDPV)
  - 4 to methylmethcathinone (Mephedrone)

“Bath Salts”

- Have effects similar to meth, cocaine, and ecstasy
Marketing of Bath Salts

- Always packaged “Not for human use/consumption” to sidestep laws
- Sold as plant food, decorative sand, or toy cleaner
- Mephedrone is a designer drug—a derivative of cathinone, from the plant khat

Delivery

- Smoked
- Snorted—minutes to onset, 30 minute duration
- Injected
- Inserted rectally
- Wrapped in paper and ingested (“bombed”)—20 min onset, 2 to 4 hour duration

Pharmacology of Bath Salts

- Intense cravings similar to meth
- Increases brain dopamine similar to meth
- Increases brain serotonin similar to ecstasy
- Damages brain’s ability to respond to serotonin with repeat use similar to ecstasy
- Causes hyperthermia similar to both meth and ecstasy

Outcomes of Effects

- Stimulation—increased alertness, euphoria, elevated mood, “rush”, feelings of sociability and closeness, mild sexual arousal
- Tremor, shortness of breath, loss of appetite, nose bleeds, throat irritation
- Tachycardia, chest tightness, hypertension
- Anxiety, agitation, hallucinations, paranoia
  - High to dose benzodiazepines (BZDs) and cardiovascular (CV) management

Dangers of Bath Salts

- Users perceive a better high than cocaine, regardless of route of administration.
- More addictive after snorting than by the per os (PO) route
- Web-based information and low price has made access to these drugs easy.
Trends in Bath Salts

• In wake of increased calls to poison control centers and presentations to EDs, the DEA has banned mephedrone, MDPV, and methylene.
• The ban will likely be expanded as more drugs are marketed as bath salts—designer analogs.
• Makes these substances Schedule 1 controlled substances

Treatment of Bath Salts Ingestion

• Key systems to monitor!
  • CV
    • Watch for dysrhythmias, hypertension: beta blockers, benzodiazepines to treat
  • Neuro
    • Paranoia, agitation, seizures, hostility: antipsychotics, sedatives to treat

Sedative Drugs

• Marijuana
• Alcohol
• Inhalants
• Opiates
• Sedatives

Effects of CNS Depressants/Sedatives

• Alcohol, Marijuana, Opiates, GHB (Roofies), Benzodiazepines, Barbiturates
• Hypotension
• Decreased heart rate (EXCEPT FOR MARIJUANA)
• Sedation
• In SFST, failure of all three aspects of test
• Synergistic effects when used together

Alcohol—The Most Widely Abused Drug

Deaths Due to Alcohol by County
Alcohol Use in the Older Population

- Alcohol is the most commonly used recreational drug in older adults. Among 40,556 U.S. adults age 60 years and older, 52.8% of men and 37.2% of women were current drinkers.

- A safe amount of alcohol intake for individuals over age 65 would be no more than seven drinks per week and no more than four at one sitting for both men and women.

Alcohol Plus.....

- In a survey of 83,321 older outpatients, 19% of those taking prescription medications known to adversely interact with alcohol reported concomitant alcohol use.

Alcohol-Related Dementia

- Deficits in abstracting abilities, short-term memory, executive control
  - This is in contrast to Alzheimer’s disease, in which word-finding ability is hampered; there is profound memory loss, and recognition and recall are affected.

- With abstinence, physical and mental function do NOT continue to deteriorate (as they do in Alzheimer’s).

- However, alcohol-related dementia may contribute to worsening of Alzheimer’s.

Trends in Alcohol Use

- Teens: Use has normalized but trends are still disturbing.
  - 62% report having their first full drink by age 15;
  - 25% say they have had a drink by age 12 or younger

- Age of first drink is strong indicator of dependence
  - >40% of those who drank by age 14 developed alcohol dependence

News in Alcohol Treatment

- Drugs for the Withdrawing Patient:
  - BZDs that have a long half-life—chlordiazepoxide, diazepam, oxazepam, and lorazepam. PRN administration allows for withdrawal to progress faster.

- Adjunctive drugs include:
  - Carbamazepine—reduces risk of seizures
  - Clonidine—suppresses autonomic component of withdrawal
  - Beta blockers—as above, plus decrease cravings
News in Alcohol Treatment

• Drugs for Abstinence:
  • Disulfiram: Aversion therapy, causes acetaldehyde syndrome when alcohol is ingested (nausea, vomiting, chest pain, palpitations, blurred vision, hypotension. May even cause death!). Patient selection is key, as is education. Initial dose is 500 mg taken 12 hours after last drink, then for 1 to 2 weeks.Maintenance dose is 125 to 500 mg/day.

News in Alcohol Treatment

• Drugs for Abstinence
  • Naltrexone—the most effective agent; opioid antagonist that blocks pleasurable effects of alcohol and cravings. Works best with counseling, support. 2 formulations: 50 to mg tablets for PO use (ReVia) and IM depot injection (Vivitrol—380 mg once per month).

News in Alcohol Treatment

• Drugs for Abstinence
  • Acamprosate—reduces unpleasant feelings of alcohol abstinence. Works best with talk therapy. May enhance GABA and decrease glutamate in the CNS, but MOA is uncertain. Dosing is 2 333 to mg tablets with meals, 3 times/day.

News in Alcohol Treatment

• Other Drugs for Abstinence
  • Topiramate—may take 6 weeks for benefits to develop, but users drink less. Start with 25 mg dose at bedtime, building to 200 mg over several weeks. Patients may start this drug while still drinking, and this is an advantage.

News in Alcohol Treatment

• Other Drugs for Abstinence
  • Ondansetron—early trials indicate usefulness in those who have early to onset alcoholism (before age 25). Persons with the genotype 5 to HTTLPR polymorphism derived the most benefit. Most effective dose was 4 mg/kg twice a day. New black box warning for this drug—avoid use in patients with long QT syndrome.
**Effects are Dose-Dependent**

- Causes three effects on the brain: Euphoria, sedation, and hallucinations.

  Low-moderate dose: Euphoria, relaxation, appetite stimulation, impairment of short to term memory, impairment of driving skills, depersonalization.

- High dose: Hallucinations, paranoia, delusions.

**Where Does it Work in the Brain?**

**Cannabinoid Receptor Sites**

- Basal Ganglia
- Hippocampus
- Cerebellum

**How Marijuana is Used**

- **Cigarette**—also called a joint, dried marijuana buds are rolled into a cigarette. Approximately 60 percent of the THC is transferred into the body when smoking a joint.

- **Cigar**—some users slice open a cigar, remove the tobacco and refill it with marijuana. The marijuana to filled cigar is often called a blunt.

**Problematic Volume of Distribution**

- Marijuana doesn’t follow the rules with respect to distribution and elimination of drugs:
  - Distributed to adipose tissue
  - Pregnancy affects retention and excretion patterns
  - Retained differently by a chronic user
  - Tolerance to impairing effects with chronic use
  - Quality control issues relative to THC content
  - Huestis Models are always cited

**How Marijuana is Used**

- **Pipe**—about 40 percent to 50 percent of the THC is transferred into the body when using a pipe.

- **Bong**—these are water pipes that typically have a long tube rising out of a bowl to shaped base. Water pipes trap the smoke until it’s inhaled, raising the amount of THC taken in.

**How Marijuana is Used**

- **Food**—marijuana is sometimes baked into foods, such as brownies, or brewed as tea. About 6 to 20% of THC gets into the body after oral use.
Use Patterns and Trends
• Marijuana use is on the rise
  • Among 18 to 25 year olds, have seen a 2% increase in the past year
  • In younger teens a big increase—from 32 to 39%
  • Attributable to medical marijuana? Diversion of medical marijuana is proving to be a big problem.
• Overall incidence in the US is up 3 million from 14.4 million to 17.4 million stating regular use in the past year

Marijuana Use in the US

Cannabis Use in the Elderly
• May cause a protracted impairment even after discontinuance and years of abstinence
• Attention and short to term memory may be especially affected
  • These are most affected acutely as well, as is executive function

Clinical Use of Cannabis
• Dronabinol (Marinol), and nabilone (Cesamet) may be used clinically for the suppression of emesis.
  • Both THC derivatives
  • Used to suppress N/V from cancer chemo
  • Dronabinol is CSIII; nabilone is CSII
  • Dronabinol is approved to increase appetite in patients with AIDS.
  • Though these drugs may reduce spasticity and pain of multiple sclerosis, these are not yet approved in US for this use.
  • Glaucoma is not an approved use

Clinical Use of Cannabis— "Spice,” K2
• Marketed as ‘legal’ herbal smoking blends, but found to be synthetic compounds with psychotropic effects
• Poison control and ED visits have been in the thousands over the past 2 years related to these compounds
• Readily accessible via the internet, have been sold in head shops, tobacco shops, gas stations, convenience stores, etc.
Effects of Synthetic Cannabinoids

- Agitation, anxiety, vomiting, tachycardia, hypertension, seizures, hallucinations, non to responsiveness
- Withdrawal syndromes, dependence similar to cannabis
- Several of these compounds are now Schedule 1 CS

In Most of the US...

- Law enforcement agencies may seize spice and K2 from stores (or individuals) selling these compounds.
- Currently, possession, sale, or manufacture of these compounds in most states is illegal.

Treatment for Spice Ingestion

- Focus is mainly on management of anxiety, seizures, agitation.
  - BZDs appear to be drugs of choice here; Haloperidol has also been used in extremely agitated patients
  - Control of blood pressure with beta blockers

Inhalants

- Inhalants are sniffed, snorted, or placed in bags and breathed in to achieve a “high.”
- Common household products such as glue, lighter fluid, paint, and cleaning fluids are the most abused. Gas, nail polish remover, anesthetics and spray paint may also be used. ALL are dangerous.
Inhalant Effects
• Users of inhalants feel headache, nausea, slurred speech, disinhibition and loss of motor coordination.
• Overdose effects include damage to the heart, lungs, liver, kidneys, and brain. DEATH may occur from a SINGLE use.

Facts About Inhalant Abuse
• About 20% of 8th graders have abused inhalants.
• Sudden death from inhalant use is due to cardiac arrhythmia.
• Inhalants are the third most popular drug among teens trying drugs for the first time, after marijuana and prescription drugs.

Common Inhalants

Other Inhalants of Interest
• Nitrous oxide
  • Laughing gas
  • Available in small cylinders to provide aeration for whipping cream
• Volatile nitrates—amyl, butyl, isobutyl, and cyclohexyl
  • Available as drugs, room deodorizers, or drugs of abuse
  • Used mostly by males for vasodilatory effects
  • “Poppers,” “Snappers”

Inhalant Trends
• Good news! Inhalant use is DOWN from 4.4 percent to 3.9 percent.
• Teens trying inhalants for the first time was about 2.1 percent
• Education, parental involvement contribute to the downturn
• Gasoline, lighter fluid, glue, shoe polish, spray paint, correction and cleaning fluids, degreasers, nitrates

Treatment for Inhalant Ingestion
• Supportive care
• Stabilization of vital signs
Trends in Prescription Drug Abuse
• In Teens: 25% report taking a prescription drug not prescribed for them at least once; 23% report taking a prescription pain reliever not prescribed for them.
• In the Elderly: In the past 10 years, hospital admits for prescription drug and illicit drug use rose 96% in patients 65 to 84.
  - Delirium and dementia

With Respect to Costs...
• Prescription drug abuse accounts for 1 million ED visits/year
  Equal to the number due to illegal drugs
• 60% of hospital costs related to opioid overdoses are paid for with public funds
• What to do?

Trends in Opiates
• Prescriptions for hydrocodone/acetaminophen have increased to 131 million in 2011.
• US consumes 80% of the world’s opioids and 99% of the world’s hydrocodone.
• Accidental overdoses of Rx opiates kill more people in 17 states than do car accidents.
• Males are 1.5 times more likely to become addicted.

Opiates: Heroin, Morphine, Hydrocodone, Oxycodone
• True Narcotics come from raw opium or a synthetic opiate.
• Depress all functions of the Central Nervous System, reduce pulse, blood pressure, temperature, and consciousness.
• Overdose can be fatal due to respiratory depression.
• Withdrawal produces extreme symptoms, but is rarely fatal.
Risk Evaluation and Mitigation Strategies
• REMS is being proffered as a way to decrease the risks associated with long to term opiate use/abuse
  • Morphine, morphine SR, hydromorphone ER, methadone, oxycodone CR, oxymorphone ER, transdermal fentanyl and transdermal buprenorphine, and morphine/naltrexone ER
  • IR products are exempt for now due to lower doses
• Drug companies would have to pay to educate prescribers.

Will REMS Work?
• FDA is asking that the training be mandatory for anyone with a DEA number
• Advantages? OBVIOUS!
• Disadvantages? OBVIOUS!
  • Though most prescribers are on board with the idea, the fear is that other drugs will be “switched to”

Judicious Prescribing is Key
• Over to prescribing may be at the heart of the problem...especially with respect to opiates
  • Opiates are for chronic pain.
  • Opiates are NOT pm medications!
  • It is acceptable to prescribe “just a few” for patients with minor pain, a minor procedure.
  • Consider a non-opiate

Trends to Reduce Opiate Abuse
• Attempts to make them “abuse-proof”
  • Acurox—(oxycodone) crumbles into chunks instead of powder, making injection difficult; sudes when mixed with water; irritating when inhaled—quite successful
  • Remoxy (gelatinous oxycodone)—cannot be crushed, chewed or drawn into a syringe

Trends to Reduce Opiate Abuse
• Tightened controls for hydrocodone?
  • Schedule III to Schedule II?
  • Still in the consideration stage....
• Increased buprenorphine (suboxone) treatment
  • Prescribers can receive a waiver to treat up to 100 patients for opiate addiction with Suboxone.
  • More preparations that are opiate to only, with no acetaminophen

News About Illegal Opiates
• High-purity heroin is now available in the US
  • About $10/bag; imported from Mexico
• Purity level is between 50 to 80%
  • Asian heroin is about 5% pure
• Heroin deaths are up 20.3% in the past 2 years
Treatment for Acute Opiate Overdose/Toxicity

- Naloxone is the drug of choice (IV, IM, subcutaneous)
- Titrate dose in the addict so as not to induce withdrawal
- Re-administer every few hours until opiate levels are in the nontoxic range.
  - 0.4 mg for adults in two to three min intervals at first; additional doses at one to two hours for up to 72 hours, if needed

Drugs for Detox of the Opioid to Addicted Patient

- Methadone—substitution to prevent abstinence syndrome. Patient is weaned over 10 days. Determine dosage by patient observation of withdrawal symptoms.
- Buprenorphine—agonist to antagonist used as a substitute, then patient is weaned.
- Clonidine—alpha-2 agonist that gives symptomatic relief. Does not suppress cravings.

Management of Opioid Addiction

- 3 strategies:
  - Substitute one opioid for another—methadone most often used.
  - Use of opioid agonist to antagonist—buprenorphine most often used.
  - Use of opioid antagonists—naltrexone most often used.

Management of Opioid Addiction

- Methadone (Methadose)
  - Maintenance—once to a to day PO dosing from approved SAMHSA prescriber. Goal is to reduce dependence on illicit drugs.
  - Suppression—goal is to prevent opioid induced euphoria. Here, increasing doses of methadone are given until a top dose of 120 mg/day is reached. Again, the drive to seek out illicit opioids will be reduced.

Management of Opioid Addiction

- Buprenorphine (Subutex, Suboxone)
  - Partial agonist at mu receptors, full agonist at kappa receptors—creates an induction phase
  - Decreases cravings reduces use of illicit opioids, increases retention in programs
  - Prescribers must register with SAMHSA and receive 8 hours of training
    - Treatment starts with Subutex, then switches to Suboxone, which contains naloxone to discourage IV use.
    - Probuphine is a six to month subdermal implant.

Management of Opioid Addiction

- Naltrexone (ReVia, Vivitrol)
  - Blocks all opioid effects, so reinforcing properties of the drugs are lost
  - No training or certification required
  - ReVia is PO and dosed once per day; Vivitrol is IM and dosed once per month
Sedatives
• Alprazolam (Xanax) and diazepam (Valium)—used to treat insomnia and anxiety, abused by the general population, cocaine and heroin users most often. When combined with alcohol, the use of these drugs is greatly impairing. Schedule IV controlled substance.
• Rohypnol and GHB are BZD analogs that are used as date rape drugs
  • Conscious sedation is the goal
  • “Appealing” due to the amnesia these drugs cause

For BZD Overdose....
• Flumazenil (Romazicon) may be used
• Abstinence syndrome may be mitigated by slow withdrawal over a period of months

Stimulants
• Ritalin, Concerta, and Adderall
  • These are stimulant drugs used to treat attention deficit hyperactivity disorder (ADHD). They can cause heart palpitations, agitation, epistaxis, mood swings, and high blood pressure. Heart damage and SUDDEN DEATH are associated with overdose. All are Schedule II controlled substances.

Stimulant Use

Effects of Short-Term Use
• Elevated blood pressure
• Increased heart rate
• Increased respiration
• Suppressed appetite
• Sleep deprivation
• Dilated pupil
• A “wearing off” effect as short to term drugs stop working. This can be lessened with caffeine (Mountain Dew, coffee, energy drink).
Effects of Long-Term Use

- Potential for physical dependence and addiction
- Stimulants have many “desirable” gains...increased alertness, attention, weight loss.
- Euphoric feelings are most intense when the user snorts or injects the drug.
- Increased risk for cardiovascular effects, seizures, paranoia, hostility, agitation

A Brief History...

- ADHD was once called Minimal Brain. Dysfunction before it was “reclassified”
- ADD vs. ADHD
- Methylphenidate was a drug looking for a disorder.
- Guess which nation consumes 85% of the world’s Methylphenidate?

Who Takes the Most Ritalin?

Who Takes the Most Ritalin?

United States Tops World Consumption of Ritalin

United States

- 15% of world population
- 85% world use
- 95% United States

Ritalin Use

The United States, with less than 5 percent of the world’s population, accounts for 85 percent of the world’s consumption of Ritalin.

[Diagram showing United States consumption]

Ritalin as a Drug of Abuse

- Ritalin prescriptions have increased 1000% over the past decade.
- Ritalin is the most stolen controlled substance in the US.
  - Sold for about $10/pill on average.
- Permanent lung damage can result from injected Ritalin.
- Loss of nasal cartilage and nose bleeds are seen with snorted Ritalin.

Federal Classification and Penalties

- Many stimulants are Schedule II
  - Schedule II drugs must have a written prescription to be refilled.
  - One to month supply only
  - Class A felony for illicit trading in these drugs

Strattera is an exception—it is a non-controlled substance.

Trends in Prescription Stimulants

- As many as 22% of adults fake symptoms to get prescription stimulants.
- Most people use stimulants for medical reasons.
  - But...what are the reasons?
  - If they are diverted, it is usually to “stay awake” or to “boost performance.”
**Stimulant Addiction/Overdose**

- Symptoms of abstinence include fatigue, depression, eating, and cravings
- Sleep patterns take months to normalize.
- Symptoms of psychosis, if present, resolve within a week...unless latent schizophrenia is unmasked by abuse of these drugs.
- Hallucinations due to overdose may be controlled with chlorpromazine; seizures controlled with diazepam; HTN controlled with phentolamine.

**What’s New?**

- "Legal X"—benzylpiperazines
  - Structural analogs of ecstasy with similar effects
  - Structurally unique; not covered by the Designer Analog Act
- Isobaric compounds that are congeners of crystal meth
- SSRI/SNRI analogs
- Phenylketones
- Bath salt analogs
- Spice analogs

**Driving Under the Influence of Drugs**

- It has been predicted that within the next decade, the number of drug related DUI arrests will equal or exceed the number of alcohol related DWI arrests.

**Drug Testing**

*In the Field, In the Lab*

**Field Sobriety Testing**

- Horizontal Gaze Nystagmus: If the individual has HGN they are impaired. Depressants cause this—alcohol, sedatives
  - VGN more useful for stimulant drugs—cocaine, meth
- Walk to and to turn
- One to leg stand
  - Devised by physicians and pharmacologists to test responses to psychotropic drugs

**In the Field...What Do These Tests Mean?**

- BrAC
- Pupil size, reactivity, evenness
- HGN, VGN, lack of ocular convergence
  - Depressants, inhalants, dissociatives, cannabis all cause lack of convergence
- Pulse
  - Elevated with cannabis, stimulants; decreased with alcohol, other sedatives
Drugs Included in the Drug Test

- Alcohol
- Cannabinoids
- Amphetamines
- Cocaine
- Phencyclidine
- Methadone
- Opiates
- Methaqualone
- Barbiturates
- Benzodiazepines
- Propoxyphene

Drug Testing

- Step one—Collection of Sample
  - Urine vs. blood vs. saliva
  - Urine considered the best due to ease of collection and the highest presence of metabolites. Blood and saliva have more parent compound, so may be more useful for establishing time of use.

Drug Testing

- Step one—collection of Sample
  - Comparing blood to urine can give a ratio of parent drug to metabolites. This can be used to determine a time of drug ingestion.
  - Sweat testing may be done over a longer course to determine use over an extended period of time. The sweat test does not correlate with impairment.

Urine Parameters

- Temperature—between 90.5 to 98.9 (34 to 36.5 °C within one minute of voiding)
- Specific gravity—between 1.005 and 1.030
- pH—between 4 and 10
- Creatinine—between 20 to 400 ng/dl
  - Specimen is considered dilute if creatinine is <20 ng/dl and specific gravity is <1.003
  - Salt increases SG; bleach, vinegar, soap, detergent, acid alter pH.
- Eyedrops, Urine Luck, Whizzies, UrinAid, Klear all escape routine testing.

Drug Testing

- Step Two—ImmunoAssay
  - ELISA or EMIT
  - Cutoff levels key: 20, 50, 100 ng/ml for THC, for example
  - Indicate the presence of drug or metabolite
  - Problems with these tests

Drug Testing

- Immunoassay
  - Determines presence of drug or metabolites in blood, urine, sweat or saliva
  - Depending on cutoff level may be enough for an employment, school, sobriety test
  - ELISA or EMIT most often used
  - Usually 50 ng/ml used as standard (100 ng/ml)
  - 20ng/ml, 6 ng/ml also being used
  - May help determine time of last use
Drug Testing

• Gas Chromatography to Mass Spectrometry (GC to MS)
  • Considered gold standard of drug testing
  • Confirms parent drug and drug metabolites
  • Sensitivity to nanogram amounts
  • Has been linked to impairment when blood is tested
  • If sequential samples are used, can be used to determine time of last use

Other Confirmatory Tests

• More specific immunoassays (FPIA)
• LC to MS/MS
• More expensive and take more time, but more sensitive and more likely to pick up adulterants

Drug Testing

• Step Three—GC/MS
  • Confirmatory for parent drug or metabolite
  • GC compares the sample to a "known". It cannot differ more than 1% from the standard.
  • MS offers further confirmation of GC by looking for diagnostic ions in the sample compared to a reference
  • GC/MS is especially helpful if the sample has been adulterated

Altering a Drug Test

• Big problem with urine tests in particular
• Common adulterants include water, bleach, diuretics
• Easier to fool the immunoassay than the GC to MS
• Urine is usually tested for specific gravity and proteins to rule out some adulterants.

Household Items as Drug Test Adulterants

• Table salt
• Vinegar
• Goldenseal Tea
• Bleach
• Lemon juice
• Eyedrops

Other Ways to Trick the Test—Do They Work?

• 2 Categories
  • Diluents, fluids or tablets to flush drugs out of the system:
  • Absolute Detox XXL, Absolute Carbo Drinks, Ready Clean Drug Detox Drink, Fast Flush Capsules, Ready Clean Gel Capsules
  • In vitro urinary adulterants:
  • Stealth, Klear, Instant Clean ADDIT to ive, Urine Luck, Iodine, Papain, Eye drops
Adulterants

Problems With Dilute Urine

• May cause a false to negative because SAMSHA labs typically have cutoff values too high to detect dilute drugs. BUT dilute urine will alter the creatinine level and the specific gravity. Both taken together (if too low) will invalidate the sample and suggest tampering.

What About “Legal” Diuretics?

• These are banned in athletics.
• Cannot be detected by EMIT or GC/MS
• An additional test—HPLC—is typically ordered to rule these out.
• Hydrochlorothiazide or Furosemide most often used

Detecting Adulterants

• Dipstick methods on to site
• AdultaCheck 6 and Intect 7 detect most adulterants or at least indicate that a specimen has been altered with respect to pH, creatinine or specific gravity.
• From there, more exact tests can be run (GC/MS, FPIA)

Hair Drug Testing

• Allows for a longer window of drug use to be examined
• Twice as expensive as urine testing
• Drug becomes trapped in keratinized hair
  • Can distinguish between occasional, frequent, and heavy use
• Dark hair traps opiates at the highest rate!
• Mixed hair usually not an accurate sample
• Drug cleansing shampoos have not been shown to be effective.

Hair Testing
Saliva Testing—NEW

• Many advantages—including roadside testing to correlate with impairment
• Little chance to adulterate the specimen
• Oratect test (amphetamines, BZDs, cocaine, marijuana, opiates, PCP) with cutoff levels equal to or better than EMIT
• No interference with mouthwashes, juices, foods

False to Positives

• Opiates and poppy seeds
  • Cut to off level for opiates was raised to account for dietary ingestion
• Health Inca Tea and Mate de Coca tea
  • Strongly brewed, will test weakly positive for cocaine metabolites
• Second hand marijuana smoke
  • No; confined space experiments
• Hemp, hemp oil exposure
  • Not really...GC/MS usually rules out

How Long Do Drugs Stay in the System?

• Alcohol: up to 12 hours or longer
• Amphetamines: 1 to 4 days
• Steroids: up to months
• THC: 1 day up to 20 days or longer
• Cocaine: 6 hours to 4 days
• Opiates: 2 hours to 3 days
• Benzodiazepines: 4 hours to 4 weeks
• Barbiturates: 4 hours to 4 weeks

Summary

• Stimulants and depressants both have tremendous addictive potential.
• Adolescent drug use is increasing for marijuana, cannabis analogs, bath salts, some designer drugs, and prescription drugs.
• Adult drug use continues to increase for marijuana and prescription drugs.
• Elderly are abusing marijuana and prescription drugs.

Summary

• The past year has brought Spice and Bath Salts to the attention of the abuser, the caregiver, and legal authorities.
• Drug laws are in flux
  • New regulations for new drugs
  • New regulations for old drugs?