

ASAM REVIEW COURSE 2023

**Other Classes of Drugs:  
Pharmacology and  
Epidemiology**

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**Financial Disclosure**

Annie Lévesque, MD, MSc

- No relevant disclosures

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**LEARNING OBJECTIVE**

**Identify** other classes of drugs, their physiological impacts, and treatment considerations.

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### In Summary

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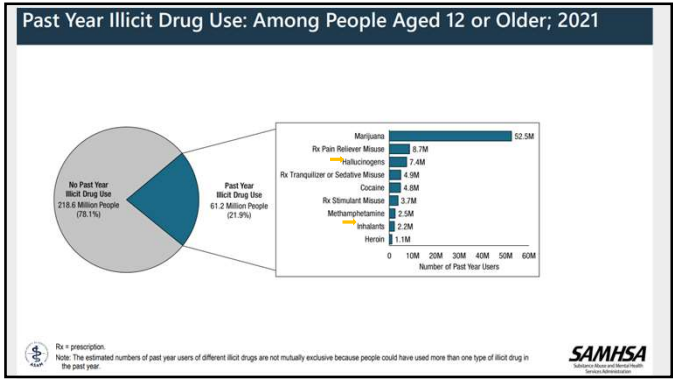
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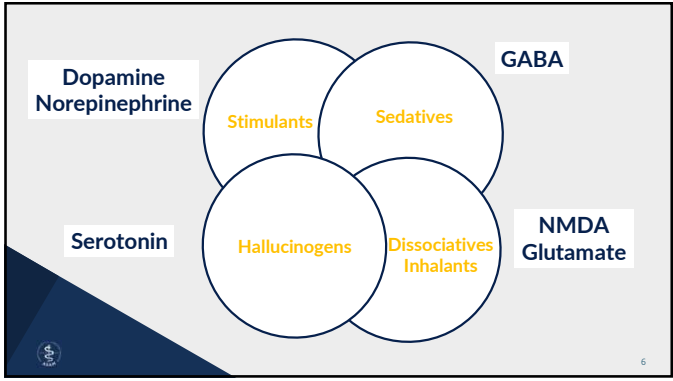
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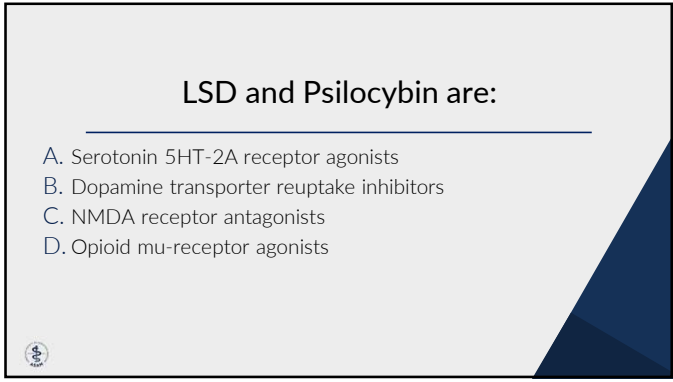
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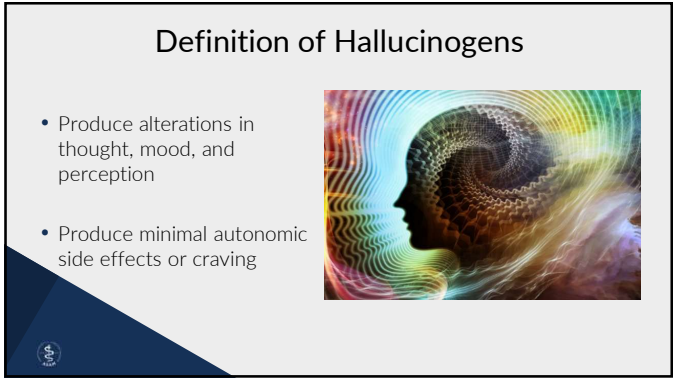
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### “Illusionogen”



- Illusions = alteration or enhancement of existing sensory perception
- May be more accurate term
  - Reality testing is generally intact
  - Effect varies greatly with expectations and environment

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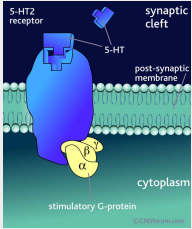
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### Classical Hallucinogens (Serotonergic Hallucinogens)

- 5HT-2A agonists or partial agonists
- Fall within the group of chemical compounds called arylalkylamines:
  - Not all arylalkylamines are hallucinogenic
  - Also includes some stimulants and empathogens



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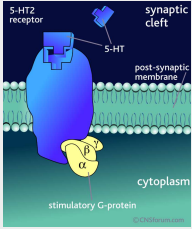
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### Classical Hallucinogens (Serotonergic Hallucinogens)

- 2 subclasses of arylalkylamines
  - Indolealkylamines (serotonin analogs)
    - Bind at multiple receptors (5HT-2A, 5HT-2B, 5HT-2C, 5HT-1A)
  - Phenylalkylamines (norepinephrine analogs)
    - Fairly selective for 5HT-2A



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### Effects of Hallucinogens



Altered shapes and colors

Synesthesia

Alterations in mood (can be tension and anxiety)

Distorted sense of time

Difficulty expressing thoughts

Depersonalization

Dreamlike feeling

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### Effects of Hallucinogens *Somatic*



Dizziness

Weakness

Tremors

Nausea

Drowsiness

Paresthesias

Blurred Vision

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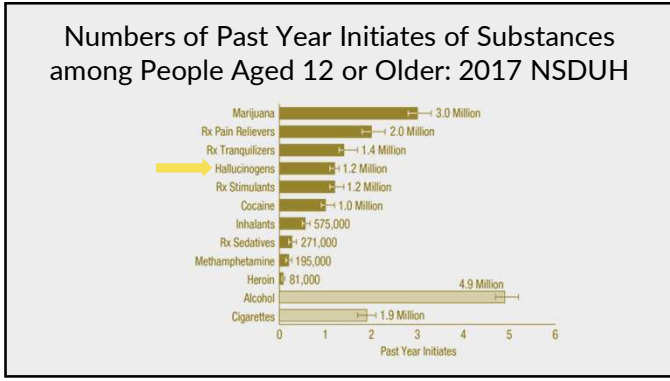
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### DMT

- DMT (N,N-Dimethyltryptamine)
  - Naturally occurring (plants, toad)
  - Rapid onset (<5 min), short duration of action (30 min)
  - Inhalation (smoking) or injection (rare)
  - Can be taken orally, but requires MAOI



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### Ayahuasca

- Brew containing DMT, MAOIs, and other hallucinogens
- Used ceremonially in parts of the Amazon and in some Native American religions
- Can cause significant vomiting

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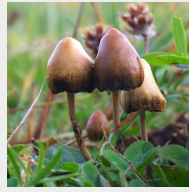
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### Psilocybin

- Psilocybin → psilocin
  - Found as naturally occurring tryptamine in certain varieties of mushrooms
  - Detachment from reality: inability to discern fantasy from reality
    - Can lead to panic attacks, psychosis
  - Rapid tolerance to effects
    - Cross tolerance with LSD
  - Duration: 4-6 hours



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### Psilocybin

- Reported mystical-like experiences
  - Inner peace, patience, optimism, self-confidence
- Adverse effects
  - Nausea, vomiting, anxiety
  - May interact with MAOI
- Duration: 4-6 hours



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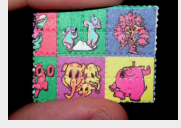
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### Lysergic Acid Diethylamide (LSD)

- Water soluble, clear, white, odorless crystals
  - Thin blotter paper with dried solution of LSD
  - Breath mints/sugar cubes ("dropping" acid), pressed into pills or thin gelatin squares
- Onset: 30-60 min, Peak: 2-4 hours, Duration: 8-12 hours
- Effects
  - Altered shapes and colors, heightened sense of hearing
  - Depersonalization, visual hallucinations, alterations in mood



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### Mescaline/Peyote



**Mescaline**  
3,4,5-trimethoxyphenethylamine

COC1=CC(OC)=C(OC)C=C1CCN

- Buttons from top (crown) of peyote cactus
  - 6-10 buttons for intoxication
- Slow onset (30-60 min)
  - First hour: minor perceptual changes, increased resp rate, nausea
- Next several hours (5-10):
  - Visual illusions/hallucinations
  - Synesthesia

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### Mescaline/Peyote



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### DOM

- Results from structural modification of mescaline-like substances
- Extremely potent
- Used as model hallucinogen in drug discrimination studies

**DOM**  
2,5-dimethoxy-4-methylamphetamine

COC1=CC(OC)=C(C)C=C1C[C@H](C)N

- Buttons from top (crown) of peyote cactus
  - 6-10 buttons for intoxication
- Slow onset (30-60 min)
  - First hour: minor perceptual changes, increased resp rate, nausea
- Next several hours (5-10):
  - Visual illusions/hallucinations
  - Synesthesia

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### MDA

- Produces stimulant and hallucinogenic effects
  - Similar to combined effects of cocaine and LSD
- Can be modified to MDMA (ecstasy)
  - Stimulant effects
  - Empathogenic
- Has been represented and sold as MDMA

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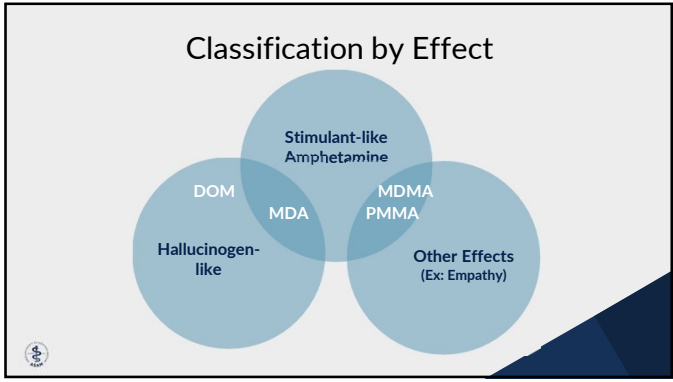
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### Salvia

- Naturally grows in the US
- Traditionally ingested by chewing / drinking juice for healing rituals
- Sometimes smoked when used as drug
- Active ingredient in Salvia is salvinorin A, a kappa opioid agonist

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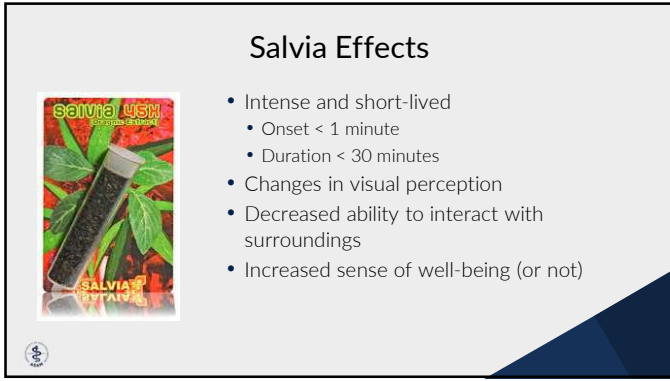
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**Salvia Effects**

- Intense and short-lived
  - Onset < 1 minute
  - Duration < 30 minutes
- Changes in visual perception
- Decreased ability to interact with surroundings
- Increased sense of well-being (or not)

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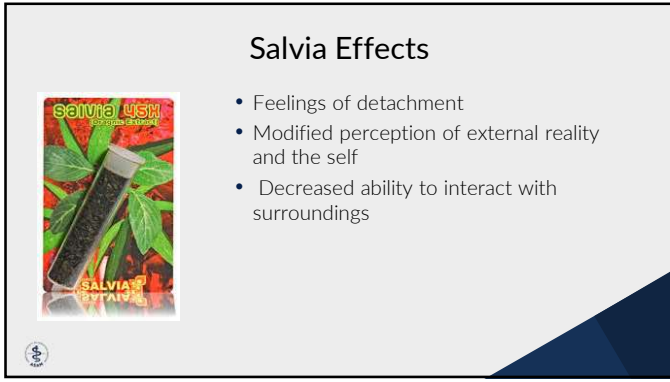
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**Salvia Effects**

- Feelings of detachment
- Modified perception of external reality and the self
- Decreased ability to interact with surroundings

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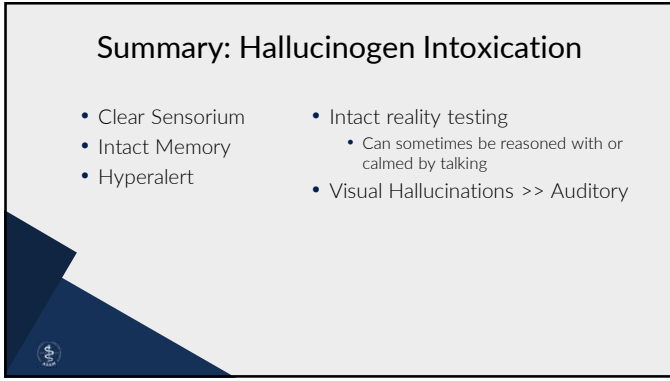
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**Summary: Hallucinogen Intoxication**

- Clear Sensorium
- Intact Memory
- Hyperalert
- Intact reality testing
  - Can sometimes be reasoned with or calmed by talking
- Visual Hallucinations >> Auditory

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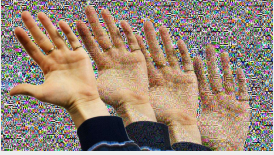
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**Hallucinogen Persisting Perception Disorder (HPPD)**

- Re-experiencing of perceptual symptoms experienced while intoxicated following cessation of use = flashbacks



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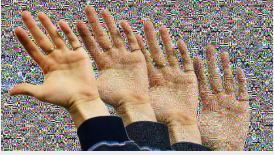
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**Hallucinogen Persisting Perception Disorder (HPPD)**

- Unrelated to dose or number of exposures
- Usually resolves within 1-2 years of last use
- Can be triggered by other substance use



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**Dissociatives**

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**PCP and Ketamine are:**

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- A. Serotonin 5HT-2A receptor agonists
- B. Dopamine transporter reuptake inhibitors
- C. NMDA receptor antagonists
- D. Opioid mu-receptor agonists

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**Definition**

- NMDA receptor antagonists
  - Glutamate activates NMDA receptors to filter sensory stimuli
  - Dissociatives noncompetitively block NMDA receptors → sensory overflow
  - Visual hallucination relatively rare

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**Members of the Class**

- Arylcyclohexylamines
  - PCP
  - Ketamine
- Dextromethorphan (DXM)
- Nitrous Oxide



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### Effects



Dissociation

Sensory Isolation

Mental Distortions

Increased HR, BP, Temp

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### Epidemiology

- Men > Women
- More common in large urban areas
- Often used in combination with alcohol or other illicit substances



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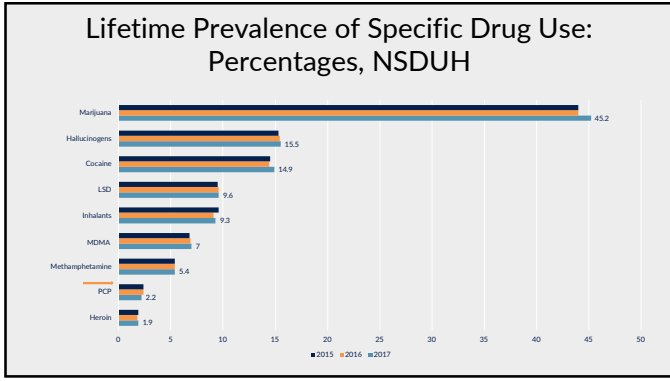
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### Phencyclidine (PCP, Angel dust)

- Developed as IV anesthetic
  - No longer FDA-approved; now Schedule I
    - Associated with prolonged delirium
- Risk of seizures or death
- Available as powder, tablets, liquid, and sprayed onto plant leaves and then smoked



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### PCP Effects

- Vary widely with dose
  - Confusion, delirium, psychosis
  - ↓
  - Semi-coma and coma (less common)
  - ↓
  - Coma with seizures (rare)

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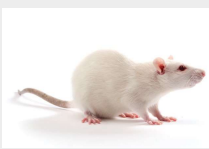
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### PCP

- Psychotomimetic = model of psychosis
  - Positive Symptoms (Delusions, hallucinations)
  - Negative Symptoms (Blunted affect, asociality)



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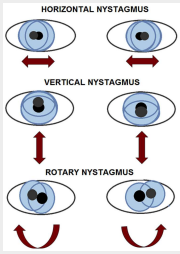
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### PCP

- PCP Intoxication
  - Nystagmus (rotary, vertical, horizontal)
  - Hyperreflexia
  - HTN
  - Feelings of invulnerability
  - Management: low stimulus environment, benzos/antipsychotics as indicated



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### Ketamine (K, Special K)

- FDA-approved for general anesthesia in animals and humans
- Schedule III
- Administered as IV or IM in medical settings
- Used by inhalation, smoking, or oral administration
- Less potent, shorter-acting than PCP



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### Effects of Ketamine

- Analgesia / numbness
- Spacy feeling ("K-hole")
- Amnesia
- Delirium (higher doses)
- Nystagmus (vertical and/or horizontal)
- CV + renal complications
- Long-term
- Dysphoria, memory impairment, apathy, irritability



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### Dextromethorphan (DXM)



- OTC cough medicines
  - Capsules, tablets, lozenges, syrup
  - AKA "skittles"
- Anti-tussive dose: <120mg daily; recommended dose 10-20mg q4hours
- 300-1800mg produces PCP-like effects

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### Effects of DXM

- Euphoria and hallucinations (increasing w/ higher dose)
- Drowsiness, blurred vision, slurred speech
- N/V, hypertension, diaphoresis



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### Effects of DXM

- Significant serotonergic properties
  - ↑ serotonin synthesis and release
  - ↓ reuptake
- Deaths have been reported with large doses (200x dose)
  - CNS & respiratory depression, seizure, arrhythmias



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**Dissociative: Additional Information**

- PCP included on most screening panels (high false positive rate)
  - Need special testing (GC-MS) for ketamine, DXM
- Increased serum CPK & urine myoglobin

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**Summary: Dissociative Intoxication and Overdose**

- Rarely see dilated pupils
  - Different from stimulant or hallucinogen intoxication, opioid withdrawal
- Visual hallucinations relatively rare

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**Inhalants**

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Many abused inhalants produce an intoxication that most closely resembles which of the following?

- A. Alcohol
- B. Cocaine
- C. Cannabis
- D. LSD

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### Inhalants



Breathable chemicals that can be self-administered, also known as:

- Whippets
- Poppers
- Huff
- Bang
- Kick
- Sniff

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### Terminology

- Sniffing = inhaling from an open container
- Huffing = holding fabric soaked in substance to the nose or mouth and inhaling
- Bagging = concentrating vapors in a bag and inhaling



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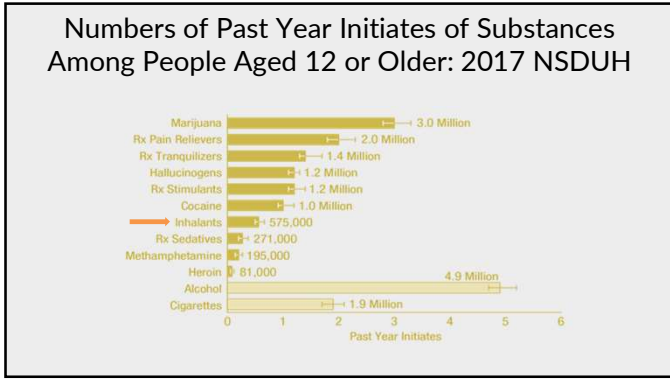
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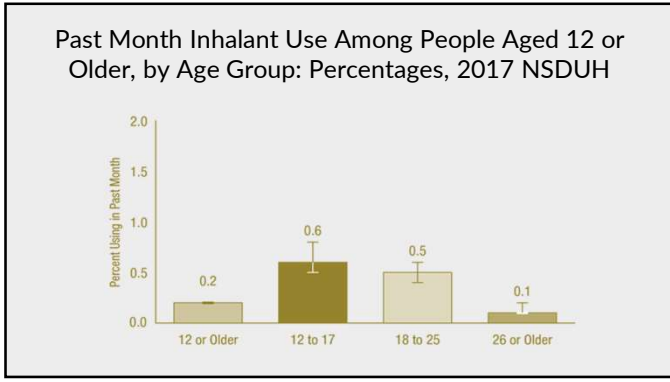
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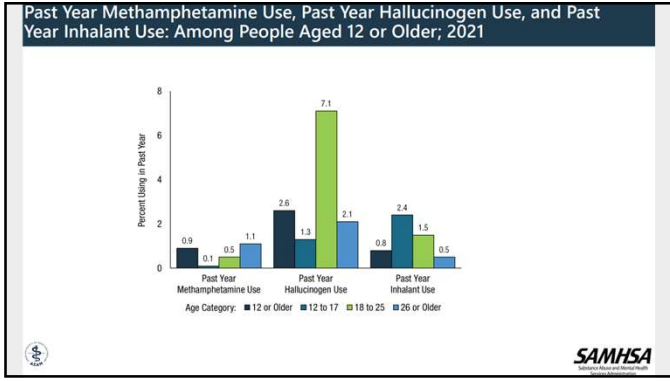
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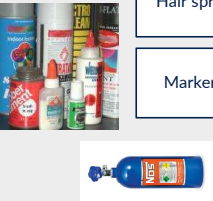
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**Source of Inhalants: Products**



Air freshener	Lighter fluid	Household cleaners	Gasoline
Hair spray	Mothballs	Nail polish remover	Paint thinner
Markers	Refrigerant	Rubber cement	Spray paint
	Video head cleaner	Whipped cream canisters	

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**Sources of Inhalants:**

Possible Contents

- Amyl, butyl, cyclohexyl nitrite; butane
- Butane
- n-Hexane, tetrachloroethylene, xylene
- Benzene, toluene, xylene, (lead)
- Butane, propane
- Naphthalene, paradichlorobenzene
- Acetone, toluene
- Toluene, trichloroethylene, xylene
- Xylene
- Freon
- Acetone, benzene, n-Hexane, toluene
- Butane, propane, toluene
- Amyl, butyl, cyclohexyl nitrite
- Nitrous oxide

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**Abuse Liability**

- Number of factors increase abuse potential
  - Free or low cost
  - Readily available
  - Difficult to test for
  - Perceived as low risk
- Inquire about inhalant use, especially when working with adolescent population
- Provide education regarding consequences of use

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### Inhalant Pharmacology

- Highly lipophilic
- Rapidly absorbed through the lungs
- Crosses blood-brain barrier
- Accumulates in brain, liver and fatty tissue
- Rapid onset, short duration
- Synergistic effect: alcohol, benzos

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### Effects of Inhalants

Acute Effects	Toxic Effects and Overdose
<ul style="list-style-type: none"> <li>• Euphoria</li> <li>• Disinhibition</li> <li>• Dizziness / lightheadedness</li> <li>• Slurred speech</li> <li>• Ataxia</li> </ul>	<ul style="list-style-type: none"> <li>• Respiratory depression</li> <li>• Arrhythmias</li> <li>• Asphyxia, cardiac arrest and death can occur</li> </ul>

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### Chronic Effects of Inhalants

<p style="text-align: center; margin: 0;"><b>CARDIAC</b></p> <p style="margin: 0;">arrhythmia cardiomyopathy</p>	<p style="text-align: center; margin: 0;"><b>DERMATOLOGICAL</b></p> <p style="margin: 0;">perioral infection rash</p>
<p style="text-align: center; margin: 0;"><b>GASTROINTESTINAL</b></p> <p style="margin: 0;">hepatorenal failure</p>	<p style="text-align: center; margin: 0;"><b>MUSCULOSKELETAL</b></p> <p style="margin: 0;">Rhabdomyolysis</p>

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**Chronic Effects of Inhalants**

<p style="text-align: center; color: #0070C0;"><b>PULMONARY</b></p> <p style="text-align: center;">emphysema hypoxia aspiration pneumonia</p>	<p style="text-align: center; color: #0070C0;"><b>GENITOURINARY</b></p> <p style="text-align: center;">glomerulonephritis hypokalemia</p>
<p style="text-align: center; color: #0070C0;"><b>HEMATOPOIETIC</b></p> <p style="text-align: center;">aplastic anemia leukemia bone marrow suppression</p>	<p style="text-align: center; color: #0070C0;"><b>NEUROLOGICAL</b></p> <p style="text-align: center;">peripheral neuropathy delirium/dementia cerebellar atrophy irreversible white matter changes</p>

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**Treatment Considerations**

- User may experience prolonged residual effects because chemicals are stored in fatty tissue
- Neurological impairment is often present
  - Cognition should be continually re-assessed
  - Talk therapy / group therapy may not be appropriate

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**Anabolic-androgenic Steroids**

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Which of the following is a side effect of anabolic steroid use?

- A. Mania
- B. ↓LDL,↑HDL
- C. Hypersomnia
- D. Weight loss

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Anabolic - Androgenic Steroids (AAS)



- Anabolic = skeletal muscle-building
- Androgenic = masculinizing
- Includes testosterone and >100 related synthetic substances

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Misuse

- Enhance performance and/or improve physical appearance
  - May be taken at 10-100x the intended dose



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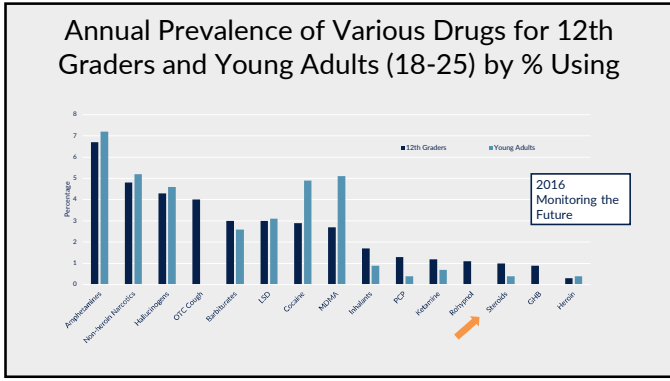
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### Epidemiology

- 3 most common populations:
  - Athletes
    - Performance enhancement
  - Aesthetes
    - Improve physical appearance (often adolescents)
  - Fighting Elite
    - Increase aggression and/or job performance (security, law enforcement)

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### Steroid Side Effects

Acne	Liver damage	↑LDL, ↓HDL	Complications of Injections
Aggressive / violent behavior ("Roid Rage")	Hypomania or Mania	Paranoia	Extreme irritability

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### Steroid Side Effects

Women	Men
<ul style="list-style-type: none"> <li>• Deepening of voice</li> <li>• Facial hair</li> <li>• Menstrual changes</li> <li>• Male-pattern baldness</li> <li>• Genital hypertrophy</li> </ul>	<ul style="list-style-type: none"> <li>• Testicular atrophy</li> <li>• Prostatic hypertrophy</li> <li>• Gynecomastia</li> <li>• Baldness</li> <li>• Infertility</li> </ul>

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### Psychiatric Side Effects

<ul style="list-style-type: none"> <li>• Aggressive / violent behavior               <ul style="list-style-type: none"> <li>• "Roid Rage"</li> </ul> </li> <li>• Hypomania or Mania (high doses)</li> <li>• Paranoia</li> <li>• Extreme irritability</li> <li>• Impaired judgment</li> <li>• Delusions</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment               <ul style="list-style-type: none"> <li>• Remove AAS</li> <li>• Use mood stabilizers or anti-psychotics as needed</li> </ul> </li> <li>• Generally, resolves within 1-2 weeks after cessation</li> </ul>
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### Other Associated Syndromes & Treatment

<ul style="list-style-type: none"> <li>• Steroid Withdrawal-Associated Depression               <ul style="list-style-type: none"> <li>• Can be responsive to SSRIs</li> </ul> </li> <li>• Comorbid SUD, especially opioid</li> <li>• Body Dysmorphic Disorder / Muscle Dysmorphia</li> </ul>	<ul style="list-style-type: none"> <li>• Rarely seek treatment</li> <li>• Not euphorogenic; no immediate high</li> <li>• Goal is long-term reward associated with physical changes</li> <li>• May be seen as socially acceptable or positive</li> </ul>
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**In Summary**



- 1  
Diverse group of substances with relatively low prevalence, but high abuse liability
- 2  
Varied but significant effects from use and misuse, including long-term consequences

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**Get in Touch**

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