

# Other Classes of Drugs

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# Learning Objectives

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

# Presentation Outline



- ◆ Hallucinogens
- ◆ Dissociatives
- ◆ Inhalants
- ◆ Anabolic-Androgenic Steroids

**Dopamine  
Norepinephrine**

**GABA**

**Serotonin**

**NMDA  
Glutamate**

*Stimulants*

*Sedatives*

*Hallucinogens*

*Dissociatives  
Inhalants*

# Hallucinogens

# Definition of Hallucinogens

- ◆ Produce alterations in thought, mood, and perception
- ◆ Produce minimal autonomic side effects or craving
- ◆ Fail to produce excessive stupor or central stimulation





# “Illusionogen”

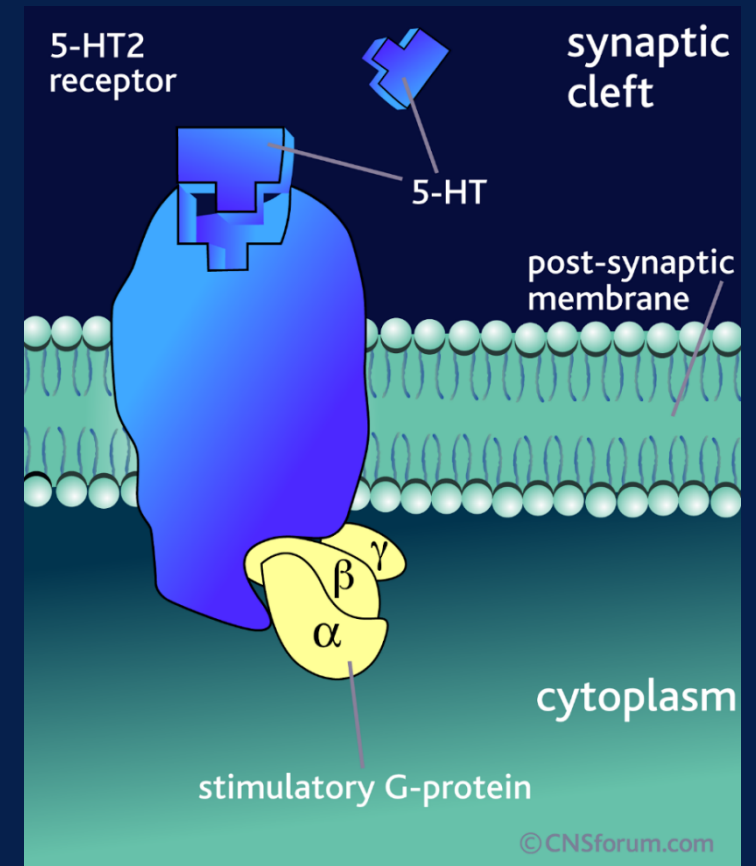


- ◆ Illusions = alteration or enhancement of existing sensory perception
- ◆ May be more accurate term
  - ◆ Reality testing is generally intact
  - ◆ Effect varies greatly with expectations and environment



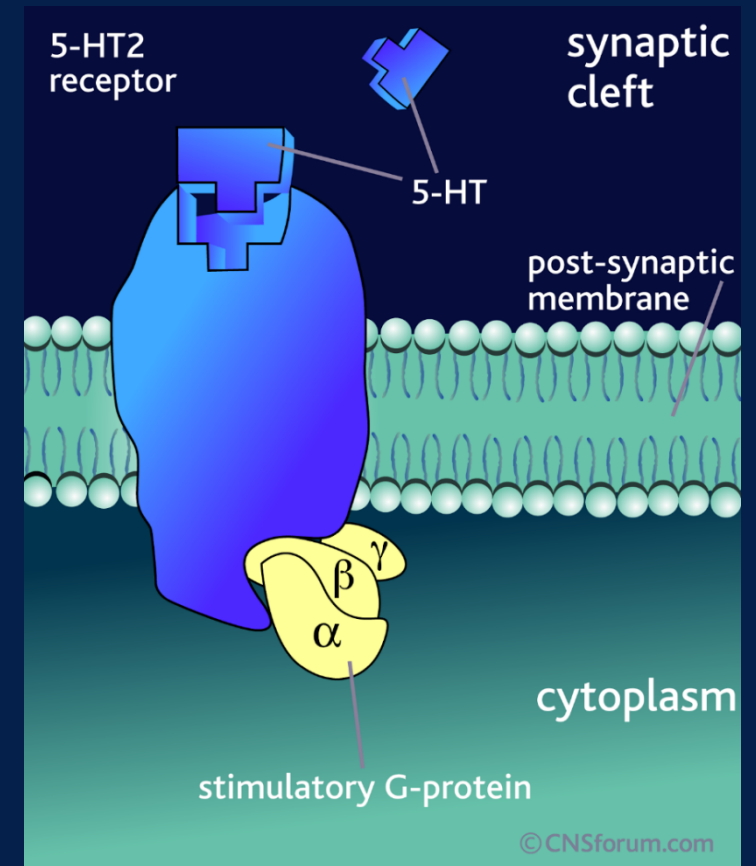
# Classical Hallucinogens (Serotonergic Hallucinogens)

- ◆ 5HT-2A agonists or partial agonists
- ◆ Fall within the group of chemical compounds called arylalkylamines
  - ◆ Not all are hallucinogenic
  - ◆ Stimulants
  - ◆ Empathogens



# 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



# 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

# Effects of Hallucinogens

## Somatic



Dizziness

Weakness

Tremors

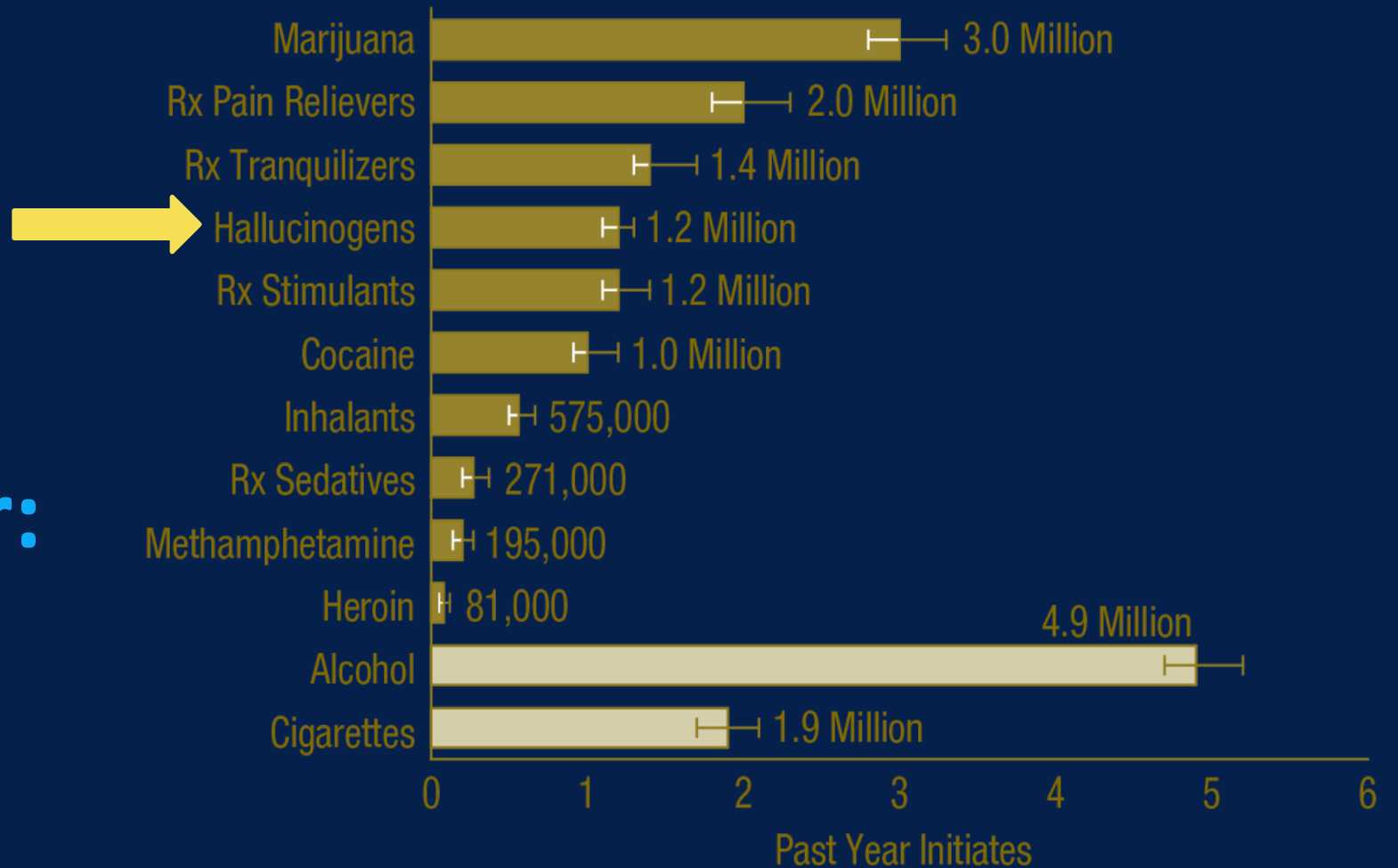
Nausea

Drowsiness

Paresthesias

Blurred Vision

# Numbers of Past Year Initiates of Substances Among People Aged 12 or Older: 2017 NSDUH



# DMT

- ◆ DMT (N,N-Dimethyltryptamine)
  - ◆ Prototype of this subclass of indolealkylamines
    - ◆ 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



DMT Crystals



# Ayahuasca



- ◆ Brew containing DMT, MAOIs, and other hallucinogens
- ◆ Used ceremonially in parts of the Amazon and in some Native American religions
- ◆ Legalized for religious use among Native Americans in the US



# Psilocybin

- ◆ Psilocybin → psilocin
  - ◆ Found as naturally occurring tryptamine in certain varieties of mushrooms (shrooms, shrooming)
  - ◆ Detachment from reality
    - ◆ Inability to discern fantasy from reality
      - ◆ Can lead to panic attacks, psychosis
  - ◆ Rapid tolerance to effects
    - ◆ Cross tolerance with LSD



# Psilocybin

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



# 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



# Lysergic Acid Diethylamide (LSD)

- ◆ 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



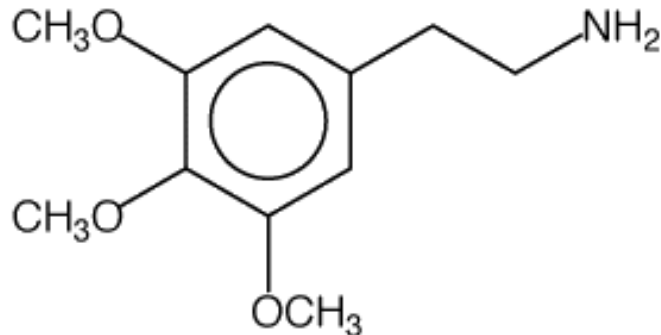


# Mescaline/Peyote



## Mescaline

3,4,5-trimethoxyphenethylamine



- ◆ Use legalized within Native American Church
- ◆ Buttons from top (crown) of peyote cactus
  - ◆ 6-10 buttons for intoxication

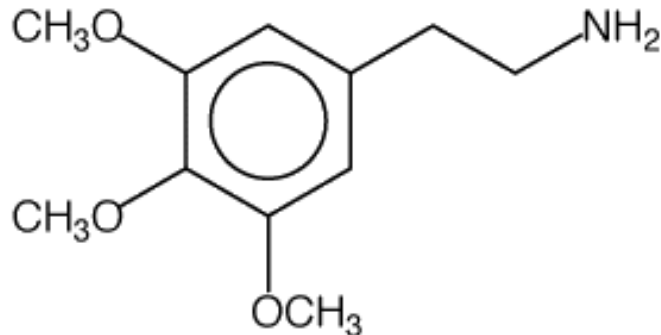


# Mescaline/Peyote



## Mescaline

3,4,5-trimethoxyphenethylamine



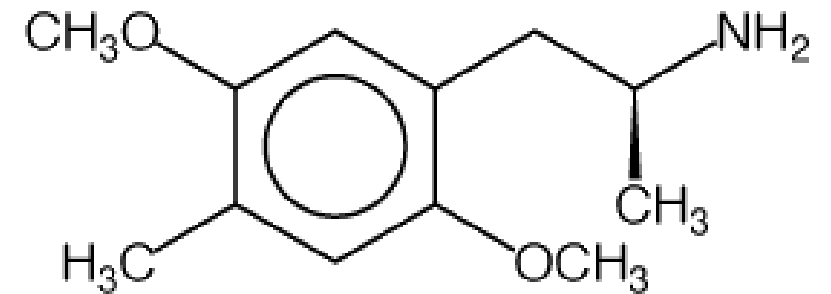
- ◆ Slow onset (30-60 min)
  - ◆ First hour: minor perceptual changes, increased resp rate, nausea
  - ◆ Next several hours (5-10):
    - ◆ Visual illusions/hallucinations
    - ◆ Synesthesia

# DOM

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

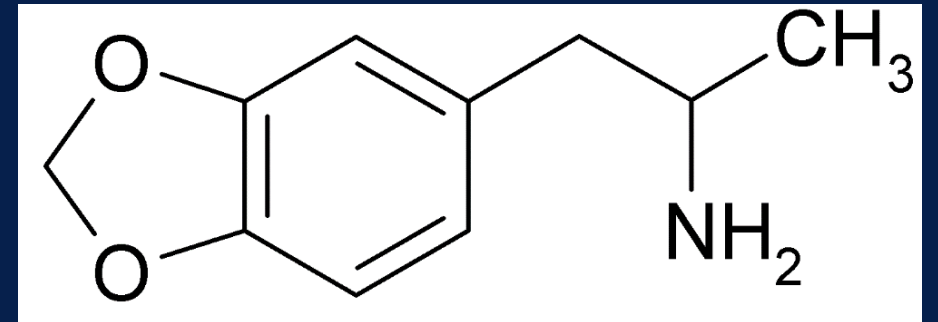
## DOM

2,5-dimethoxy-4-methylamphetamine

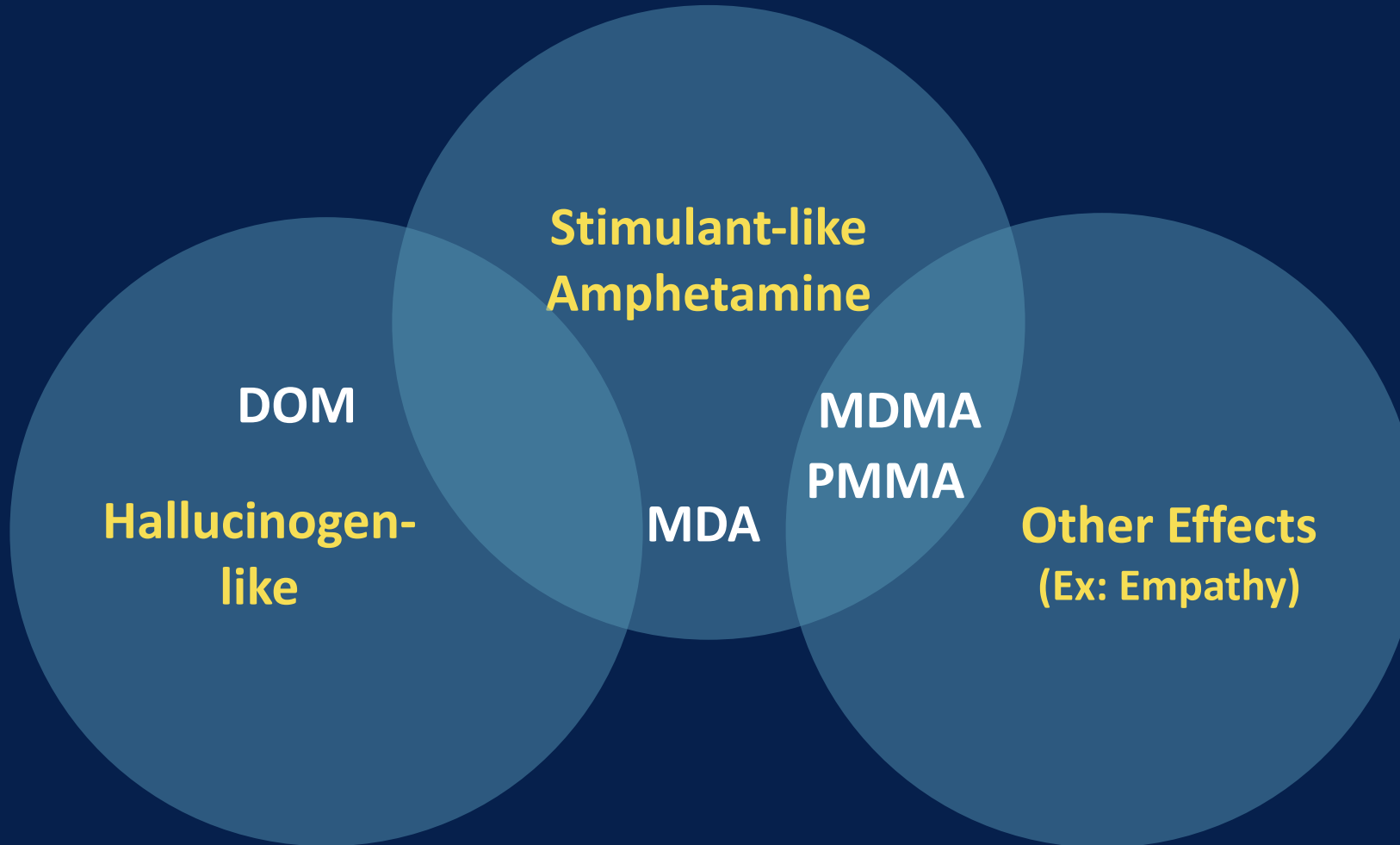


# MDMA

- ◆ 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



# Classification by Effect



# Salvia

- ◆ Herb found in southern Mexico and South America, used in healing rituals
  - ◆ Traditionally ingested by chewing / drinking juice
  - ◆ Sometimes smoked when used as drug of abuse
- ◆ Active ingredient in Salvia is salvinorin A, a kappa opioid agonist
- ◆ Varied legal status: Banned in 29 states



# Salvia Effects



- ◆ Intense and short-lived
  - ◆ Onset < 1 minute
  - ◆ Duration < 30 minutes
- ◆ Changes in visual perception
- ◆ Increased sense of well-being (or not)



# Salvia Effects



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

# Summary: Hallucinogen Intoxication

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

# Hallucinogen Persisting Perception Disorder (HPPD)

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



# Hallucinogen Persisting Perception Disorder (HPPD)

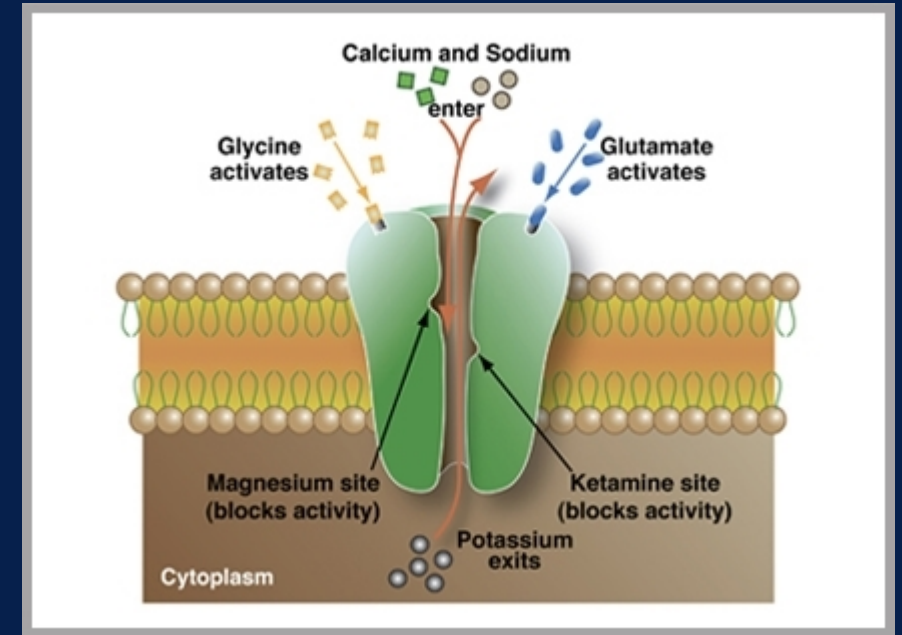
- ◆ Unrelated to dose or number of exposures
- ◆ Usually resolves within 1-2 years of last use
- ◆ Can be triggered by other substance use



# Dissociatives

# Definition

- ◆ NMDA receptor antagonists
  - ◆ Glutamate activates NMDA receptors to filter sensory stimuli
  - ◆ Dissociatives noncompetitively block NMDA receptors → sensory overflow





# Members of the Class

- ◆ Arylcyclohexylamines

- ◆ PCP

- ◆ Ketamine



- ◆ Dextromethorphan (DXM)

- ◆ Nitrous Oxide



# Effects



Dissociation

Sensory Isolation

Mental  
Distortions

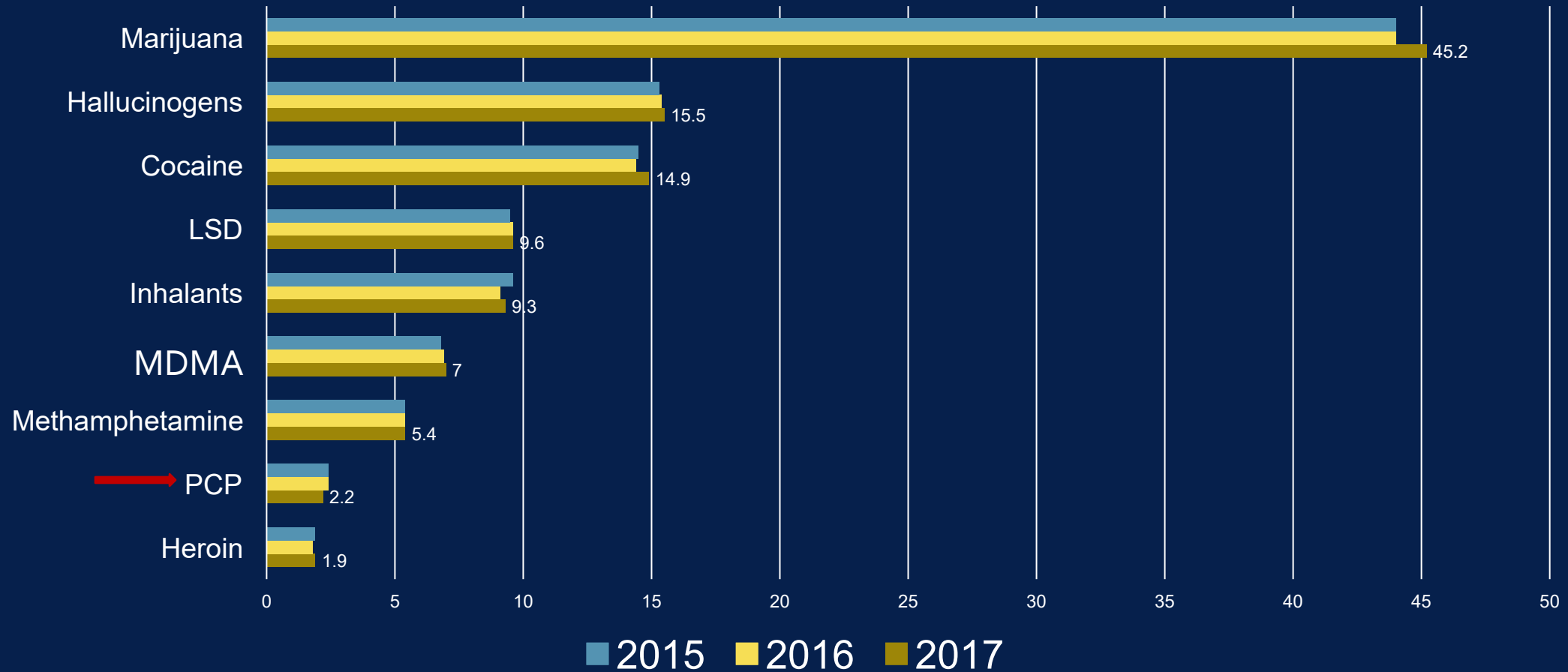
Increased HR,  
BP, Temp

# Epidemiology

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

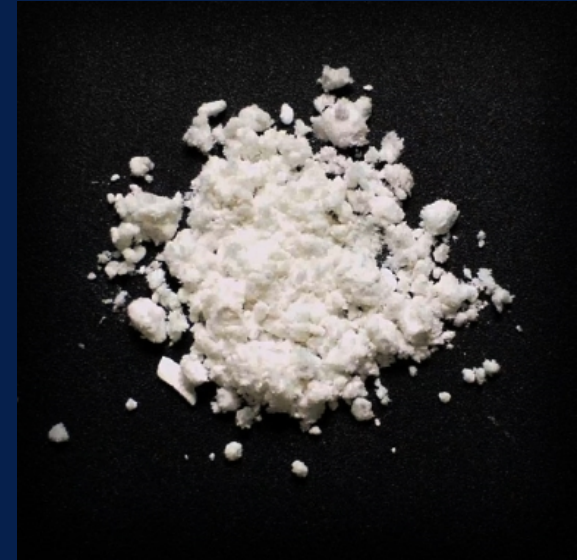


# Lifetime Prevalence of Specific Drug Use: Percentages, NSDUH



# 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



# PCP Effects

- ◆ Vary widely with dose

Confusion, delirium, psychosis



Semi-coma and coma (less common)



Coma with seizures (rare)

# PCP

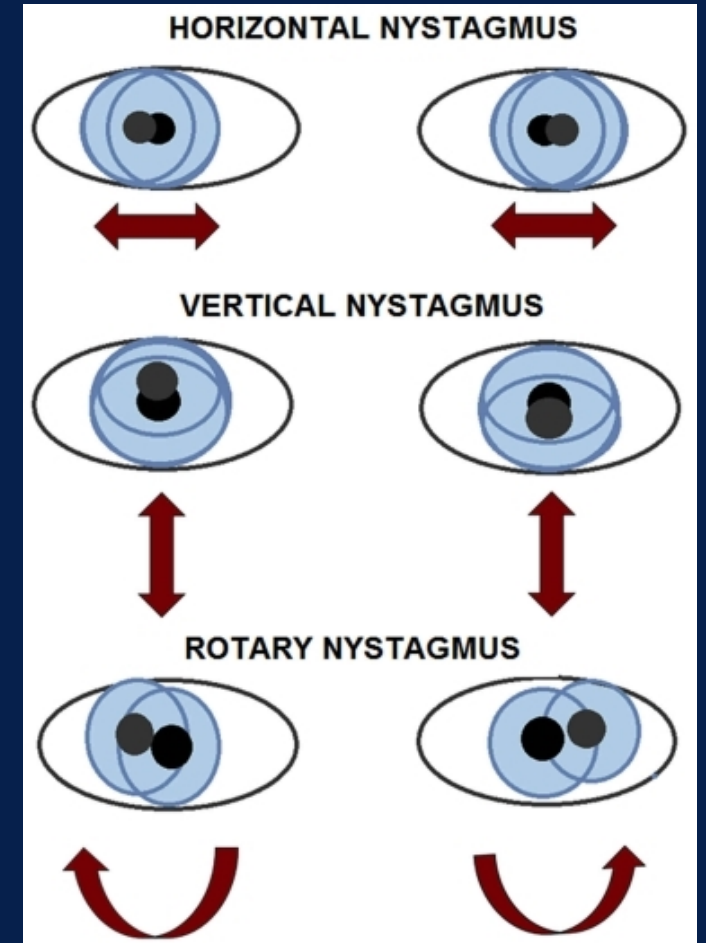
- ◆ Psychotomimetic = model of psychosis
  - ◆ Positive Symptoms (Delusions, hallucinations)
  - ◆ Negative Symptoms (Blunted affect, asociality)





# PCP

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



# 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



# Effects of Ketamine

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



# 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

# Effects of DXM

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



# 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



# Summary: Dissociative Intoxication and Overdose

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



# Summary: Dissociative Intoxication and Overdose

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

# Inhalants

# Inhalants



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

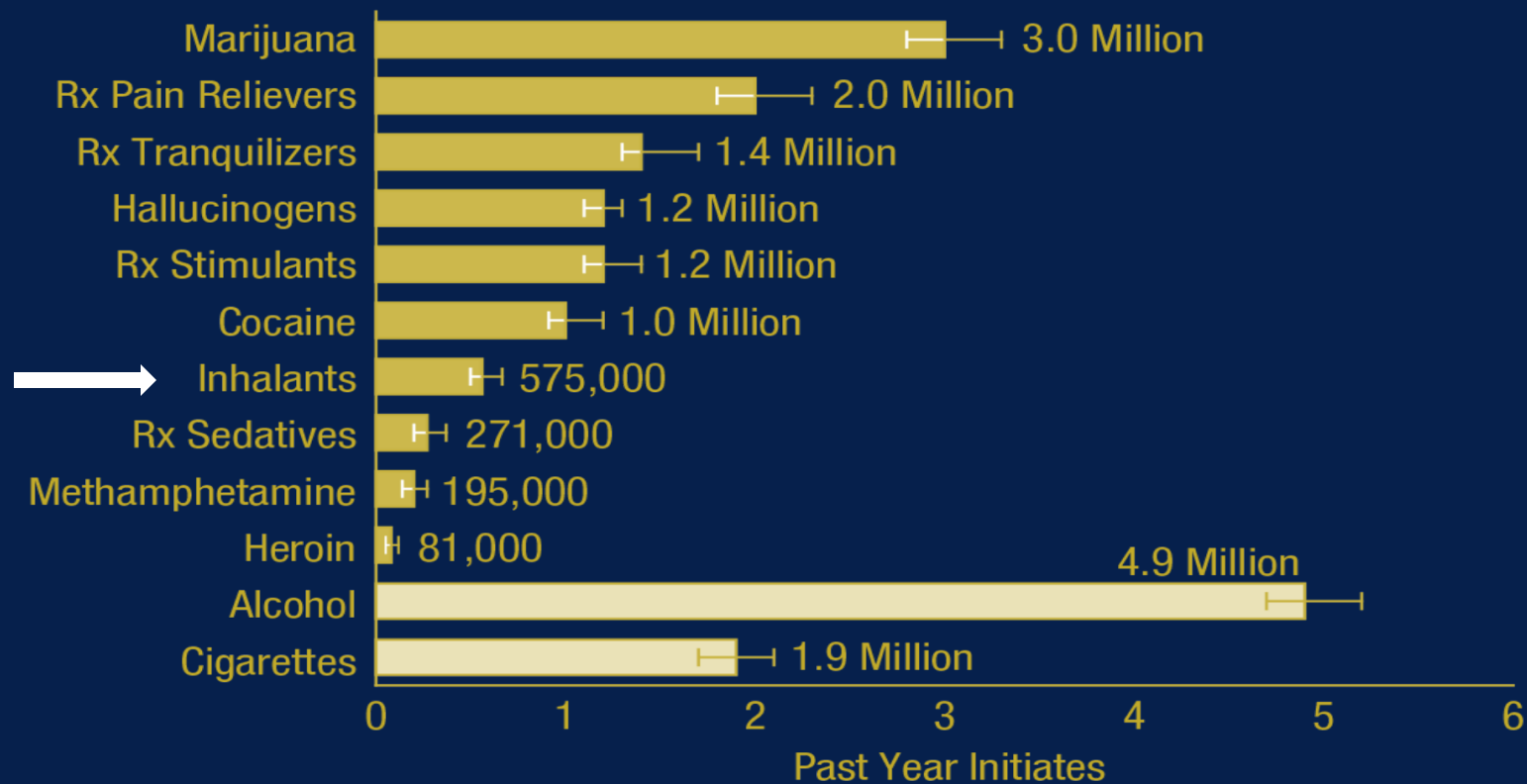
- ◆ Whippets
- ◆ Bang
- ◆ Poppers
- ◆ Kick
- ◆ Huff
- ◆ Sniff

# Terminology

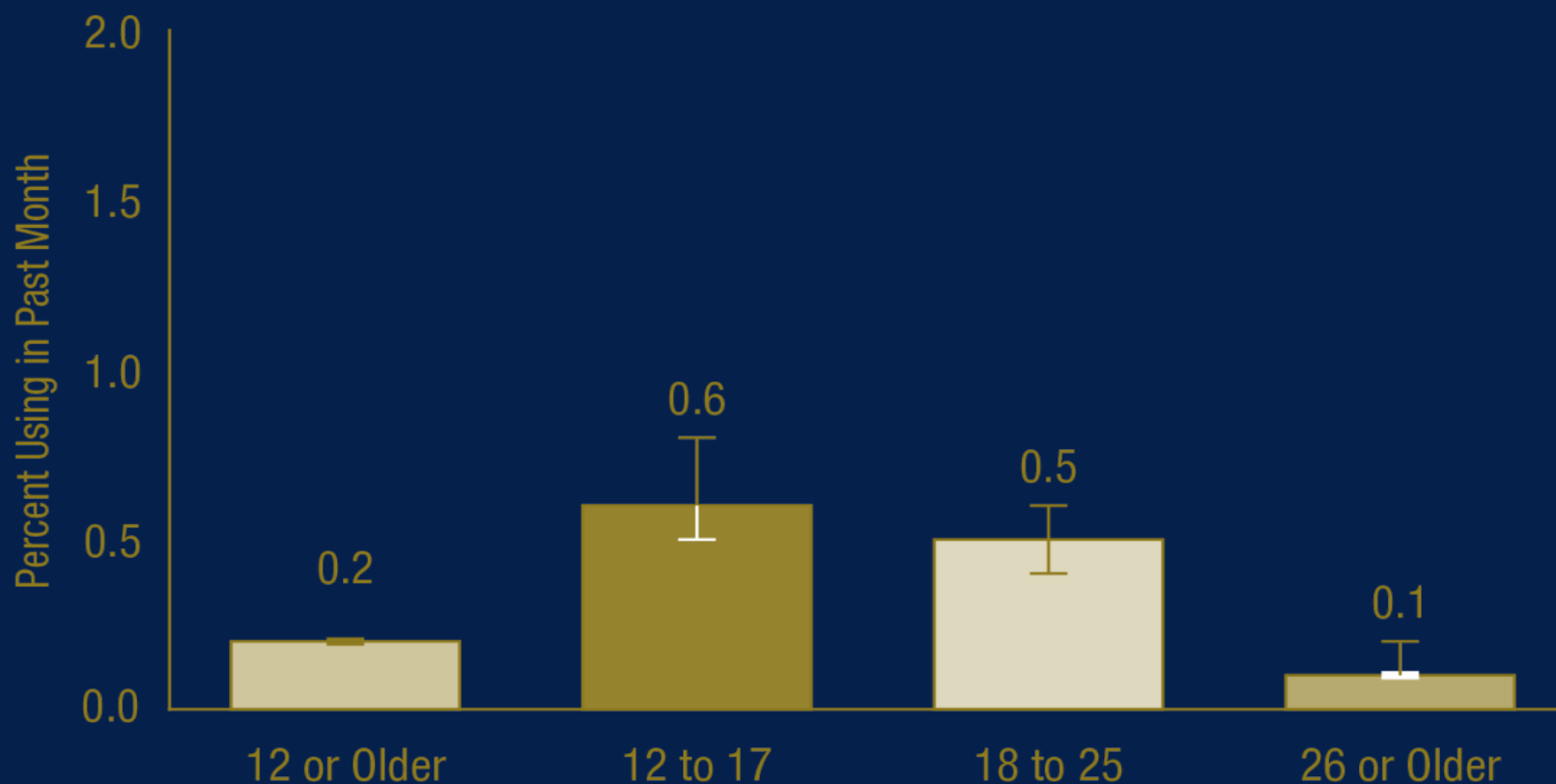
- ◆ **Sniffing** = inhaling from an open container
- ◆ **Huffing** = holding fabric soaked in substance to the nose or mouth and inhaling
- ◆ **Bagging** = concentrating vapors in a bag and inhaling



# Numbers of Past Year Initiates of Substances Among People Aged 12 or Older: 2017 NSDUH



# Past Month Inhalant Use Among People Aged 12 or Older, by Age Group: Percentages, 2017 NSDUH



# 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



# 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

# 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

# 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

# Effects of Inhalants

## Acute Effects

- ◆ Euphoria
- ◆ Disinhibition
- ◆ Dizziness / lightheadedness
- ◆ Slurred speech
- ◆ Ataxia

## Toxic Effects and Overdose

- ◆ Respiratory depression
- ◆ Arrhythmias
- ◆ Asphyxia, cardiac arrest and death can occur

# Chronic Effects of Inhalants

## CARDIAC

arrhythmia  
cardiomyopathy

## DERMATOLOGICAL

perioral infection  
rash

## GASTROINTESTINAL

hepatorenal failure

## MUSCULOSKELETAL

Rhabdomyolysis

# Chronic Effects of Inhalants

## PULMONARY

emphysema  
hypoxia  
aspiration pneumonia

## GENITOURINARY

glomerulonephritis  
hypokalemia

## HEMATOPOIETIC

aplastic anemia  
leukemia  
bone marrow suppression

## NEUROLOGICAL

peripheral neuropathy  
delirium/dementia  
cerebellar atrophy  
irreversible white matter changes

# 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



# Anabolic-androgenic Steroids

# Anabolic - Androgenic Steroids (AAS)



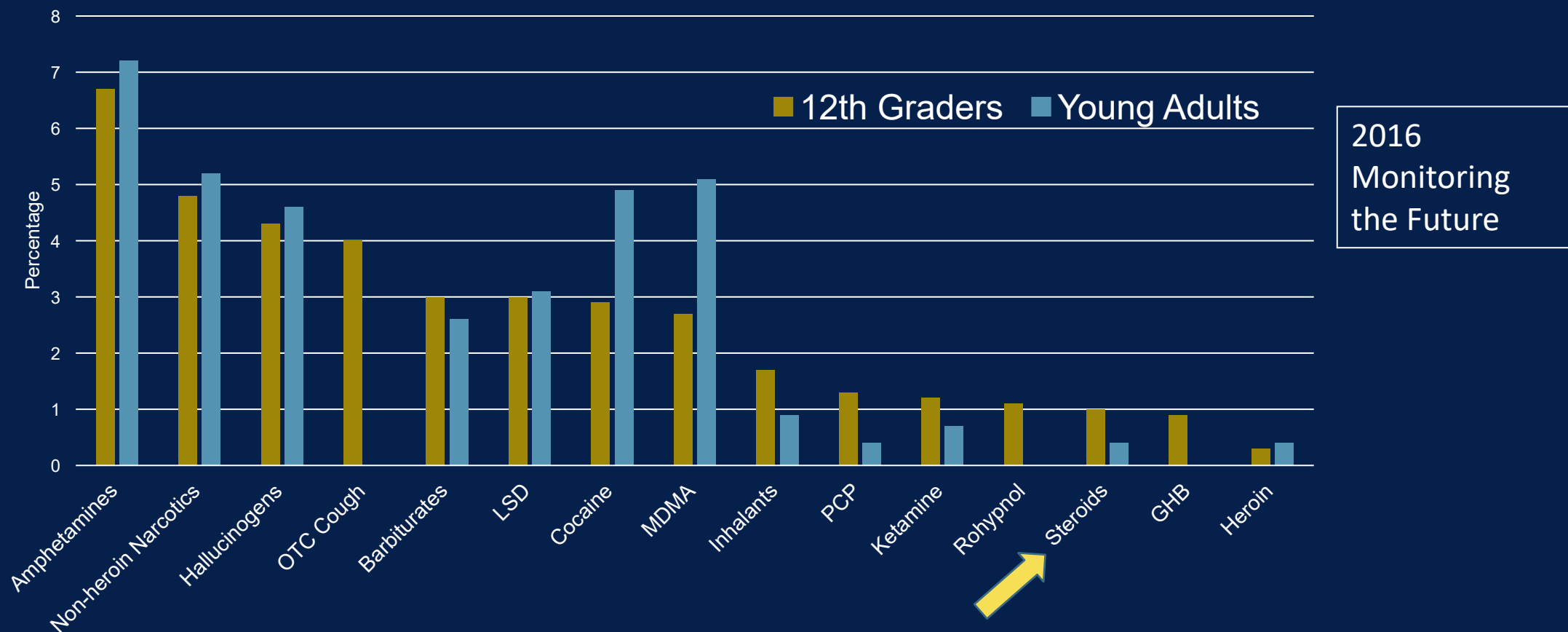
- ◆ Anabolic = skeletal muscle-building
- ◆ Androgenic = masculinizing
- ◆ Includes testosterone and >100 related synthetic substances

# Misuse

- ◆ Enhance performance and/or improve physical appearance
  - ◆ May be taken at 10-100x the intended dose
- ◆ Routes of Administration
  - ◆ Oral
  - ◆ IM



# Annual Prevalence of Various Drugs for 12th Graders and Young Adults (18-25) by % Using



# 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)

# Steroid Side Effects

Acne

Liver damage

↑LDL, ↓HDL

Complications of  
Injections

Aggressive /  
violent behavior  
("Roid Rage")

Hypomania or  
Mania

Paranoia

Extreme  
irritability

# Steroid Side Effects

## Women

- ◆ Deepening of voice
- ◆ Facial hair
- ◆ Menstrual changes
- ◆ Male-pattern baldness
- ◆ Genital hypertrophy

## Men

- ◆ Testicular atrophy
- ◆ Prostatic hypertrophy
- ◆ Gynecomastia
- ◆ Baldness
- ◆ Infertility

# Psychiatric Side Effects

- ◆ Aggressive / violent behavior
  - ◆ “Roid Rage”
- ◆ Hypomania or Mania (high doses)
- ◆ Paranoia
- ◆ Extreme irritability
- ◆ Impaired judgment
- ◆ Delusions

## Treatment

- ◆ Remove AAS
- ◆ Use mood stabilizers or anti-psychotics as needed
- ◆ Generally, resolves within 1-2 weeks after cessation



# Other Associated Syndromes & Treatment

- ◆ Steroid Withdrawal-Associated Depression
  - ◆ Can be responsive to SSRIs
- ◆ Comorbid SUD, especially opioid
- ◆ Body Dysmorphic Disorder / Muscle Dysmorphia
  - ◆ Rarely seek treatment
  - ◆ Not euphorigenic; no immediate high
  - ◆ Goal is long-term reward associated with physical changes
  - ◆ May be seen as socially acceptable or positive

# In Summary

Diverse group of substances with relatively low prevalence, but high abuse liability

Varied but significant effects from use and misuse, including long-term consequences

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