STIMULANTS

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Outline

1. 1980s: Cocaine
2. 1990s: Ecstasy
3. 2000s: Crystal Methamphetamine
4. Crystal Meth in a Gay Subculture
5. 2010s: Bath Salts
6. Summary

General Roadmap

- Effects
- Chemistry and Neurobiology
- Intoxication
- Withdrawal
- Long-Term Effects
- Treatments
- Special Topics

1

1980s: Cocaine
“Cocaine is like really evil coffee.”
- Courtney Love

**Effects**

- Euphoria
- Sense of Mastery
- Sexual Arousal
- Appetite Suppression

**Free Base Cocaine**

**Neurobiology**

[Diagram showing the effects of cocaine on the brain]

**Natural Rewards and Dopamine Levels**

[Graph showing the percentage of basal DA output with different samples and activities]

Adapted from: Di Chiara, Neuroscience, 1999; Fiorino & Phillips, Neuroscience, 1997; courtesy of Nora D. Volkow, MD.
Sensitization

- Seizures
- Psychosis
  - Paranoia
  - Visual, auditory and tactile hallucinations
  - Virtually indistinguishable from schizophrenia
- Stereotypical behaviors

Tolerance

- “First Dose” effect
  - Cardiovascular Effects
  - Euphoria, mastery, sexual arousal
  - But no longer-term tolerance
- Anorexia

Intoxication

1. Euphoria
2. Decreased appetite
3. Hypervigilance to frank paranoia
4. Autonomic hyperactivity
5. Stereotyped behavior
6. Seizures

Withdrawal

1. Dysphoria
2. Increased appetite
3. Fatigue
4. Psychomotor retardation
5. Vivid, unpleasant dreams
6. Insomnia or hypersomnia

Cognitive-Behavior Therapy

1. Functional Analysis
2. Skills Training to:
   - identify,
   - avoid, and
   - cope with thoughts & cravings

Adapted from Di Chiara & Imperato, Proceedings of the National Academy of Sciences USA, 1988; courtesy of Nora D. Volkow, MD.

Carroll, Sust Use Misuse, 2000.
Motivational Interviewing

REDS

1. Roll with Resistance
2. Express Empathy
3. Develop Discrepancy
4. Support Self-Efficacy


Motivational Interviewing Today

Beyond REDS

Engaging
Focusing
Evoking
Planning


Antidepressants - FAIL

Please note: This agent is not approved by the FDA for use in cocaine dependence.

Dopamine Agonists - FAIL

Please note: This agent is not approved by the FDA for use in cocaine dependence.

The Modafinil Promise - FAIL

Please note: This agent is not approved by the FDA for use in cocaine dependence.

The Cocaine Vaccine - FAIL

Please note: This agent is not approved by the FDA for use in cocaine dependence.
2

1990s: Ecstasy

“Freshmen love it, Sophomores like it, Juniors are ambivalent, and Seniors are afraid.”
Effects

• Essentially partly a stimulant and partly a hallucinogen:
  - An attenuated form of cocaine, plus
  - An attenuated form of LSD.
• Empathy (more than ecstasy).
• Profound feelings or relatedness to the rest of the world.
• In the 1970s, it was used in psychotherapy (unsuccessfully).

Methamphetamine

Methylene-Dioxy-Methamphetamine

Neurobiology

• Acutely increases serotonin levels by:
  - Blocking reuptake, and
  - Directly releasing the neurotransmitter.
• Chronically decreases serotonin levels by:
  - Depleting serotonin stores
  - Inhibiting the synthesis of new serotonin.
• Neurotoxicity.

Intoxication

• “Disco dump” and bruxism.
• Stimulant effects:
  - Wakefulness, endurance, energy.
  - Trismus, anorexia, diaphoresis, hot flashes.
• Serotonin Syndrome:
  - Treat with hydration, cooling, and sedation.
  - Do not use beta-blockers, which may worsen vasospasm and hypertension.

Withdrawal

• Anhedonia and depressed mood.
• Lethargy and fatigue for several days.
• Frank suicidality in the absence of co-occurring depressive disorder is rare.
• No indication for treatment.
Long-term Effects

- Associated with:
  - Depression
  - Anxiety
  - Panic Disorder
  - Increased impulsivity
  - Sleep disturbances
  - Cognitive dysfunction
- No FDA approved medications.
- MET and CBT are the major treatment modalities.

3
2000s: Methamphetamine

"It was the hardest boyfriend I ever had to break up with."
- Fergie
**Methamphetamine**

**Epinephrine**

**Pseudoephedrine**

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**Effects of Drugs on Dopamine Levels 2**

**Cocaine v. Methamphetamine (1)**

**COCAINEN**

- Inhibits Reuptake of synaptic dopamine

**METH**

- Inhibits Reuptake of synaptic dopamine
- Promotes Direct dopamine release

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Adapted from: Dr. Chiara & Imperato, Proceedings of the National Academy of Sciences USA, 1988; courtesy of Nora D. Volkow, MD.
Cocaine v. Methamphetamine (2)

COCAINEx
- Metabolizes rapidly
- Effects typically last 1-2 hours
- Withdrawal can last 1-2 days

METH
- Metabolizes slowly
- Effects typically last 10-20 hours
- Withdrawal can last several days


The Crystal Mouth

TalentlessHero.blogspot.com

The Frying Pan


People Recover


The Matrix Model

- Group Psychotherapy
- Individual Counseling
- Family Therapy
- Contingency Management (CM)
- Crystal Methamphetamine Anonymous
- Treatment of Co-occurring Disorders

The Case of Sertraline

Please note: This agent is not approved by the FDA for use in methamphetamine dependence.

Methylphenidate

Crystal Meth in a Gay Subculture

The Basic Pathway

1. Crystal meth intoxication
2. Decreased inhibitions and judgment
3. Increased sensation seeking and extreme sexual arousal
4. Unsafe sex
5. HIV transmission

Levourek and Ruggiero, Primary Psychiatry, 2006.
Sildenafil and HIV

• Erectile dysfunction, i.e., the “crystal dick” problem.
• In 1998, sildenafil became commercially available.
• From 1999 to 2005, new diagnoses of HIV in men having sex with men increased by almost 18%.

Leventis and Ruggiero, Primary Psychiatry, 2006.

Crystal, Sex, and the Internet

• The Perfect Storm
• Sex, both virtual and real, both safe and unsafe, is only a click away.
• Variable Intermittent Reinforcement

Leventis and Ruggiero, Primary Psychiatry, 2006.

Variable Intermittent Reinforcement

Crystal, Sex, and the Internet

Primary Prevention

Leventis and Ruggiero, Primary Psychiatry, 2006.

Primary Prevention

Leventis and Ruggiero, Primary Psychiatry, 2006.
Secondary Prevention

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<tr>
<th></th>
<th>Women</th>
<th>Men</th>
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<tbody>
<tr>
<td>Only same-sex</td>
<td>15.4%</td>
<td>15.2%</td>
</tr>
<tr>
<td>Mostly same-sex</td>
<td>24.2%</td>
<td>25.1%</td>
</tr>
<tr>
<td>Equally both sexes</td>
<td>17.7%</td>
<td>17.2%</td>
</tr>
<tr>
<td>Literally other sex</td>
<td>5.5%</td>
<td>5.6%</td>
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*p<0.05, ***p<0.001 based on logistic regression analysis adjusted for race, age, educational level, personal income, employment status, relationship status, health insurance status, geographic location, MSA, age at alcohol onset, and family history of AOD problems. Reference group was “heterosexual” group.

Sexual Attraction

5
2010s: Bath Salts
“Hey, I just met you, and this is crazy, but I’m on bath salts, and your face looks tasty.”

Effects

- Euphoria
- Heightened alertness
- Elevated energy
- Increased sexual arousal

Lavuud P and Herron A. The Addiction Casebook. 2014.

Cathinone (Khat)

Cathinone (Khat)

Mephedrone
Methylone

Smiles
2,5-dimethoxy-4-iodophenethylamine

The British Experience

Methylenedioxyxypovalerone (MDPV)

The British Data
1. Cocaine is the prototypical dopaminergic drug.
2. Ecstasy acts as half a mild stimulant and half a mild hallucinogen.
3. Crystal methamphetamine is the turbo cocaine.
4. Culturally-specific community involvement is the key to prevention.
5. Bath Salts are as pleasurable as ecstasy and as addictive as cocaine.

Thank you