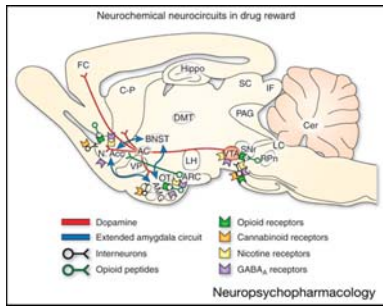


Neuropsychopharmacology

Figure 1



Neuropsychopharmacology (2010) 35, 217-236
doi:10.1038/npp.2009.110

Predictors of Addiction

- Substance
- Environment
- Individual

Substance

- Availability
- Cost
- Speed of entry to brain
- Effect on the brain

Environment

- Socioeconomic background
- Poor quality of parent-child relationships, parental conflict, parental & sibling drug use
- Association with antisocial & drug-using peers
- Social instability
- Trauma

Individual

- Genetics
- Sensation seeking personality
- Conduct disorder
- Psychiatric disorders
- Poor school performance
- Use of tobacco & alcohol in early adolescence
- Earlier onset of illicit drug use
- Multiple types of illicit drugs used

Who is at greater risk of developing problems with alcohol?

- Teen A can drink 5 beers before he gets wasted
- Teen B gets tipsy after just 1 beer

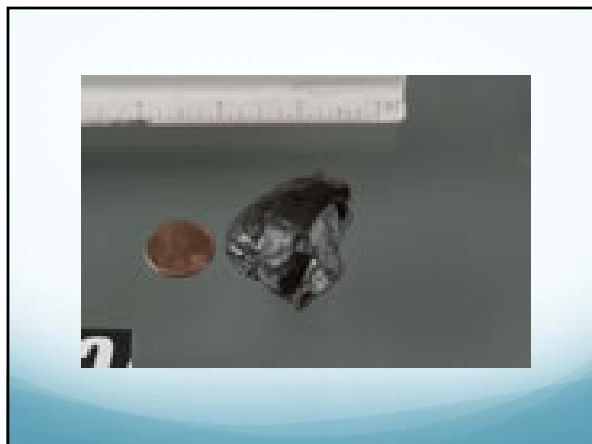


What Kinds of Substances Are Abused?

- Tobacco
- Sedatives
 - Alcohol
 - Opioids
 - Benzodiazepines & Barbiturates
- Stimulants
 - Cocaine
 - Amphetamines
- Hallucinogens
 - Marijuana
 - LSD, PCP, Mushrooms

Opioids

- Opiate: Naturally occurring drug (morphine, codeine) derived from opium plant *Papaver somniferum*
- Opioid: Morphine-like drug that occurs naturally, semi-synthetically (diacetylmorphine), or synthetically (hydromorphone, meperidine, methadone)
- Narcotic: Pharmacologically refers to morphine-like analgesics. In legal terms refer to controlled substances including opioids, stimulants, marijuana, etc.



Heroin

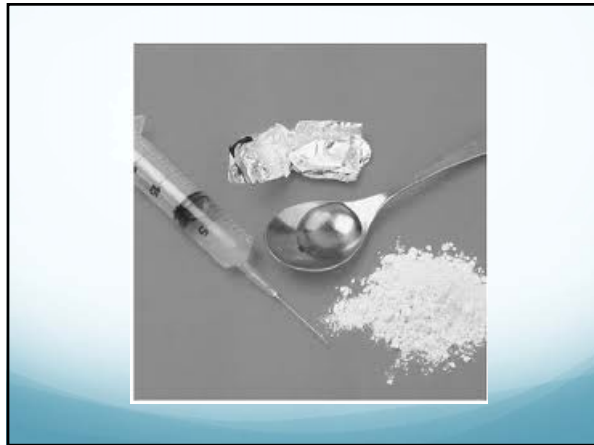
- Name: Diamorphine, diacetylmorphine
- Street Name: Black tar, down, dust, H, horse, junk, scag, smack
- Drug Class: Semi-synthetic opioid produced by combining morphine with acetic anhydride. First synthesized in 1874





Heroin-Route of Administration

- Intravenous: Mainlining, shooting, fixing, slamming
- Intramuscular: Muscling
- Subcutaneous: Skin popping
- Smoking: Chasing the dragon
- Intranasal: Snorting, sniffing
- Oral ingestion: Eating



Injection Sites

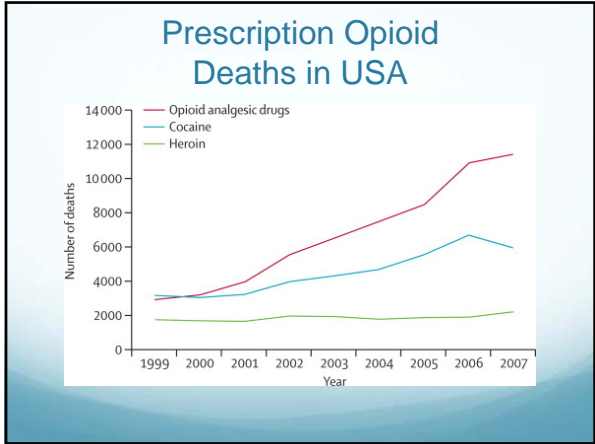
- Arm-Antecubital fossa, forearms, upper arm
- Hands & wrists
- Legs-Thighs & calves
- Feet
- Neck: Jugging
- Hidden/unusual sites-Sublingual, axilla, mammary/inframammary, inguinal, genital



Prescription Opioids


- Fastest growing drug abuse problem in North America





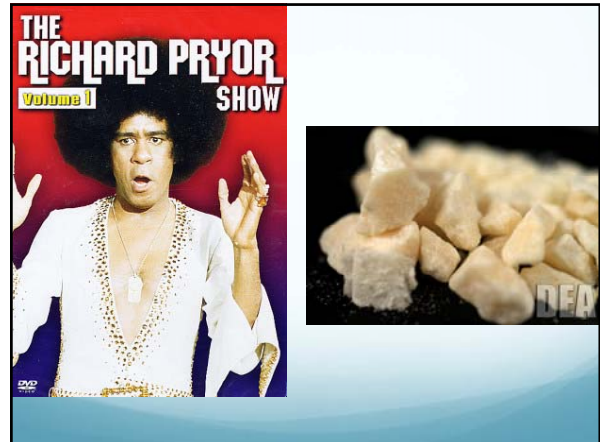
Cocaine

- Street Name
 - Cocaine hydrochloride: Blow, C, coke, powder, snow
 - Cocaine base: Crack, rock, freebase
- Drug Class: Derived from the leaves of the coca plant *Erythroxylum coca*. First purified in 1860s




Cocaine-Route of Administration

- Coca Leaves
 - Chewing & sucking
- Cocaine Hydrochloride
 - Intranasal
 - Intravenous
- Cocaine Base
 - Inhaled



Amphetamines

- Amphetamine: Bennies (Benzedrine), black beauties, eye-openers, lid poppers, pep pills, speed, uppers
- Dextroamphetamine: Dexies (Dexedrine)
- Methamphetamine: Speed, crystal meth, meth, crank, Christina, Tina
- Smokable methamphetamine: Ice, Hawaiian salt, rock candy
- 3,4 methylenedioxymethamphetamine (MDMA): Ecstasy, XTC, X, Adam, hug drug, love drug



Amphetamines-Route of Administration

- Oral
- Intranasal
- Inhaled
- Intravenous
- Rectal: Booty bump, butt rocket, plugging



Marijuana

- Name: Marijuana, marihuana, cannabis
- Street name: Ganja, grass, hemp, J, joint, Mary Jane, pot, reefer, skunk weed, weed
- Often described based on reported geographic origin, suggesting potency/quality: BC bud, Columbian, Jamaican, Panama gold

Marijuana

- Drug class: Hallucinogen derived from the plant *Cannabis sativa*. Principal psychoactive ingredient is delta-9-tetrahydrocannabinol (THC)



Marijuana

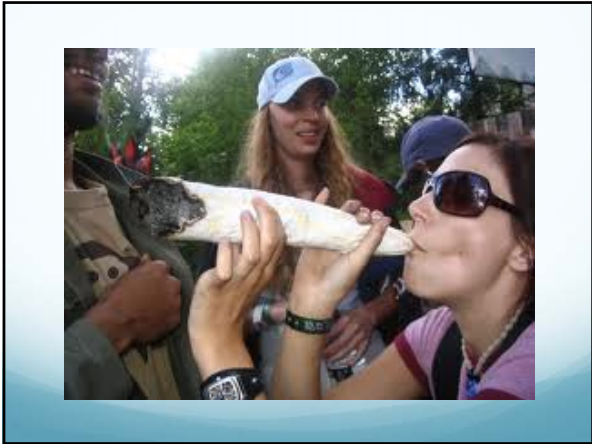
- Marijuana: Dried flowering tops & leaves (0.5-7.5% THC)
- Hashish (hash): Dried resin & compressed flowers (2-20% THC)
- Hashish oil: Oil extracted from hashish using organic solvent (15-50% THC)



Marijuana-Route of Administration

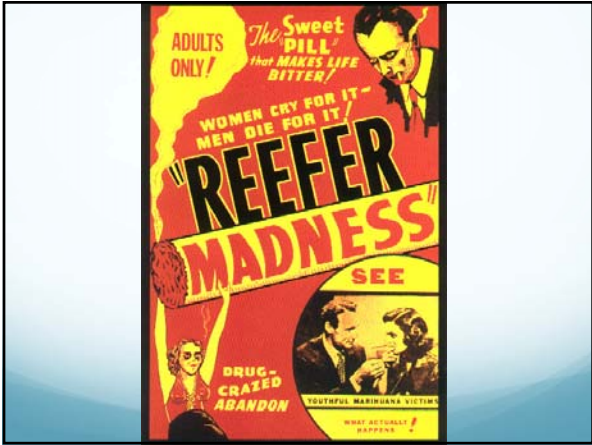
- Inhaled: Cigarette form (joint), pipe, water pipe
- Oral ingestion: Cooked, baked, butter, tea





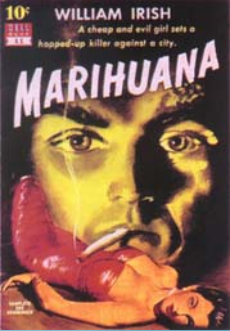
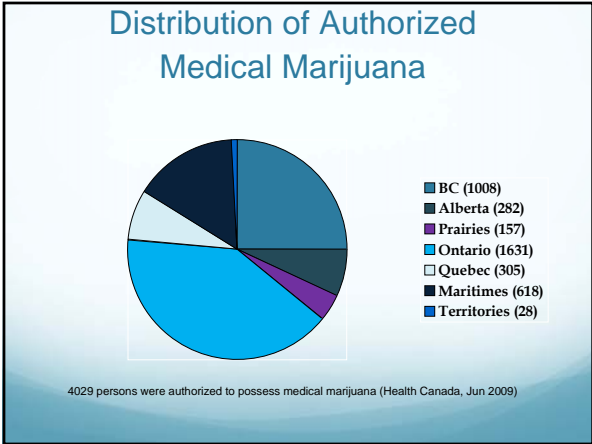
Pharmaceutical Cannabinoids

- Nabilone (Cesamet)
 - Synthetic cannabinoid
- Dronabinol (Marinol)
 - Δ^9 -THC
- Sublingual cannabis whole plant extract spray (Sativex)





Potential Medical Uses

- Pain
- Nausea
- Appetite
- Muscle spasm
- Seizures
- Glaucoma

What is the Worst Drug Addiction?



What is the Worst Drug Addiction?

- Which drug is most widely used?
- Which drug causes the most harm?
- Which drug is the most addictive?
- Which drugs have specific medication treatments available?

Which Drug is Most Widely Used?



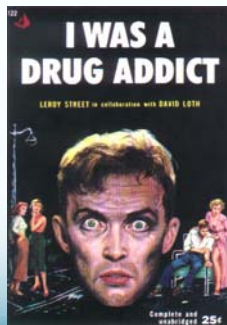
Illicit Drug Use By People Aged 15-64 Years in 2009

	World	North America
Marijuana	124-202 M (2.8-4.5%)	32 M (10.7%)
Opioids	11-20 M (0.3-0.5%)	1-1.6 M (0.3-0.5%)
Amphetamines	14-56 M (0.3-1.3%)	3.5 M (1.1%)
Cocaine	14-21 M (0.3-0.5%)	5.7 M (1.9%)

Canadian Alcohol & Drug Use Monitoring Survey 2010

	Lifetime Use	Use in Past Year
Alcohol	88.9 %	77.0 %
Cannabis	41.5	10.7
Cocaine		0.7
Speed		0.5
Hallucinogens		1.1
Ecstasy		0.7

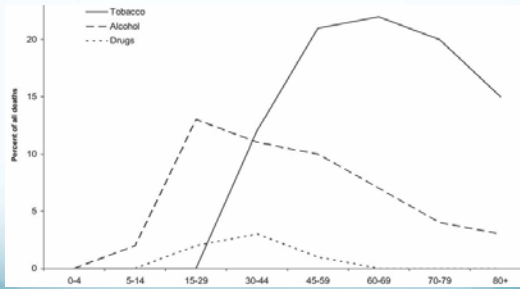
Which Drug Causes the Most Harm?



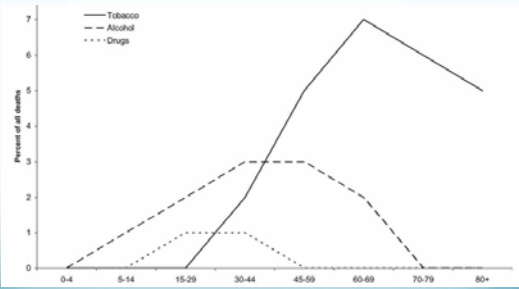
Global Estimate of Use & Burden of Disease (Millions/Global Percent)

	Illicit Drugs	Alcohol	Tobacco
Past year use	149-272 M (3.3-6.1%)	2830 M (44%)	
Problem use	15-39 M (0.3-0.9%)	76.3 M (1.2%)	1670 M (26%)
Deaths	0.25 M (0.4%)	2.25 M (3.8%)	5-11 M (8.7%)

Death Due to Tobacco, Alcohol, & Drugs in Males (2001)



Death Due to Tobacco, Alcohol, & Drugs in Females (2001)



Estimated Death from Illicit Drugs

Opioids	14.7
Cocaine	4.7-7.6
Amphetamines	6.2
Cannabis	1

Note: Cannabis deaths likely underestimated e.g. motor vehicle accidents

Which Drug is the Most Addictive?



Use of Drugs of Abuse in US (1990-92)

Drug	Ever Used	Dependence in Users	Population Prevalence of Dependence
EIOH	91.5%	15.4	14.1
Tobacco	75.6%	31.9	24.1
Marijuana	46.3%	9.1	4.2
Cocaine	16.2%	16.7	2.7
Heroin	1.5%	23.1	0.4

Strategies to Deal with the Consequences of Drug Use

- Prevalence Reduction
 - ↓ # people who engage in drug use by prevention (e.g. education) & treatment
- Quantity Reduction
 - ↓ extent or amount of drug use (e.g. drug eradication, criminal justice system)
- Harm Reduction
 - ↓ harmful consequences of drug use when drug use occurs

Prevention

- The most effective prevention programs are actually those that promote social cohesion and self-esteem, not drug information/scare tactics (e.g. "Positive Action")

"WHEN YOU DO GOOD, YOU FEEL GOOD": The thoughts-actions-feelings cycle that is shown on posters and stickers reminds children of the Positive Action program's central idea. Six units each focus on a specific theme.

- Developing self-concept: What it is, how it's formed, and why it's important (philosophy and thoughts-actions-feelings circle)
- Maintaining a healthy body and mind (includes motivation to learn)
- Managing yourself responsibly (self-control skills)
- Getting along with others by treating them the way you like to be treated (social-emotional skills and character)
- Being honest with yourself and others (mental health)
- Improving yourself continually (setting and achieving goals)



How Are Drug Addictions Treated?

- Detoxification vs. Relapse Prevention
- Non-Pharmacologic vs. Pharmacologic

Detoxification

- The process of stopping the drug and supporting the person through the withdrawal period
- Yoda says "Detoxification alone does not addiction treatment make!"



Non-Pharmacologic Treatment

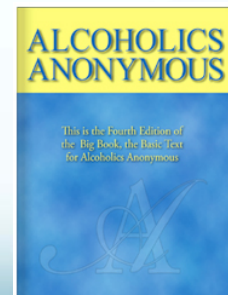
- Brief Intervention
- Mutual Support Groups (e.g. AA)
- Motivational Enhancement
- Cognitive Behavioral Therapy
- Contingency Management
- Network Therapy
- Counseling (individual, group, family)
- Recovery Houses & Therapeutic Communities

Brief Interventions

- Brief (e.g. 5-10 minutes), patient-centered counseling strategies focused on changing behavior
- Focus on small, incremental success rather than the final objective
- Often repeated over a 6-8 week period
- Cost-effective
- May include education, contracting, negotiating, goal setting

Mutual Support Groups

- Common features
 - Acceptance
 - Social Support
 - Mentoring



Alcoholics Anonymous

- "A fellowship of men & women who share their experience, strength, & hope with each other that they may solve their common problem & help others recover from alcoholism. The only requirement for membership is a desire to stop drinking"
- Founded in 1935 by Bill W a stockbroker from New York & Dr. Bob S a surgeon from Akron
- 1939 the Big Book of Alcoholics Anonymous is published
- 1943 Canada's first AA group forms in Toronto

Alcoholics Anonymous

- Recovery program based on the 12 steps
- Organization/structure based on the 12 traditions
- Positive correlation between AA attendance & drinking outcomes

Pharmacologic Treatment

- Tobacco
 - Nicotine Replacement
 - Bupropion
 - Varenicline
- Alcohol
 - Disulfiram
 - Acamprosate
 - Naltrexone
- Opioids
 - Methadone
 - Buprenorphine
 - Naltrexone

Medications Limited to Restricted Coverage Only by BC Pharmacare

- Tobacco (only covered within the last year, & limited to 3 months per year)
 - Nicotine Replacement
 - Bupropion
 - Varenicline
- Alcohol
 - Acamprosate
 - Naltrexone
- Opioids
 - Buprenorphine
 - Naltrexone

Medications Restricted to Physicians With Federal Approval to Prescribe

- Opioids
 - Methadone
 - Buprenorphine

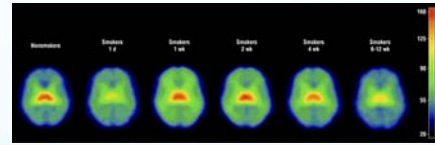
Medications with No Restrictions

- Alcohol
 - Disulfiram
- Disulfiram (Antabuse) the only medication treatment for addiction available in BC with no access restrictions, it is also the least effective

Why Are Addictions So Difficult To Treat?

- Substance use creates euphoria/pleasure
- Social stigma creates barriers to accessing treatment
- Major changes are required in the external environment (i.e. it's not just about the biology & chemistry)
- Co-existing medical & psychiatric conditions
- Drugs of abuse cause changes in the way the brain works that last long after the drug is gone
- Very limited number of medication treatment options available

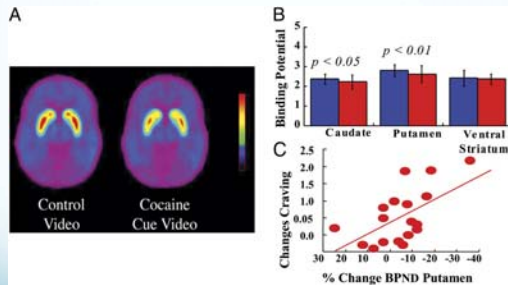
Mean parametric images illustrating the availability of the nicotinic acetylcholine receptor containing the (beta)2 subunit in nonsmokers and tobacco smokers



Cosgrove, K. P. et al. Arch Gen Psychiatry 2009;66:666-676.

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DA changes induced by conditioned cues in active cocaine-addicted subjects.



Volkow N D et al. PNAS 2011;108:15037-15042

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PNAS

What Is the Future of Addiction Treatment?

- Increasing awareness of addiction as a chronic medical condition
- Increasing advocacy for people with addictions
- Increasing understanding of how the brain works and how it is affected by addictions
- Development on new treatments for addictions
 - e.g. vaccines against nicotine and cocaine, genetic manipulation (e.g. cocaine caterpillar)

Caterpillars & Cocaine

- A South American caterpillar that normally feeds on coca leaves and is unaffected by the cocaine. This is because this caterpillar's dopamine transporter in the brain does not respond to cocaine
- Through genetic engineering, scientists have been able to change mice, so that their brains react to cocaine the like the caterpillar brain, resulting in cocaine-resistant mice

FOOD NOT DRUG A coca leaf—the source of cocaine—is just food to the South American caterpillar *Eloria noyesi*. Like some other insects, its dopamine transporters are much less sensitive to cocaine than those of mice.

