Drugs 1

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What drug is associated with this image?

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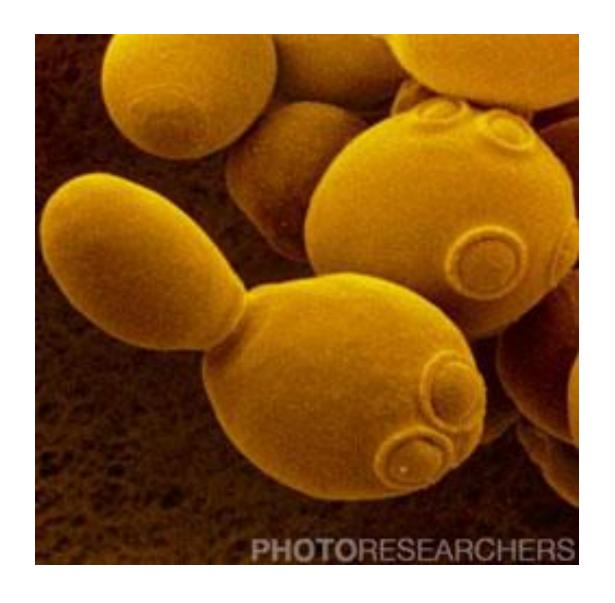






Also see: https://www.sciencedaily.co m/releases/2012/06/12060 6102605.ht





Did You Know?

Driving Under the Influence

- Approximately 4 people in Canada are killed each day in car crashes involving a <u>driver under the</u> <u>influence of drugs, alcohol, or both</u>.
- In 2013, car accidents resulted in 2,430 deaths,
 - 369 (15.2%) driver under the influence of alcohol,
 - 683 (28.1%) driver under the influence of drugs other than alcohol.
 - 399 (16.4%) driver under the influence of drugs and alcohol.

https://www.addictioncenter.com/addiction/addiction-in-canada/

2014 Stats

Hospitalization costs of substance abuse increased between 2006 and 2011

- Alcohol \$118M > \$145M (45-60 year olds)
- Opioids \$9M > \$15M (25-44 year olds)
- Cannabis \$9M > \$14M (15-24 year olds)
- Cocaine decreased to \$13M
- http://www.ccsa.ca/Resource%20Library/CCSA-Substance-Use-Hospital-Impact-Infographic-2014-en.pdf

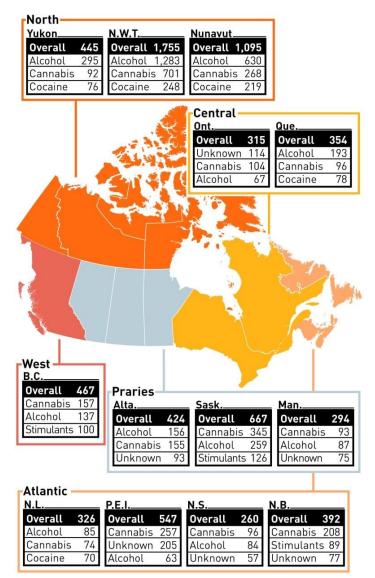


2017-2018 Canadian study

23,500 youths hospitalized due to cannabis and other substance use = ~65/day

Hospitalization rates for harm caused by substance use

per 100,000



Canadian Legislation

The Controlled Drugs and Substances Act and related sections of the Criminal Code provide Canadian Drug legislation.



What is a drug – narcotics

- •A drug is a natural or synthetic substance that is used to produce physiological or psychological effects in humans or other higher order animals.
- •Narcotic drugs are analgesics, meaning they relieve pain by depressing the central nervous system response. This effects: blood pressure, pulse rate and breathing rate.
- The regular use of a narcotic drug may lead to physical dependence.
- •The most common of narcotic drugs is opium, extracted from poppies.



Opiates

- Morphine is readily extracted from opium and is used to synthesize heroin.
- Addicts frequently dissolve heroin in water by heating it in a spoon, and then use this for injection.
- •Heroin produces a "high" that is accompanied by drowsiness and a sense of well-being that generally lasts for three to four hours.
- Codeine is also present in opium, but it is usually prepared synthetically from morphine.

http://www.victoriananursery.co.uk/pretty_perennials/poppy_the_opium_poppy/

The many faces of the opium poppy



afghan-opium.jpg



http://blog.thegooddrugsguide.com/0754/7-countries-where-drug-lords-lord-it-over/



Researcher Peter Facchini with the poppy plants he studied. Source: University of Calgary.



http://en.wikipedia.org/wiki/Opium

Other Opiates



- •OxyContin, with the active ingredient oxycodone, is <u>not</u> derived from opium or morphine, but does have the same physiological effects on the body as do opium narcotics.
- •Methadone, which is pharmacologically related to heroin, appears to eliminate the addict's desire for heroin while producing minimal side effects.

(Photo: Bruce Taylor, New Hampshire State Police Forensic Lab.) **Lethal Doses**

Fentanyl

- •Fentanyl patches are on the World Health Organization's List of Essential Medicines, the most effective and safe medicines needed in a health system.
- •Fentanyl 75 times stronger than morphine with stronger derivatives, e.g. carfentanil illegally made and mixed with heroin or cocaine
- Fentanyl causes thousands of deaths each year due to overdoses
- Narrow therapeutic index (the difference between a therapeutic dose and a toxic dose is not large)



Fentanyl

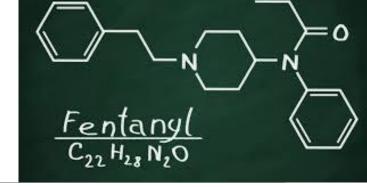
- Manslaughter charges are now being laid against some dealers in Ontario
 - requires a specific set of circumstances
- •https://www.ontario.ca/page/getnaloxone-kits-free
 - Recognize and temporarily reverse an opioid overdose
 - Naloxone can temporarily reverse an opioid (e.g. fentanyl) overdose.





Call 911 if you suspect someone has overdosed!

Fentanyl and Forensics



Drug identification – forensic chemistry, toxicology

- Fentanyl Test: Neogen Corporation's Fentanyl ELISA (Enzyme-Linked ImmunoSorbent Assay) test kit
- "Rapid detection of fentanyl, fentanyl analogues, and opioids for on-site or laboratory based drug seizure screening using thermal desorption DART-MS and ion mobility spectrometry" Sisco et al 2017 Forensic Chemistry 4: 108-115

Forensic pollen scientists are helping the US track opioids

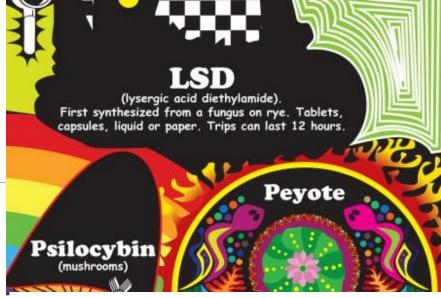
By Zoë Schlanger

Pollen is every where

https://qz.com/1635897/t he-us-is-using-pollen-totrack-illegal-drugs-likefentanyl/

Hallucinogens

- Another class of drugs is hallucinogens; <u>marijuana</u> is the most well-known member of this class.
- Hallucinogens cause marked changes in normal thought processes, perceptions, and moods.
- •Marijuana is the most controversial drug in this class because its longterm effects on health are still largely unknown.





Marijuana



http://www.narconon.org/drug-information/marijuana-history.html



http://psychologyface.com/2011/06/effect-of-marijuana/





http://www.policemag.com/Channel/Patrol/Articles/2010/11/It-s-Time-to-Get-Tough-on-Drugs-America.aspx



Marijuana

- •Marijuana refers to a preparation derived from the plant *Cannabis*.
- •The chemical substance largely responsible for the hallucinogenic properties of marijuana is known as *tetrahydrocannabinol*, or THC.
- •The THC content of *Cannabis* varies in different parts of the plant, generally decreasing in the following sequence: resin, flowers, leaves, with little THC in the stem, roots or seeds.
- The THC-rich resin is known as hashish.
- Marijuana does not cause physical dependency, but the risk of harm is in heavy, long-term use

Marijuana: Newer Forms of Consumption

- •shatter, wax, errl, oil, live resin, or dabs
- distillates





Impact of Legalization - Forensics

- Impaired driving
- •Road side assessments standardized field sobriety test
- Saliva tests Dräger drug test 5000
 - Not accurate at low temperatures, false positives
- Testing a newer device from Abbott called 'Sotaxa'
 - Answer in 5 minutes not impacted by cold
- Blood tests
- Forensic Science involved in correct identification and tracking to source
 - Chemistry, toxicology and DNA analysis
 - Most crops are clones specific clones have been linked to organized crime

"Sewage Epidemiology" Estimating Cannabis Use by Analysis of Sewage



Population served by wastewater treatment plant (WWTP)

Study by Rebecca Hale: Forensics
Honours project (2018-2019;
Worked in Chris Metcalfe's lab



RESEARCH QUESTION:

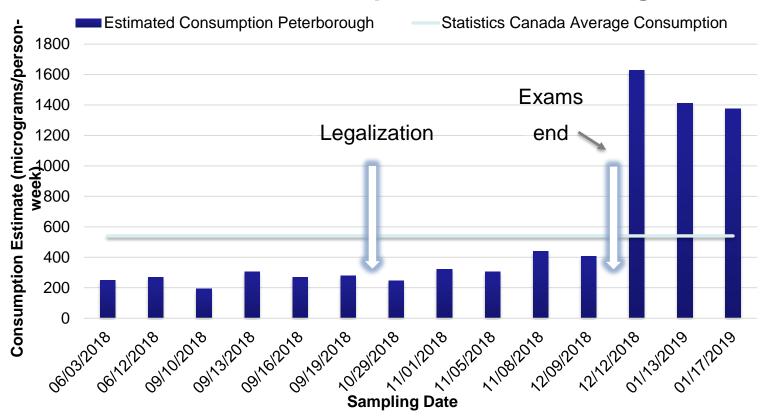
Did cannabis use increase in Peterborough after legalization of marijuana?

Concentrations of THC metabolite in raw sewage entering WWTP



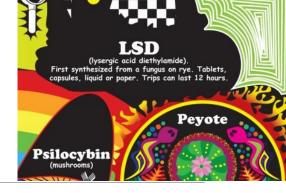
Estimates of Cannabis Use in Peterborough

Cannabis Consumption in Peterborough



CONCLUSIONS: Cannabis use did not increase immediately following legalization of marijuana (below national average pre-legalization) in 2018, but increased when exams ended at Trent and Fleming. Elevated use persisted into January, 2019.

Other Hallucinogens



Other hallucinogens include LSD, mescaline, PCP, psilocybin, and MDMA (Ecstasy).

LSD is synthesized from lysergic acid, and can cause hallucinations that can last for 12 hours.

Phencyclidine, or PCP, is often synthesized in clandestine laboratories and is often smoked, ingested, sniffed.

Phencyclidine is often mixed with other drugs, such as LSD, or amphetamine, and is sold as a powder ("angel dust"), capsule, or tablet.

Oral intake of PCP first leads to feelings of strength and invulnerability, which may turn to depression, tendencies toward violence, and suicide.

LSD



http://www.gov.mb.ca/agriculture/crops/insects/fad64s00.html







St Anthony's fire

http://en.wikipedia.org/wiki/Ergotism

Ergotism, long term ergot poisoning usually from eating rye or other cereals infected with *Claviceps* purpurea or ergoline (ergot alkaloid) drugs

Historically associated with bewitchment – 15th century Germany, Salem witch trials

Ergotism

http://en.wikipedia.org/wiki/Ergotism

Convulsive symptoms

- Convulsive symptoms include painful seizures and spasms, diarrhea, paresthesias (tingling), itching, mental effects including mania or psychosis, headaches, nausea and vomiting.
- Usually the gastrointestinal effects precede central nervous system effects.
- Hallucinations resembling those produced by LSD although ergot's hallucinations more strongly resemble a delirious and psychotic state.

Ergotism

Gangrenous symptoms

- The dry gangrene is a result of vasoconstriction induced by the ergotamine-ergocristine alkaloids of the fungus.
- Affects more poorly vascularized extremities fingers and toes.
- Symptoms include desquamation or peeling, weak peripheral pulses, loss of peripheral sensation, edema and ultimately the death and loss of affected tissues. http://en.wikipedia.org/wiki/Ergotism

Several drugs have been derived from ergot chemicals

Legal or Illegal?



Forensic analysis of hallucinogenic fungi: DNA-based approach*



Psilocybin

Psilocybin is produced by over 200 fungal species, most potent are members of the genus *Psilocybe* (*P. azurescens*, *P. semilanceata*, and *P. cyanescens*)

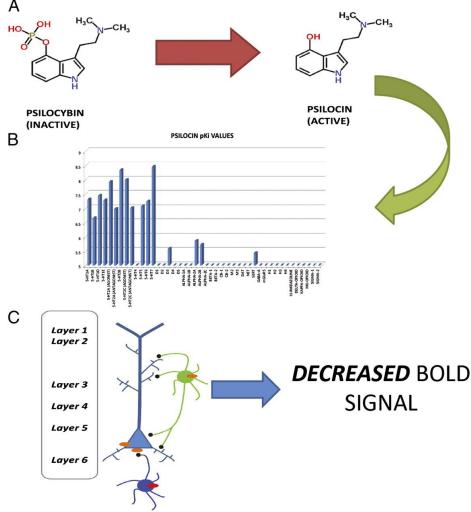
Psilocybin is a prodrug that is converted to psilocin, which has mind-altering effects similar (in some aspects) to those of LSD, mescaline, and DMT.

The effects include euphoria, visual and mental hallucinations, changes in perception, a distorted sense of time, and spiritual experiences, and can include possible adverse reactions such as nausea and panic attacks.

http://en.wikipedia.org/wiki/Psilocybin

Psilocybin diminishes brain activity and connectivity. A

Psilocin interacts with Many neurotransmitter receptors to modulate activity



Lee H, and Roth B L PNAS 2012;109:1820-1821

Depressants

Depressants are class of drugs that depress the functions of the central nervous system.

Depressants calm irritability and anxiety and may induce sleep.

These include alcohol (ethanol), barbiturates, tranquilizers, and various substances that can be sniffed, such as airplane glue, model cement, or aerosol gas propellants such as freon.

Alcohol



Depressants

Alcohol (ethyl alcohol) enters the body's bloodstream and quickly travels to the brain, where it acts to suppress the brain's control of thought processes and muscle coordination.

Barbiturates, or "downers," are normally taken orally and create a feeling of well-being, relax the body, and produce sleep.

Tranquilizers, unlike barbiturates, produce a relaxing tranquility without impairment of high-thinking faculties or inducing sleep.

Sniffing has immediate effects such as exhilaration, but impairs judgment and may cause liver, heart, and brain damage, or even death.

Stimulants

The drug classification of stimulants includes amphetamines, sometimes known as "uppers" or "speed," and cocaine, which in its free-base form is known as *crack*.

Stimulants are substances taken to increase alertness or activity, followed by a decrease in fatigue and a loss of appetite.



AMPHETAMINES

Sleep is for the weak



http://ohnotheydidnt.livejo urnal.com/51152805.html



Stimulants

Amphetamine and methamphetamine, often injected intravenously, cause an initial "rush," followed by an intense feeling of pleasure.

This is followed by a period of exhaustion and a prolonged period of depression.

Cocaine, extracted from the leaves of *Erythroxylin coca*, causes increased alertness and vigor, accompanied by the suppression of hunger, fatigue, and boredom.

Crack is cocaine mixed with baking soda and water, then heated.

Crack is often smoked in glass pipes, and like cocaine stimulates the brain's pleasure center.

Coca ---- Cocaine ---- Crack



http://www.dismalworld.com/blackeconomy/coca_trade_in_peru.php









Club Drugs

The term *club drugs* refers to synthetic drugs that are used at nightclubs, bars, and raves (all-night dance parties).

Substances that are often used as club drugs include, but are not limited to, MDMA (Ecstasy), GHB (gamma hydroxybutyrate), Rohypnol ("Roofies"), ketamine, and methamphetamine.

GHB and Rohypnol are central nervous system depressants that are often connected with drug-facilitated sexual assault, rape, and robbery.





Gursky Union Rave Caltech:

http://www.its.caltech.edu/~squires/gursky/gursky_10.html

Rave Candy : ecstasy









Methylenedioxymethamphetamine, also known as MDMA or Ecstasy, is a synthetic mind-altering drug that exhibits many hallucinogenic and amphetamine-like effects.

Ecstasy enhances self-awareness and decreases inhibitions, however, seizures, muscle breakdown, stroke, kidney failure, and cardiovascular system failure often accompany chronic abuse.

Ketamine is primarily used as a veterinary animal anesthetic that in humans causes euphoria and hallucinations.

Ketamine can also cause impaired motor functions, high blood pressure, amnesia, and mild respiratory depression.



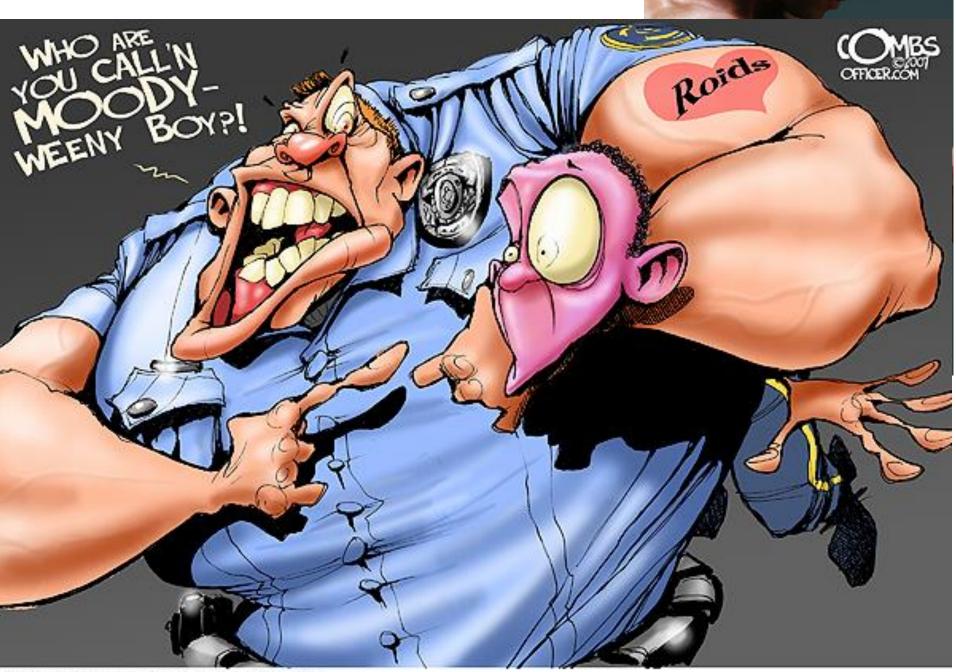
Anabolic Steroids

Yet another category of drugs is the anabolic steroids.

These are synthetic compounds that are chemically related to the male sex hormone testosterone.

Anabolic steroids are often abused by individuals who are interested in accelerating muscle growth.

Side effects include unpredictable effects on mood and personality, depression, diminished sex drive, halting bone growth, and liver cancer.



Summary

Overview of natural origin of some drugs

Cost to Canadian society

Discussion of different classes of drugs

Opiates, hallucinogens, depressants, stimulants, club drugs

Next Lecture we will cover

- Canadian drug laws
- Drug offense penalties
- Introduction to crime scene collection of drugs
- Drug identification