Introduction to Forensic Science – (Criminalistics)

Basic

Crime **S**cene **I**nvestigation Techniques

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This week the student will learn:

- Definition of drug
- Psychological vs physical dependence
- Definition of narcotic and its effect on CNS
- Define hallucinogen, depressant, and stimulant and their effects on CNS
- Methods of drug identification
- Effects of alcohol on system
- HOMEWORK
  - Read chapter 11 - Turn in lamp assignment

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Manufacturers produce enough “downers” for 40 pills for every man, woman &child

Review – Drugs

- Better living through chemistry, is NOT our credo.
- This is not your drug course, we are interested in the lab and CSI involvement.
- For our purposes, “drug” has a very wide definition.
- A drug can be defined as a natural or synthetic substance that is used to produce physiological or psychological effects in humans or other higher order animals.
- (All humans satisfy this requirement)

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Review – Drugs (trivia)

- This includes LSD, Heroin, Meth, PCP, Cocaine, Mushrooms, Barbiturates, Alcohol, Caffeine, Tobacco and others.
- 90 Million Americans drink alcohol regularly (2 out of every 3)
- 10 Million are addicted.
- 1915 prohibition fueled the rise of the KKK
- If all the Nicotine in one cigarette were absorbed into the body, the effect would be toxic, even fatal.
- Caffeine is the most widely used psychoactive drug.

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Review – Drugs (trivia)

- There are approximately ½ million known heroin addicts.
- There are 6 million users of cocaine.
- In the U.S. 23 million people use illicit drugs.
- More than 75% of all evidence evaluated in crime labs is drug related.
- Early drug laws were to control those considered "habit-forming", Opium, cocaine and weed.

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Review – Drugs (terms)

- Psychological Dependence – The conditional use of a drug caused by underlying emotional needs
- The person NEEDS the drug to aid in control of emotions, etc.
- Physical Dependence – Physiological need for a drug that has been brought about by its regular use. It is characterized by withdrawal sickness when administration of the drug is abruptly stopped.

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Review – Drugs (terms)

- Narcotic –
  - Analgesic or pain killing substance that depresses vital body functions such as blood pressure, pulse rate and breathing rate.
  - Regular use will cause a physical dependence.
- Narcotic comes from the Greek narkoticos
  - A state of lethargy or sluggishness.
- Analgesic –
  - A drug or substance that lessens or eliminates pain.
  - They work on the central nervous system

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Review – Drugs (terms)

- The source of most analgesic narcotics is opium.
- The active ingredient is … morphine

- Hallucinogen – A substance that induces changes in mood, attitude, thought or perception.
  - (That makes my wife a hallucinogen)

- Depressant – A substance that is used to depress the functions of the central nervous system.
  - Depressants calm irritability and anxiety and may induce sleep.
  - Like Jack Daniels
  - Who likes the Bohemian Rhapsody?

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Review – Drugs (terms)

- Stimulant – A substance taken to increase alertness or activity.
- Anabolic Steroids – chemicals that promote muscle growth.
  - Synthetic
  - Related to testosterone

- Screening test –
  - Not what happens to handcuffed persons in the back of police cars
  - A test that is nonspecific and preliminary in nature
- Confirmation – A single test that specifically identifies a substance

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Review – Drugs (terms)

- Microcrystalline Tests
  - Tests to identify specific substances by the color and morphology of the crystals formed when the substance is mixed with specific reagents
  - Top-Heroin in 10% Sodium Acetate
  - Bottom-In Mercuric Iodine

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Review – Drugs

- What personal factor causes physical addiction or dependence?
  - The desire to avoid withdrawal symptoms
- What physical factor causes addiction?
  - Previous adherence to a regular intake, to avoid symptoms
  - Heroin requires dosing at least every 6 – 8 hrs
- **Narcotics –** pain killers
- Heroin - Made by reacting Morphine with either acetic anhydride (smells like vinegar) or acetyl chloride
  - Works on the central and autonomic nervous systems

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Review – Drugs

- Heroin
  - Users suffer from constipation
  - Decrease in body temperature
  - Dilation of the pupils
  - Nausea
  - Respiratory depression
  - Clammy skin
  - Convulsions
- Heroin
  - Purity averages about 35% in the U.S.
  - Quinine is the usual cutting agent
  - Starch, lactose, procaine & mannitol are others
  - In N.Y. there are 200,000 heroin addicts 60% have AIDS

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Review – Drugs

- Heroin
  - 1874, British chemist produced Heroin when experimenting with morphine
  - Initially discovered while attempting to find a non-habit forming pain reliever to replace morphine.
  - Hotel California by the Eagles about Heroin
  - BAYER (the German Pharmaceutical company) named it and marketed it as a "sedative for coughs" in 1898
  - Named after the German word Heroisch, meaning large and powerful

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Review – Drugs

- Codeine – also opiate
- 1/6th as strong as morphine
- Oxycontin – not opiate, synthetic
  - Oxycodone is primary ingredient
  - Structure closely resembles heroin and morphine
  - 7 million scripts/year
- Methadone
  - Synthetic, also invented in Germany
  - Prevents addicts from getting a "high" from heroin or morphine
  - Affects last 12-24 hours
  - Legitimately used for pain relief
  - Originally named after Hitler

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Review – Drugs

- **Hallucinogens**
- 1950's – U.S. Army and the CIA experimented on soldiers and civilians (without their knowledge or consent) with LSD to test its use for chemical warfare and as a "truth serum"
- Harvard Psychologists Timothy Leary and Richard Alpert
  - Started the "psilo-cybin project" to study the mushroom.
  - Became a front for friends use of LSD

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Review – Drugs

- Leary's friends included:
  - Aldous Huxley (Brave New World)
  - Ken Kesey (One Flew Over the Cuckoo's Nest)
  - Poet Allen Ginsberg
  - Cary Grant was the "High Cardinal" at the LSD Colony in Hollywood
  - White Rabbit by Jefferson Airplane
  - Sunshine Superman by Donovan
  - Magical Mystery Tour and Lucy in the Sky with Diamonds by the Beatles are about LSD
- LSD is absorbed through the intestines and excreted in urine in 24 hours

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Review – Drugs

- First "trip" occurred in 1943 by the discoverer Albert Hofmann
  - First through skin contact on his fingers
  - 3 days later he took 250 milligrams
  - 0.1 milligrams will produce an effect.
  - 25 micrograms will last 12 hours
  - In 1954 Eli Lily created a totally synthetic version.
  - Produces Mydriasis (prolonged dilation of the pupil)
  - Raised body temp, rapid heartbeat, elevated blood pressure, increased blood sugar, salivation, tingling in toes and fingers, etc, etc, etc

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Review – Drugs

- Most controversial member is marijuana
  - It is the most widely used illicit drug in U.S.
  - 43 million have tried it
  - ½ may be current users
  - The resin (hashish) is the primary concern
  - THC is the active ingredient
  - Loose vegetation is 3 – 4.5% THC
  - Sinsemilla is 6 – 12% THC
  - Hash is 2 – 8% THC
  - Hash Oil is 8 – 22% THC
  - Sinsemilla comes from the unfertilized flowering tops of female plants

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Review – Drugs

- Other members include Mescaline, PCP – Phencyclidine, Psilocybin, MDMA or Ecstasy – (methylenedioxymethamphetimine)
- PCP is a tranquilizer for large animals like buffalo and elephant
- PCP requires special handling because it will penetrate regular plastic.
- A person can be dead and still attack and kill people for quite some time when on PCP

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Review – Drugs

- **Depressants**
- Barbiturates
  - Relax and cause a feeling of well being, usually produce sleep
  - Synthesized by German chemist Adolf Von Bayer
  - Dose is usually 10-70 milligrams
  - 1970's a non-barbiturate depressant discovered, methaqualone or Quaalude.
- Alcohol (ethyl alcohol)
  - The most widely used and abused drug.
  - Affects central nervous system

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Review – Drugs

- Tranquilizers
  - Are depressants but have less effect on central nervous system than barbiturates
  - Supposed to produce relaxation without impairment of high thinking faculties or the inducement of sleep
- Common mild tranquilizers are:
  - Miltown
  - Librium
  - Valium
- Glue Sniffing
  - All substances contain volatile gaseous substances that depress the central nervous system

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Review – Drugs

- Glue Sniffing
  - Toluene (airplane glue) is most desired
  - Others include gasoline, methyl ethyl ketone, naptha, trichloroethylene, freon, computer cleaner, air freshener, etc.
  - Significant risk of death
- **Stimulants**
- Amphetamines
  - Synthetic drugs that stimulate the central nervous system
  - 5-20 milligrams increase alertness, provide feeling of well being, decrease appetite and decrease fatigue

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Review – Drugs

- Amphetamines
  - Amphetamines and methamphetamine can be injected at 500 – 1,000 milligrams every 2-3 hours on a "speed binge".
  - Following the binge, exhaustion and days of nonstop sleep occurs.
  - ICE is smokable form
- Cocaine
  - Effects are similar to amphetamines
  - It produces the strongest psychological compulsion for continued use of all abused drugs
  - Crack is smokable form

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Review – Drugs

- Cocaine
  - Stimulates a pleasure center at the base of the brain
  - Provides many times the stimulation the center can receive in any other fashion
  - Drug gets to brain in 15 seconds, about the same as injection
- Club Drugs
  - Refers to a group of synthetics popular in clubs, bars and raves
  - MDMA (Ecstasy), GHB (gamma hydroxybutyrate), Rohypnol (date rape drug), Ketamine (animal anesthetic), Methamphetamine, and others.

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Review – Drugs

- Club Drugs
  - GHB & Rohypnol are central nervous system depressants.
  - Both used as date rape drugs
  - GHB causes dizziness, sedation, headache and nausea
  - Rohypnol causes muscle relaxation, loss of consciousness, loss of memory
- MDMA (Ecstacy)
  - Most popular drug at raves
  - Synthetic mind-altering drug that exhibits many hallucinogenic and amphetamine like effects
  - Originally patented as an appetite suppressant

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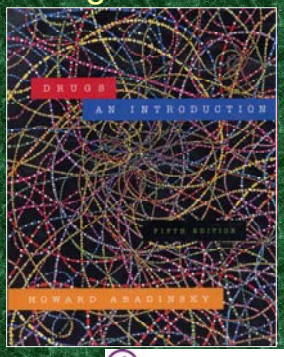
Review – Drugs

- For additional information about drugs, get the book at right by Abadinsky.
- Covers drugs and culture from the start of time to current.



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Review – Drug Identification

- When making drug ID, either it is a certain drug, or it is not.
- There is no gray area.
- After making positive ID, the chemist must be capable of defending his opinion in court.
- To reduce the number of tests that must be run, screening tests are run first.
- This reduces the number of possibilities to a reasonable number.

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Review – Drug Identification

- Testing may take the following course:
  - Color tests
  - Microcrystalline tests
  - Chromatography
  - Spectrophotometry
  - Mass spectrometry
- Color tests produce characteristic colors when drugs are exposed to reagents
- Color Tests
  - Marquis – turns purple in the presence of heroin, morphine & opium derivatives
  - Turns orange-brown with amphetamines and methamphetamines
  - 2% formaldehyde in sulfuric acid

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Review – Drug Identification

- Color Tests
  - Dillie-Koppanyi – turns violet-blue when exposed to barbiturate
  - 1% cobalt acetate is added to suspect drug, then 5% isopropylamine in methanol
  - Duquenois-Levine – turns purple with marijuana
  - 1st 2% vanillin and 1% acetaldehyde in ethyl alcohol solution
  - 2nd concentrated hydrochloric acid
  - 3rd chloroform
  - Van Urk – Turns blue-purple when exposed to LSD
  - 1% p-dimethylamininobenz aldehyde in 10% concentrated hydrochloric acid and ethyl alcohol

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Review – Drug Identification

- Color Tests
  - Scott Test – Initially turns blue when cocaine is tested. Turns pink on addition of 2nd chemical. Then turns blue again on addition of 3rd.
  - 1st is 2% cobalt thiocyanate dissolved in water and glycerine
  - 2nd is concentrated hydrochloric acid
  - 3rd is chloroform
- Microcrystalline tests.
  - Much more specific than color tests
  - Often does not require separation of drug from polutants
  - Very fast analysis

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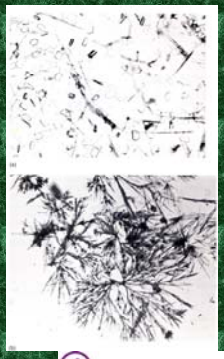
Review – Drug Identification

- Microcrystalline tests
  - Results are empirical
  - Scientists don't know why they do what they do, just that they do it.
- Chromatography
  - TLC and Gas techniques require a basic idea of what material you are testing, for comparison



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Review – Drug Identification

- Chromatography
  - Because of needing an idea of the substance, these techniques compliment the color and microcrystalline tests.
  - They cannot reasonably stand alone
- Spectrophotometry
  - The UV spectrum is not conclusive for the positive identification of a drug.
  - Can be used like color tests to eliminate many drugs and indicate a possible likely suspect.

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Review – Drug Identification

- Spectrophotometry
  - Infrared spectrophotometry is one method that will produce a "fingerprint" of a specific substance
- Mass Spectrometry
  - Chromatography is great at separating the drug from other pollutants, but not at providing specific ID
  - The GCMS overcomes this problem.
  - With the GCMS an analysis can in one test separate a drug and determine what it is with positive ID.
- Marijuana Testing
  - Plant leaves are first tested by microscopic exam for cystolithic hairs.

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Review – Drug Identification

- Marijuana Testing
  - The hairs are found on the top side of the leaf.
  - Followed by the Duquenois-Levine test is considered a positive ID.
  - If no leaf material is available for microscopic analysis, TLC can supplement.

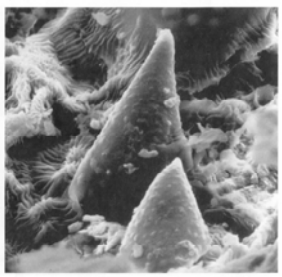

FIGURE 7–11 The cystolithic hairs of the marijuana leaf, as viewed with a scanning electron microscope (800×). *Courtesy Jeff Albright.*

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Review – Forensic Toxicology

- The purpose of forensic toxicology is:
  - The detection and isolation of drugs in the body for the express purpose of determining their influence on human behavior.
- Started in 1775 by Swedish chemist Karl Wilhelm Scheele
- Chlorinated water converts arsenic to arsenous acid.
- Add metallic zinc and heat, releases arsine gas
- When the gas strikes a cold vessel, arsenic collects on it.
- First used in 1821.

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Review – Forensic Toxicology

- We will focus on mainly alcohol
- 2 out of every 3 adult Americans consume alcohol.
- Alcohol is absorbed primarily through the small intestine
- The speed depends on numerous factors.
  - Solid & fatty foods slow absorption
  - Heavier persons have more bodily fluids so dilute the alcohol more
  - Females have less gastric acid so absorb 30% more alcohol than men
- Once absorbed, it moves to wherever there is water.

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Review – Forensic Toxicology

- Alcohol (ethyl alcohol) is a colorless liquid diluted with water and consumed as a beverage, created when sugar reacts with yeast.
- Alcohol is a psychoactive/mind-altering drug that depresses the CNS
- Other drugs that depress the central nervous system include:
  - Heroin
  - Tranquilizers
- 1st effect is inhibitions
  - Talk more
  - Higher self-confidence
  - Loss of restraint
  - Rowdyness

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Review – Forensic Toxicology

- Almost all alcohol is burned as fuel.
- Other

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My youngest student
And most faithful employee

Quiz Week #4

Quiz Week #4

Forget about it!