PSYC1022 – PSYCHOLOGY OF ADDICTION

ORIGIN OF DRUGS

Drug classifications

- Drugs can be classified in many diff ways e.g. licit vs. illicit
- Classification based on the drug's CNS effects
    - Depressants – slow down CNS activity
    - Stimulants – speed up CNS activity
    - Hallucinogens (psychotogenic) – alter sensory perceptions by interfering with CNS signalling
    - Other – do not fit neatly into categories (due to diff experiences between individuals and fit in several categories)

DEPRESSANTS

Alcohol

- Can be made simply by leaving fruit in a container for some time
- Paleolithic humans may have consumed alcohol but there is little direct evidence
- 7000-5800BC – Jiahu, China (first direct evidence of alcoholic production)
    - Archaeological site (Neolithic era)
    - Pots were found to contain the residue of an alcoholic liquid made from fermented rice, honey and hawthorn
    - 'Chateau Jiahu': reverse engineered from molecular archaeology (made from rice flakes, wildflower honey, muscat grapes, hawthorn fruit with barley malt and fermented with a sake yeast)
- 4100BC – Areni-1 cave, Armenia
    - One of the earliest known sites of wine production
    - The press sits inside the cave and is slanted downwards towards the mouth of a large jar inserted in the platform's edge to catch the crushed grape juice
    - This same design of wine press was common through the Mediterranean until 1900
- Alcohol is globally available
- Worldwide consumption: 6.2L of pure alcohol per 15+ person
- Higher economic wealth of a country the higher the consumption of alcohol
    - Highest rates in Europe, Russian Federation, Australia, Canada
    - Unrecorded (i.e. home-brewed liquor) is thought to account for almost 25% of worldwide consumption
    - 3.3mil deaths worldwide are attributable to alcohol consumption

Opium

- Derived from the sap produced by the opium poppy seed head
    - Released following tissue damage
    - Acts as an anti-herbivore chemical
- Rain, wind and dew can spoil the sap, so weather considerations are important for choosing when to make incisions
    - Sap is collected
    - Opium brick is typically sold by the farmer to a broker
- In antiquity, opium was the end product
    - More recently brokers typically supply the opium to refiners who convert it into more transportable morphine bricks or heroin powder
- Selective breeding has yielded an opium poppy that has substantially higher concentrations of opioids than the wild variant

- 10,000-2000BC – used broadly throughout Europe, Asia, Middle East and North Africa
    - Numerous archaeological sites of opium poppy seed pods buried in a ritual or sacred context
- 4200BC – Brittany, France found ceramic bowls found in a sacred site
- Southern Spain – globular grass bags of opium capsules were found in a burial site
- 1500BC – the Ebers papyrus
    - Is believed to have been copied from earlier texts (Circa 3400BC)
    - Found between the legs of a mummy in a tomb near Luxor, Egypt
    - 1872 – purchased by Professor Ebers
    - Described as a mixture of opium and another material which was found effective in quietening crying children
    - Some time ago children in Egypt, India and Europe were being soothed with opium. It is said that mothers often laced their nipples with poppy juice so that the child would immediately stop crying upon sucking the 'drugged' milk
- 1332-1323BC – cultivation and trade of opium was in full operation during the reign of King Tutankhamun
    - Contributed to the wealth of the Egyptian Pharaohs
- 700BC – Homer's 'The Odyssey'
    - Opium's recreational use is described
    - "Telemachus is depressed after failing to find his father Odysseus. But then Helen…"

Morphine

- 1803 – Morphine was isolated from opium by the German pharmacist, Friedrich Sertürner
    - Named it after Morphius (Greek god of dreams)
    - Added the morphine crystals to food to kill unwanted rats and dogs in the town
    - Observed that morphine evoked sleep and ultimately death
    - He suffered from gout in his later life and quelled his pain with the very morphine he had isolated
- The alkaloid morphine is generally 8-14% of the dry weight of opium
- Sertürner's morphine extraction method still used in illicit labs
    1) Boil 30 gallons of water in a 55-gallon oil drum
    2) Add 10-15kg of raw opium. Allow to dissolve and scoop out soil, leaves, twigs and other non-soluble materials to leave a dark brown 'liquid opium' solution
    3) Add slaked lime (calcium hydroxide) or more readily available chemical fertiliser with a high lime content, which converts the water-insoluble morphine alkaloid into water-soluble calcium morphenate. The other opium alkaloids do not react with lime to form water-soluble calcium salts, and so can be removed as sludge by straining the liquid once cooled
    4) Reheat the calcium morphenate liquid but do not boil
    5) Add ammonium chloride until the alkalinity is adjusted to a pH of 8-9
    6) Cool solution and within 1 or 2 hours morphine base (solids) will precipitate and settle to the bottom of the pot
    7) Filter to extract morphine base and dry in the sun
    8) The coffee-coloured coarse powder typically contains 50-70% morphine. To further purify, dissolve the solids, in hot water and add hydrochloric acid, then add activated charcoal, reheat and filter
    9) Upon cooling morphine hydrochloride will precipitate out of the solution and settle to the bottom. Extract by filtration and form into a roughly 3 pound block
- It takes a full day to extract 'pure' morphine from opium

Laudanum

- 1493-1541 – Paracelsus (a Swiss-German occultist)
    - Discovered that opium would be better dissolved into a solution of alcohol than water
    - Named solution Laudanum i.e. tincture (medicine made by dissolving a drug in alcohol) of opium
    - Added a variety of ingredients such as garlic and frog spawn
    - Although useful for pain reduction, the compound was largely ignored

- 1624-1689 – Thomas Sydenham (English physician)
    - Produced and promoted his own Laudanum recipe
    - 1 Pt Canary Island wine, 2 Oz strained opium, 1 Oz saffron
    - Cure for a range of medical conditions
- 1837-1901 – use continued in Victorian England and USA
    - Especially by women
    - Laudanum remains available by prescription in these countries although therapeutic applications are generally restricted to pain relief and alleviating withdrawal symptoms in babies born to heroin or opiate addicted mothers
- 1910 onwards – increasingly restrictive laws established which regulated the production and sale of addictive compounds including Laudanum

Codeine

- Another alkaloid (like morphine) present in opium at a concentration of about 1-3%
- 1821 – Pierre Robiquet (French chemist)
    - Isolated from morphine using the process of o-methylation (substation of an atom by a methyl group)
- It is the most widely used opiate in the world
    - Excellent safety record
    - Used as an analgesic (pain), antitussive (coughing), antidiarrheal, antihypertensive (blood pressure), antianxiety, sedative (calming), to suppress premature labour contractions and myocardial infarction (heart attack)
    - It does have addictive potential but is less potent than morphine or heroin

Heroin

- 1874 – Charles Wright (English chemist)
    - Accidentally found diacetylmorphine by boiling morphine and acetic acid over a stove for several hours
        - This process of acetylation introduces an acetyl group into the compound
- The modern technique entails a complicated series of steps in a good laboratory
    - Equal quantities of morphine and acetic acid are heated in a glass or enamel-lined container for 6 hours at 85°C. The morphine and the acid combine to form impure diacetylmorphine
    - Water and chloroform are added to the solution to precipitate impurities. The solution is drained and sodium carbonate added to make the heroin solidify and sink
    - Heroin is filtered out of the sodium carbonate solution with activated charcoal and purified with alcohol. This solution is gently heated to evaporate the alcohol and leave heroin, which may be purified further
    - Purification in the 4th stage, involving ether and hydrochloric acid, is notoriously risky as the volatile ether gas may ignite and produce a violent explosion. The final product is a fluffy, white powder known in the trade as number four (pure) heroin
- 1898 – Felix Hoffman (German chemist)
    - Discovered the same process 23 years later
    - He worked at Bayer and discovered aspirin by subjecting salicylic acid to the same acetylation process that Wright had applied to morphine
    - Hoffman replicated this procedure and named the resulting diacetylmorphine, heroin, in reference to its heroic effects
    - Bayer marketed heroin as an effective sedative for coughs, like morphine, but without the addictive potential → sales rocketed and widespread dependence followed
    - 1931 – Bayer ceased production with the introduction of widespread legislation to control the production and sale of such compounds

STIMULANTS

Tobacco (nicotine)

- Smoked by tribes across the Americas
- 1492 – Christopher Columbus
    - Discovered tobacco when he landed in the Bahamas → scouts reported tribes ppl smoking 'half-burned wood in their hands'
- 1492 – Rodrigo de Jerez
    - First European smoker
    - Introduced the habit to Ayamonte, Spain
    - Imprisoned for his 'sinful and infernal habits'
    - Released 7 years later, during which time smoking had caught on
- 1523 – tobacco merchant of Lisbon officially documented → trade established in 30 years
- 1604 – Stuart King James I
    - Denounced tobacco use
    - 'harmful to the brain, dangerous to the lungs'
- 1604 – English introduce heavy tariffs on tobacco imports
- 1609 – commercial production began in Jamestown, Virginia from tobacco imported from Bermuda
- Until 1883 – tobacco excise tax accounted for 1/3 of internal revenue collected by the US govt
- 1962 – Britain's Royal College of Physicians
    - Published causal link between smoking and lung cancer, bronchitis and cardiovascular disease
    - 'How are we to get 800 million pounds of indirect revenue from any other source?'
- It is now broadly recognised by govts that quit smoking interventions yield substantial LT profits resulting from reduced health care expenditure and more productive economic activity
    - Thus, the ST reduction in tax revenues are more than compensated for by LT profits
    - This economic argument underpins developed counties' sustained policies for reducing smoking
- Nicotine constitutes approx. 0.6-3% of the dry weight of tobacco leaf → biosynthesis takes place in the roots and accumulates in the leaves
- Nicotine functions as an anti-herbivore chemical → a potent neurotoxin, particularly to insects e.g. application of nicotine to plant materials repels the Western Flower Thrip (amongst others)
- Nicotine derivative compounds widely used as pesticides in agriculture → removing nicotine from tobacco plants results in an approx. 5% increase in herbivore damage to leaf material

Cocaine

- Alkaloid (nitrogenous compounds) like nicotine and the opiate alkaloids
- Derived from the leaves of the coca plant → acts as an antiherbivore chemical
- Grows naturally in abundance in South America
- Coca leaves were consumed by natives of Venezuela, Colombia, Ecuador, Peru, Bolivia and North Argentina
    - 1000BC – mummies found in Northern Chile showed the presence of cocaine
    - 6000BC – evidence of coca leaf and lime production and distribution in Nanchoc Valley, Peru
- Tea infusions (often with an alkaline substance such as lime to help release the psychoactive alkaloids) or chewed leaves were consumed by South American natives
    - Practice still legal in Peru and Bolivia
    - Widely practiced by natives in other South American countries despite prohibition
- 1500s – Spanish conquistadors (explorers) landed in South America
    - Initially dismissed coca leaf consumption as the 'Devils work'
    - Soon came to commercialise and tax its distribution when they discovered that the enslaved native population worked harder under its influence
- 1600s – introduced to Spain
- 1858 – gained popularity following research published by Paolo Mantegazza (Italian neurologist) which highlighted the cognitive enhancing effects of coca leaf infusions
    - Led to several commercial wine products containing coca infusions