

Drugs

What are drugs?

A drug is any substance that is taken into the body that alters or influences the chemical reactions in the body.

Types of drugs

- Some drugs are active ingredients and are used to treat/cure people from disease
- Others are mood enhancing altering sensory perception
- Aspirin, paracetamol, morphine and antibiotics are medical drugs designed to suppress pain, counteract flu or kill pathogenic bacteria
- Alcohol, nicotine and caffeine are socially acceptable drugs that people take for pleasurable effects, to help them relax or concentrate
- Drugs that tend to be illegal for more severe effects are sometimes called recreational drugs
- Hallucinogens such as Lysergic Acid Diethylamide (LSD) cause psychedelic visions
- Stimulants like cocaine, ecstasy and amphetamines are mood enhancing drugs for a short lived feeling of well-being and energy
- Drugs act upon the body in various ways
- Nicotine and heroin interfere with the way the nervous system works and are addictive
- The aforementioned drugs act at synapses in the nervous system and change the way in which neurones send impulses
- They do this by combining with the protein molecules on the cell membranes of the neurones
- The liver is the site of the breakdown of alcohol and other toxins
- Drugs are broken down in the body by enzymes and the products are excreted
- The breakdown of the products can be detected in urine
- So urine tests are carried out to see if people have been taking drugs
- Many drugs are addictive
- If the body become reliant on the drug, the person becomes addicted and needs to take it regularly
- In several countries, the possession or on non-medicinal drugs is illegal
- The body's metabolism may become used to the drug
- The liver may produce more enzymes to break it down so the dose of the drug has to increase to have the effect that the user first experienced

Antibiotics

- Group of chemicals made by microorganisms (bacteria and fungi) that are used to kill pathogens or stop their growth
- Antibiotics are prescribed by doctors to treat diseases caused by diseases
- Antibiotics can be injected or taken orally
- A course of antibiotics has to be taken over a period of time
- Penicillin was the first antibiotic to be discovered and mass produced
- Penicillin acts on bacteria by inhibiting cell wall formation leading to a breakdown of the cell wall and the leakage of cell contents
- Some antibiotics stop substances from crossing cell membranes and others prevent bacteria from catalysing reactions

- Antibiotics have no effect on viruses
- A big problem with antibiotics is that many bacteria have become resistant to them
- Viruses are not cell
- They do not carry out their own metabolism and dependent on their host
- To control viruses- we would essentially have to inhibit our own metabolism which would be impossible
- This is why antibiotics are not used to treat viruses
- There are anti-viral drugs available such as AZT which is used to treat HIV/AIDS but work differently to antibiotics
- There are less anti-viral drugs than antibiotics
- Bacterial resistance to antibiotics has been caused by overuse especially in hospitals
- Overuse was responsible for the development of a methicillin-resistant *Staphylococcus aureus* or MRSA
- This has caused death in hospital patients with suppressed immune systems
- Prescribing antibiotics only when necessary and ensuring that people complete their courses of antibiotic treatment by taking all their pills are a way to control bacterial resistance

Heroin

The biology of heroin

- Morphine and codeine are two compounds extracted from opium poppies and used as painkillers in medicine
- Heroin is a compound modified from morphine
- Heroin has only limited medical uses as it is highly addictive so rarely used
- Heroin is a powerful depressant that slows down the nervous system
- Heroin has a chemical structure that is similar to endorphins, a group of chemicals found in the brain
- Endorphins are made naturally in the brain when the body is experiencing pain or stress
- They work by flooding the synapses in the brain and preventing neurones from transmitting impulses from pain receptors, producing pain relief
- The heroin molecules bind to the endorphin receptor sites on the post synaptic membranes of the synapse, blocking nerve transmission
- This mimics the function of endorphins
- When people take heroin for the first time they experience feelings of contentment and happiness, this state is known as euphoria

Addiction to heroin

- Heroin becomes part of the body's metabolism and the body quickly gets used to the drug
- This includes the nerve cells where it has its effect
- More painkillers are needed to prevent them sending impulses to the brain
- The feeling of pain becomes unbearable and addicts have to take heroin to reduce the pain
- This is how the body develops tolerance and the drug has to be taken in greater quantities to experience euphoria or deaden pain
- People who start taking heroin want to repeat the feelings they first experienced, but easily become hooked or addicted
- This can happen within two to three weeks of misuse

- Heroin is taken by smoking, sniffing or injecting
- Injecting is highly dangerous as veins can collapse and tissues start to die causing gangrene
- Long term addicts run out of places to inject it
- Some addicts share needles and syringes which could cause HIV or hepatitis

Social Problems

- The drug often dominates the lives of addicts until they get their next fix
- The drug can be expensive which leads people towards crime to sustain their habit
- It can be difficult to keep a job, and addiction usually leads to family breakdown and homelessness
- Addicts prefer the company of other addicts isolating themselves from family and friends
- Heroin is produced in Afghanistan and the Golden Triangle (Laos, Vietnam, Burma and Thailand)
- It is then illegally transported elsewhere
- A user who stops taking the drugs experiences unpleasant withdrawal symptoms
- These include sleeplessness, hallucinations, muscle cramps, sweating, vomiting and nausea
- A great deal of willpower and support is needed to overcome addiction
- Often the only way to recover is through rehabilitation
- This may involve staying at a treatment centre
- In some countries addicts are given another drug called methadone which gives the same effects as heroin

Alcohol

The biology of alcohol

- When consumed, it is absorbed into the blood quickly since it is a small molecule and does not have to be digested
- It is soluble in cell membranes and easily absorbed through the wall of the stomach and small intestine
- The presence of food in the stomach slows down the absorption
- Alcohol gets distributed throughout the body in the blood
- Some is lost through the lungs and the kidneys
- It is absorbed by liver cells and broken down by enzymes so its concentration in the blood decreases
- This breakdown happens faster in men than women
- Because men have more of these enzymes and tend to be more active
- Men also have more water and less fat in their bodies as compared to women, which also decreases the concentration faster
- Like heroin, alcohol is a depressant
- It affects the brain by slowing down the transmission of nerve impulses
- In small quantities this has the effect of removing inhibitions so people find it easier to be social
- With larger quantities this lack of inhibition leads to:
 - i. Loss of coordination, judgement and control of fine movements
 - ii. Slower reaction times
 - iii. Loss of self-control
- Unlike heroin, alcohol does not lead to addiction as quickly, if at all

- Many people drink alcohol in small to moderate quantities throughout their lives without becoming addicted
- The alcohol content of drinks is measured in units
- One unit is 8 grams of alcohol, this quantity is broken down by the liver in one hour
- The UK government recommends that men should not drink more than between 3 to 4 units
- And women 2 to 3 per day

Addiction

- Some people become dependent upon alcohol and are sometimes referred to as alcoholics
- They develop a tolerance as more enzymes that metabolise alcohol are made in the liver
- They need to take greater quantities to get the same effect
- They feel tense and irritable and find it hard to cope with everyday problems without a drink

Social Problems

- The misuse of alcohol is a factor in crime, family disputes, marital breakdown, child neglect, absenteeism, vandalism and violent crime
- Damage done by alcohol is considerable and difficult to measure
- Alcohol and drugs are involved in many road accidents
- Alcohol can disturb a person's concentration but make them feel more confident
- In some countries it is illegal to drink alcohol and then operate a car or machinery

Long term effects of alcohol

- Drinking in large quantities for many years can lead to stomach ulcers, heart disease and brain damage
- Drinking in large quantities interferes with the metabolism of the liver causing fat to build up
- This condition is known as fatty liver
- The liver tissue is damaged and replaced by fibrous scar tissue
- If heavy drinking persists then the liver becomes full of nodules
- This condition is known as cirrhosis
- The liver becomes less able to carry out its job of removing toxins from the blood
- This condition is irreversible and fatal unless drinking is stopped
- Long term consumption also leads to brain damage and personality and behavioural changes

The misuse of drugs in sport

- Anabolic steroids are substances similar to testosterone
- They work by mimicking the protein-building effects of this hormone
- The result is muscle strength resulting in increased strength and endurance
- There are a number of harmful side effects resulting from the excessive use of anabolic steroids
- In men: increased aggression, impotence, baldness, kidney and liver damage and development of breasts
- In women: development of male features, facial and body hair and irregular periods

Smoking and health

- Tobacco plants make nicotine as a way to protect against insect attack (natural pesticide)
- Nicotine's molecular structure allows it to interact with our nervous system

Biology of Tobacco Smoke

Nicotine

- Absorbed quickly through the alveoli to enter the bloodstream
- Interacts with nerve cells at synapses
- Stimulant
- Makes heart beat faster, narrows arterioles which increases blood pressure
- Increases stickiness of blood platelets that promote blood clotting

Tar

- A black sticky material that collects in the lungs as smoke and coals
- Does not pass into the bloodstream
- Irritates the lining of airways and stimulates production of mucus
- Accumulation of mucus because cilia is damaged by smoking
- Smokers cough to make this material move to the back of the throat
- The chemicals compounds in tar can cause cancer and are described as carcinogenic

Carbon Monoxide

- Poisonous gas
- Combines with haemoglobin thus reduces the amount of oxygen transported by 10%
- Put added strain on a heart, as response to nicotine
- When more oxygen is required, less blood is delivered as it flows through the coronary arteries to supply the heart muscle
- If a women smokes during pregnancy, there may not be enough oxygen for the fetus to develop
- The baby may have a smaller birth weight or be born prematurely

Diseases caused by smoking

- Chronic obstructive pulmonary diseases (COPD)-Collection of lung diseases including chronic bronchitis and emphysema
- Effect of hot tobacco smoke on airways reduces efficiency in keeping the lungs clean
- Cilia on the cell lining the air passages stop beating
- Mucus, dust, dirt and bacteria stick to the airways
- Stimulates body's immune system sends phagocytes to the place where this happens (particularly bronchi)
- Large amounts of phlegm (mucus, bacteria and white blood cells are produced and people attempt to cough it up
- This is called chronic bronchitis
- People with this condition find it difficult to move air in and out of their lungs as bronchi are partially blocked
- Particles, bacteria and tar reach the alveoli
- Phagocytic white blood cells digest a pathway through the lining of the alveoli to reach them
- Eventually this weakens the wall of the alveoli so much that they break down and burst
- Reducing the surface area for gas exchange
- This condition is known as emphysema

- Which leaves people gasping for breath as they cannot absorb oxygen or remove carbon dioxide efficiently
- Many long term smokers have both of these conditions
- The cause of lung cancer is the carcinogens in tar
- They promote DNA changes of cells lining the airways
- The cells grow and divide out of control
- The growth is slow but eventually may form a small group of cells known as a tumour
- If this is not discovered, it may occupy a larger space obstructing airways and blood vessels
- A part of the tumour may break off and spread to other organs

Heart disease

- Tobacco smoke increases the chances that fat will deposit in the walls of the artery
- As nicotine increases the chance that blood will clot, there is an increased risk of developing CHD
- Blocked arteries reduce the supply of oxygen to the heart and this damages the heart muscle