

## B5: Health and disease

### Lesson sequence

1. Health and disease
2. Non-communicable disease
3. Cardiovascular disease
4. Pathogens
5. Spreading disease
6. Preventing infection
7. The immune system
8. Antibiotics

### 1. Health and disease

<b>*Physical health</b>	Being free from disease, active, fit, sleeping well and no substance abuse.
<b>*Mental health</b>	Feeling good about yourself and being free of conditions such as depression and anxiety.
<b>*Social health</b>	Having healthy relationships, loving and being loved.
<b>*WHO</b>	World Health Organization – part of the UN responsible for monitoring global health.
<b>*Disease</b>	Any problem with the body not caused by injury.
<b>*Communicable diseases</b>	Diseases caused by pathogens, can be passed on.
<b>*Non-communicable diseases</b>	Diseases caused by genes or, lifestyle. Cannot be passed on.
<b>**Correlated diseases</b>	Getting one disease increases your chance of another due to diseases weakening organ systems, damaged immune system, weaker defences.

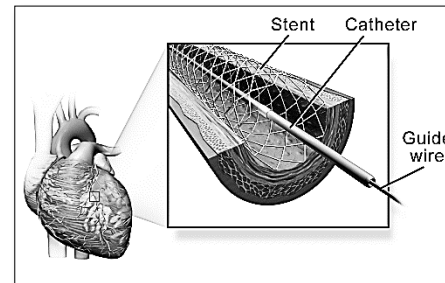
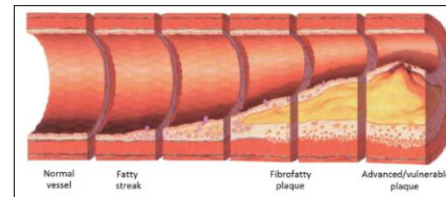
### 2. Non-communicable disease

<b>*Genetic disorders</b>	Diseases caused by inheriting faulty genes from your parents.
<b>*Malnutrition</b>	Diseases caused by poor diet.
<b>**Anaemia</b>	Lack of iron. Causes fewer and smaller red blood cells and low energy.

<b>**Kwashiorkor</b>	Lack of protein. Swollen belly, small muscles, stunted growth.
<b>**Rickets</b>	Lack of calcium or vitamin D. Causes weak bones leading to bowed legs.
<b>**Scurvy</b>	Lack of vitamin C. Swollen bleeding gums, muscle and joint pain, lack of energy.
<b>*Ethanol</b>	The drug found in all alcoholic drinks.
<b>*Drugs</b>	Chemicals that change the way your mind and body works.
<b>**Cirrhosis</b>	A fatal liver disease caused by drinking too much alcohol over a long period of time.
<b>**Social problems of alcohol</b>	Missed work days, increased risk of other diseases, risky sexual behaviour, increased violence.

### 3. Cardiovascular disease

<b>*Obesity</b>	Being overweight to the extent that your health is at risk.
<b>*BMI</b>	Body mass index, over 30 = obese.
<b>**BMI calculation</b>	$BMI = \frac{mass (kg)}{height^2 (m^2)}$
<b>**Problems with BMI</b>	Someone with a lot of muscle could have high BMI without being obese.
<b>*Waist:hip ratio</b>	The ratio of waist width to hip width. Over 0.9 (women) or 1.0 (men) = obese.
<b>**Calculating waist:hip ratio</b>	$\frac{Waist:hip\ ratio}{waist\ width} = \frac{hip\ width}{hip\ width}$
<b>*Cardiovascular disease</b>	Harmful substances in blood build up in the arteries around the heart. Blockages can form leading to heart attacks.
<b>**Stents</b>	Used to treat cardiovascular disease. A tube of metal mesh is fed into the narrowed artery and opened up, holding the artery open.
<b>**Treating heart disease with lifestyle</b>	More exercise and a better diet can treat cardiovascular disease, but this takes time.



### 4. Pathogens

<b>*Pathogen</b>	Microorganism that causes disease.
<b>*Types of pathogen</b>	Bacteria, virus, protist, fungi.
<b>*Tuberculosis</b>	Bacteria. Serious lung damage, bloody cough, fever.
<b>*Cholera</b>	Bacteria. Severe life-threatening diarrhoea.
<b>**Chalara ash dieback</b>	Fungi. Kills the leaves of ash trees, killing the tree.
<b>*Malaria</b>	Protist. Sickness, fever and weakness.
<b>**Haemorrhagic fever</b>	Virus, eg Ebola. Liver and kidney damage, internal bleeding.
<b>*HIV</b>	Human immunodeficiency virus attacks white blood cells, causing AIDS.
<b>*AIDS</b>	Acquired Immunodeficiency Syndrome. Weakened immune system making simple infections deadly. Caused by HIV.

<b>**Opportunistic pathogens</b>	Pathogens that live in us causing no harm, but become dangerous when given the opportunity, such as <i>Helicobacter pylori</i> which cause stomach ulcers.
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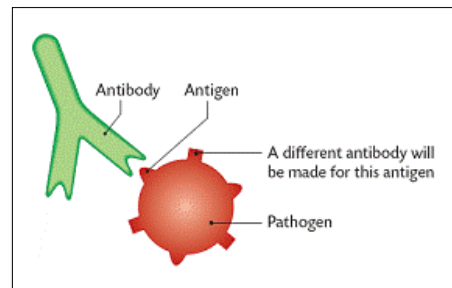
### 5. Spreading disease

<b>*Airborne</b>	Spreading through the air, such as colds and flu in infected droplets of saliva, and chalara ash dieback by fungal spores.
<b>*Waterborne</b>	Spreading through contaminated water such as cholera.
<b>*Oral route</b>	Eating food contaminated with a pathogen.
<b>**Vectors</b>	Animals that spread pathogens in their bites, such as malaria that is spread by mosquitoes.
<b>*Bodily fluids</b>	Spreading through contact with infected body fluids such as blood or semen, for example, HIV.

6. Preventing infection	
<b>*Chemical defences</b>	Kill pathogens before they can infect us.
<b>**Lysozyme</b>	Enzyme found in mucus, tears and sweat that kills <i>some</i> bacteria.
<b>**Hydrochloric acid</b>	Found in the stomach, kills most bacteria on food.
<b>*Physical barriers</b>	Block or trap pathogens so they can't enter the body.
<b>**Mucus</b>	Sticky substance in most body openings that traps pathogens.
<b>**Ciliated cells</b>	Have hairs that sweep mucus up and out of the body.
<b>*Skin as a physical barrier</b>	Blocks pathogens from entering.
<b>*STIs</b>	Sexually transmitted infections. Pathogens spread through sexual activity.
<b>*Preventing STIs</b>	Use barrier contraception (such as condoms) to prevent mixing of fluids (semen, vaginal lubrication, blood).
<b>**Screening for STIs</b>	Large scale testing of people to check if they have an STI so they can be treated. This helps to reduce the spread of STIs.

7. The immune system	
<b>*Immune system</b>	Destroys pathogens that manage to infect us.
<b>*Primary immune response</b>	How the body responds the first time it meets a new pathogen.
<b>**Antigens</b>	Chemical markers on the surface of pathogens (and other cells) that identify them as a pathogen. Antigens are unique to each pathogen.
<b>**Lymphocyte</b>	White blood cells that produce antibodies. Each lymphocyte makes a different antibody.
<b>**Antibodies</b>	Chemicals with a specific shape that can stick to the antigens on a pathogen and kill it.

<b>**Activated lymphocyte</b>	When an antigen sticks to an antibody, it activates the lymphocyte causing it to make many copies of itself that make the same antibodies.
<b>**Memory lymphocyte</b>	Lymphocytes left over after an infection that retain the ability to fight the pathogen.
<b>**Immunity</b>	When the body has the memory lymphocytes to fight a pathogen, so it can't be harmed by it.
<b>*Vaccine</b>	A weakened version of a pathogen that trains the body to fight it, without causing disease.
<b>**How vaccines work</b>	Vaccines are harmless versions of pathogen that still have the antibodies on them, so the immune response is triggered without any risk of disease.
<b>*Vaccine safety</b>	Vaccines are safe, preventing about 6 million deaths per year.



8. Antibiotics	
<b>*Antibiotics</b>	Substances that kill bacteria without harming human cells.
<b>**How antibiotics work</b>	They inhibit (stop) an enzyme that maintains bacterial cell walls. This kills the bacteria.
<b>*Resistance</b>	Widespread use of antibiotics has led to resistance, meaning many antibiotics don't work as well as they once did.
<b>*Drug development</b>	Developing new medicines involves many stages that take a of time and money.
<b>**Discovery phase</b>	Developing new chemicals that might work as medicines.
<b>**Pre-clinical testing</b>	Testing on cells grown in the lab, or on animals, to see if the chemical has any useful effect.
<b>**Small clinical trial</b>	Testing on a few healthy people to check for safety.
<b>**Large clinical trial</b>	Testing on many patients to discover how effective the drug is and determine the dose.
<b>**Side effects</b>	Unwanted effects of the medication, that can be quite harmful.

