EDEXCEL GCSE HEALTH DISEASE AND MEDICINE part 1

Health

The World Health Organisation (WHO) describes health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

The presence of one disease can lead to a higher susceptibility to other diseases.

Damage to immune system	Makes it easier for other pathogens to cause disease.
Damage to body defences	Barriers and defences are damages. Pathogens can enter the body.
Damage to organ systems	Organ systems don't work as effectively leading to other diseases.

Communicable and non communicable diseases

Communicable	*Non-communicable*
Caused by pathogens. They can be passed from person to person.	Caused by a fault in genes or by the way we live (lifestyle)

Detection and identification of plant diseases (bio HT only)

Detection	**Identification**
Stunted growth	Reference using gardening manual or website, laboratory test for pathogens, diagnostic testing.
Spots on leaves	
Area of decay	
growths	
Malformed stem/leaves	
Discolouration	
Presence of pests	

Plants have several ways of defending themselves from pathogens and animals (Biology only)

Physical	*Mechanical*
Thick waxy layers, cell walls stop pathogen entry	Thorns, curling up leaves to prevent being eaten
Chemical	
Antibacterial and toxins made by plant	

Bacteria may produce toxins that damage tissues and make us fell ill

Viruses	Bacteria (prokaryotes)	Protists (eukaryotes)	Fungi (eukaryotes)
e.g. cold, influenza, measles, HIV, tobacco mosaic virus	***e.g. tuberculosis (TB), Salmonella, Gonorrhoea***	***e.g. dysentery, sleeping sickness, malaria***	***e.g. athlete's foot, thrush, rose black spot***
DNA or RNA surrounded by a protein coat	No membrane bound organelles (no chloroplasts, mitochondria or nucleus). Cell wall. Single celled organisms	Membrane bound organelles. Usually single celled.	Membrane bound organelles, cell wall made of chitin. Single celled or multi-cellular

Pathogens are microorganisms that cause infectious disease

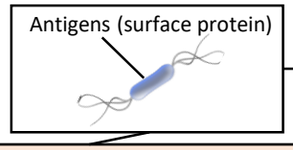
Pathogens

Communicable diseases

Pathogens may infect plants or animals and can be spread by direct contact, water or air

Pathogen	*Disease*	Symptoms	Method of transmission	Control of spread
Bacteria	***cholera***	Causes diarrhoea.	Contaminated water	Vaccination, water treatment to remove bacteria.
Bacteria	***tuberculosis***	Causes lung damage.	Air borne water droplets from couching.	Isolation of infected person, vaccination.
Fungi	***Chalara ash dieback***	Leaf loss and bark lesions.	Spores in the air.	Remove/destroy infected trees.
Protists	***Malaria***	Recurrent fever. Damage to blood and liver.	By an animal vector (mosquitoes).	Prevent breeding of mosquitoes. Use of nets to prevent bites.
Bacteria	***Stomach ulcers (Bio only)***	Pain in abdomen, damage to stomach lining.	Oral transmission.	60% already carry the bacteria.
Virus	***Ebola (Bio only)***	Internal bleeding and fever.	Contact with bodily fluids of an infected person.	Isolation of infected person. Vaccination.
Virus	***HIV***	Initially flu like systems, serious damage to immune system.	Sexual contact and exchange of body fluids.	Anti-retroviral drugs and use of condoms.
Bacteria	***Chlamydia***	Unusual discharge from genitals or anus, pain when urinating.	Unprotected sex.	Using condoms during sex.

EDEXCEL GCSE HEALTH DISEASE AND MEDICINE part 2



Life cycle of a virus

Lysogenic pathway	*Lytic pathway*
Virus attaches to cell and inserts genetic material	Viral genetic material can spilt off from bacterial chromosome.
Viral genetic material forms a circle.	
The viral genetic material uses to cell to produce new proteins and genetic material to make new viruses	Viral genetic material is inserted into the bacterial chromosome.
Cell breaks apart (lyse) to release new viruses.	Bacterium reproduces normally replicating both types of genetic material.

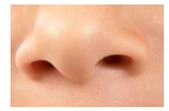
Immune system

Specific immune system

a. Exposure to pathogen	Pathogens are identified by white blood cells by the different proteins on their surfaces **ANTIGENS.**
b. Antigens trigger an immune response	Trigger causes the production of antibodies.
c. Production of memory lymphocytes	Antigens also trigger the production of memory lymphocytes (a type of white blood cell). These cells can produce the specific antibody for a pathogen.
d. Secondary response	Memory lymphocytes can produce specific antibodies much more quickly if the same pathogen returns.

Non-specific immune systems

The human body has several chemical and physical ways of providing protection from pathogens

	*Nose*	Nasal hairs, sticky mucus and cilia prevent pathogens entering through the nostrils.
	*Trachea and bronchus (respiratory system)*	Lined with mucus to trap dust and pathogens. Cilia move the mucus upwards to be swallowed.
	*Stomach acid*	Stomach acid (pH1) kills most ingested pathogens.
	*Skin*	Hard to penetrate waterproof barrier. Glands secrete oil which kill microbes.
	*Lysozymes in tears*	Breaks down the cell wall of some bacteria.

Antibiotics

e.g. penicillin	Used to treat bacterial infection by inhibiting cells processes in the bacterium but not the host organism (human) cells. They do not work on viruses.

Immunisation

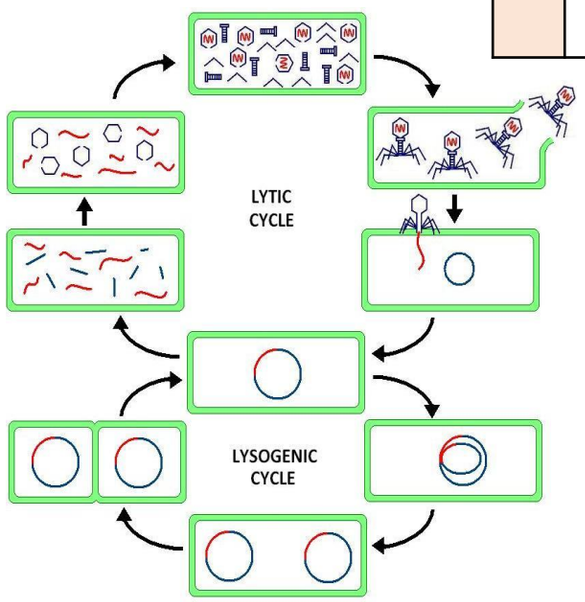
Vaccines are used to immunise a large proportion of the population (herd immunity) to prevent the spread of a pathogen

Vaccination

Small amount of dead or inactive form of the pathogen	*1st infection by pathogen*	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood.
	Re-infection by the same pathogen	White blood cells detect pathogens. Antibodies are made much faster and in larger amounts.

Vaccination (Biology only)

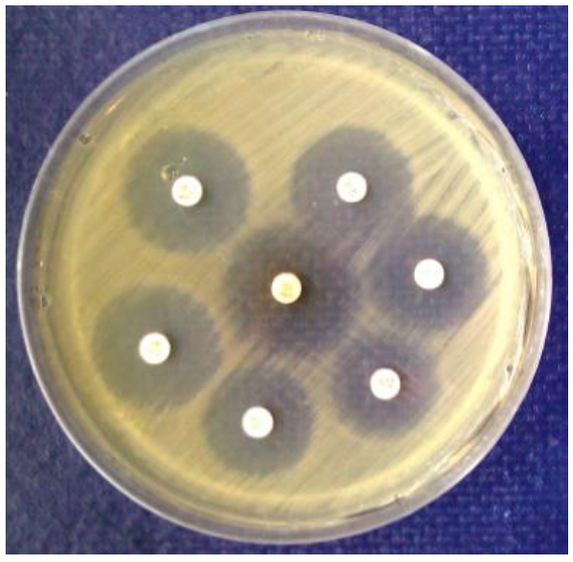
Disadvantages	A very small number of people (eg 1 in 900000 for MMR) a person may have a bad reaction to a vaccine and therefore cannot be immunised.
Advantages	Almost everyone can be immunised (herd immunity) which protects those people who cannot have vaccines. Spread of a pathogen in a population is prevented.



Calculate cross sectional area

$$\pi r^2$$

Measure the diameter of the clear area where bacteria has not grown. Half the diameter of the clear area to find the radius.



Aseptic technique

Autoclave	*Sterile inoculating loops*	*Covered petri dishes and culture vials*
Sterile growth medium and agar plates are sterilized by subjecting them to high pressure steam.	Sterilized before transferring microorganisms so that sample isn't contaminated.	Covered to avoid contamination by other microorganisms in the air.

EDEXCEL GCSE HEALTH DISEASE AND MEDICINE part 3

Non-communicable diseases

Healthy weight can be calculate using waist:hip ratio and the equation for BMI.

$$BMI = \frac{mass\ (kg)}{(height\ (m))^2}$$

Non-communicable diseases are caused by the interaction of a number of factors

Disease	Interacting factors
Cardiovascular disease	Diet, obesity, smoking, drinking alcohol, lack of exercise, genetics.
Cancer	
Lung disease	
Liver disease	
Malnutrition	

Lifestyle factors and their effects on non-communicable disease

Disease	lifestyle factors
Obesity and malnutrition	Lack of exercise and consuming too many/too few calories through an unbalanced diet. Schools meals are balanced to combat this in young people.
Liver disease	Large amounts of alcohol taken over a long period of time can lead to liver disease e.g. cirrhosis. The NHS spends over £500 million a year treating liver disease.
Cardiovascular disease	Smoking leads to damage and blocking of arteries supplying the heart with oxygenated blood. WHO estimates that 6 million people die globally as a result of smoking related illnesses.

Discovery of new drugs

Drugs (including antibiotics) have to be tested and trialled before to check they are safe and effective

New drugs are extensively tested for:

Efficacy	Make sure the drug works
Toxicity	Check that the drug is not poisonous
Dose	The most suitable amount to take

Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

Clinical trials use healthy volunteers and patients

Stage 1	*Stage 2*	*Stage 3*	*Stage 4*
Healthy volunteers try small dose of the drug to check it is safe record any side effects	A small number of patients try the drug at a low dose to see if it works	A larger number of patients; different doses are trialled to find the optimum dose	A double blind trial will occur. The patients are divided into groups. Some will be given the drug and some a placebo.

Double blind trial: patients and scientists do not know who receives the new drug or placebo until the end of the trial. This avoids bias.

A placebo can look identical to the new drug but contain no active ingredients

Monoclonal antibodies (Biology only HT)

Monoclonal antibodies

Identical copies of one types of antibody produced in laboratory

1. A mouse is injected with pathogen.
2. Lymphocytes produce antibodies (but do not divide).
3. Lymphocytes are removed from the mouse and fused with rapidly dividing mouse tumour cells.
4. The new cells are called hybridomas.
5. The hybridomas divide rapidly and release lots of antibodies which are then collected.

Monoclonal antibodies can be used in a variety of ways

Testing	*Diagnosis*
e.g. pregnancy test – measure the level of hormones	Can detect very small quantities of chemicals in the blood

Specific to one binding site on the antigen. Can target specific chemicals or cells in the body unlike drug and radiotherapy treatments.

Treating CVD

Evaluating different treatments for cardiovascular disease (CVD)

Life long medication	*Surgical procedures*	*Lifestyle changes*
Medicines to reduce blood pressure and cholesterol. Statins for lowering cholesterol carry a small risk of developing diabetes.	A stent can be surgically inserted into blocked blood vessel. Blocked blood vessels can be bypassed with inserted blood vessels. This treatment requires life long medication.	Giving up smoking, drinking excess alcohol and taking more exercise can reduce the risk of CVD. Some patients may not stick to lifestyle changes.