

OCR (B) Biology A-level

3.2.1 - Pathogenic microorganisms

Flashcards

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Name 4 groups of pathogen that can cause communicable diseases.



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- Bacteria (produce toxins)
- Fungi (secrete harmful enzymes)
- Protoctista
- Viruses (take over cell metabolism)



What causes tuberculosis (TB)?



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1. *Mycobacterium tuberculosis* are transmitted by droplet infection (inhalation).
2. Trigger inflammatory response by infecting phagocytes in lungs.
3. Infected phagocytes are sealed in waxy-coated tubercles so bacteria remain dormant. Primary TB has no symptoms.
4. If another factor weakens immune system, bacteria become active. Secondary TB destroys lung tissue.



Outline the symptoms and primary treatment of TB.



Outline the symptoms and primary treatment of TB.

- persistent cough
- worsening breathlessness
- extreme fatigue
- fever
- weight loss

Patients take a combination of antibiotics for several months.



What causes AIDS?



What causes AIDS?

1. HIV virus is transmitted by direct contact with blood, semen, rectal fluids, vaginal fluids and breast milk.
2. Attachment proteins bind to complementary CD4 receptor on T_H cells.
3. HIV particles replicate inside T_H cells, killing or damaging them.
4. AIDS develops when there are too few T_H cells for the immune system to function.



Outline the symptoms of HIV/AIDS.



Outline the symptoms of HIV/AIDS.

HIV causes initial flu-like symptoms, followed by a period of latency. AIDS results in opportunistic infections since T_H count is too low to stimulate immune response against pathogens.



How is HIV/AIDS treated?



How is HIV/AIDS treated?

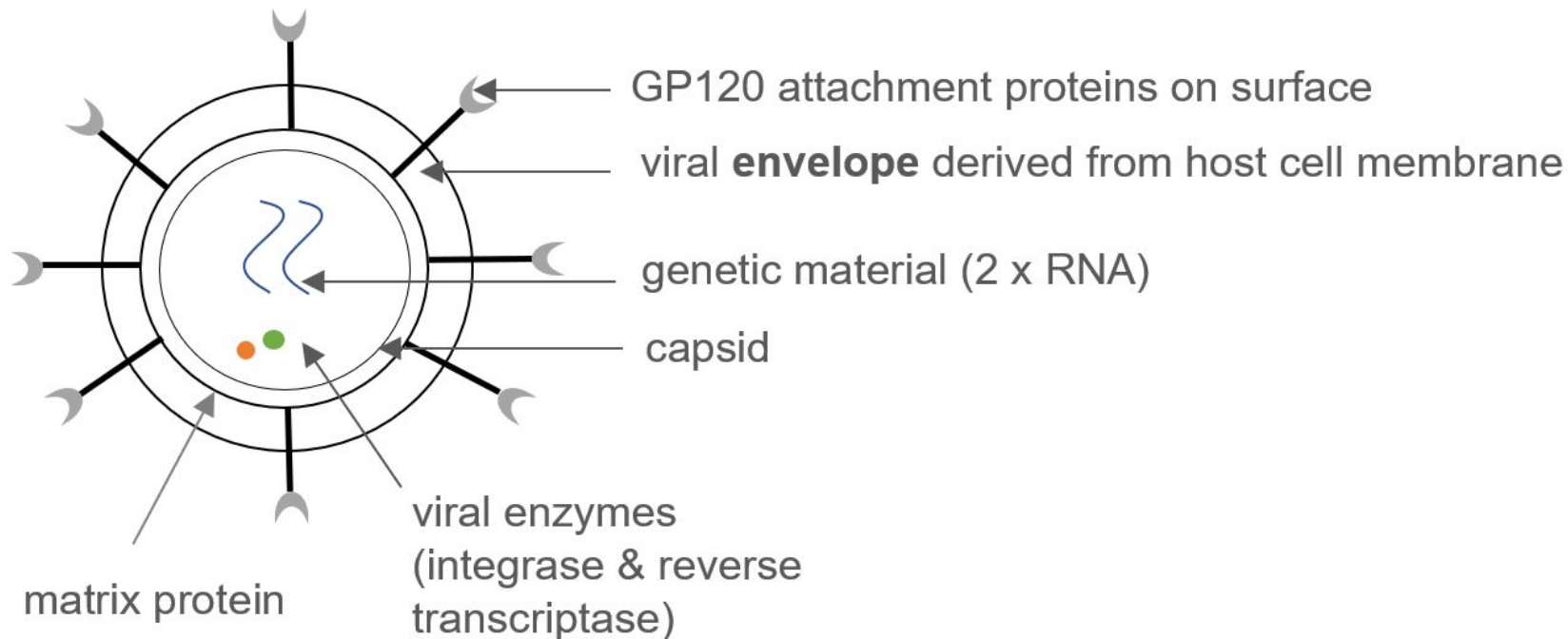
Taking a combination of antiretroviral drugs prevents HIV replication. Post exposure prophylaxis (PEP) can prevent infection after exposure.



Describe the structure of HIV.



Describe the structure of HIV.



Outline the process of Gram staining.



Outline the process of Gram staining.

1. Stain culture with crystal violet. Remove and rinse with water.
2. Add Gram's iodine solution and rinse after 1 min.
3. Alternate washes of alcohol and water for 30 s.
4. Counterstain with red safranin for 1 min.
5. Dry and examine sample under microscope.



Describe Gram positive and Gram negative bacterial cell walls.



Describe Gram positive and Gram negative bacterial cell walls.

Gram positive: Thick peptidoglycan layer (insoluble in alcohol). **Purple** under microscope when stained.

Gram negative: Thin peptidoglycan layer with outer lipopolysaccharide membrane (alcohol-soluble).
Appears **red** under microscope when stained.



Outline how to culture a pure colony of bacteria.



Outline how to culture a pure colony of bacteria.

1. Wipe surfaces with antibacterial. Set up Bunsen burner. Convection currents draw other microbes away.
2. Transfer bacteria to agar plate using sterile inoculating loop or pipette. Flame the neck of bottles before use.
3. Tape lid on at 2 ends then invert dish and incubate. Keep all vessels containing bacteria open for the minimum amount of time.



How can cell and colony morphology be used to identify bacteria?



How can cell and colony morphology be used to identify bacteria?

Bacteria can be classified by observing their shape under a microscope: cocci (spherical), bacilli (rod-shaped), spirilla, vibrio.

Some bacterial colonies have distinctive arrangements on an agar plate, often caused by cell shape e.g. cocci may form clusters.



Define endemic, epidemic and pandemic. Give an example of each.



Define endemic, epidemic and pandemic.

endemic: disease occurs routinely in a geographical area e.g. chickenpox in UK

epidemic: temporary rapid increase in incidence of disease in a geographical area e.g. 2002 SARS in China

pandemic: international epidemic e.g. 2009 H1N1



Why may the incidence and prevalence of communicable diseases change over time?



Why may the incidence and prevalence of communicable diseases change over time?

- Development of vaccine.
- Random mutations cause antigen variability in pathogens. Memory cells against are no longer complementary.
- Development of treatment e.g. antibiotics.
- Random mutation result in treatment-resistant strains.



What are incidence rates?



What are incidence rates?

Indicate the probability that a medical condition will occur in members of a population in a given time.

number of new cases ÷ duration of time period (e.g.
number of years or months)

total susceptible population (some groups are not at risk of the disease so do not need to be considered)



What are prevalence rates?



What are prevalence rates?

Represents the proportion of a population affected by a disease in a give time

$$\frac{\text{number of new and pre-existing cases in a given time period} \times 10^n}{\text{total population size}}$$

10^n is a scale factor e.g. use 10^3 to calculate mortality rate per thousand



What are mortality rates?



What are mortality rates?

number of deaths in a given time period $\times 10^n$

population size

10^n is a scale factor e.g. use 10^3 to calculate mortality rate per thousand



What is epidemiology?



What is epidemiology?

Analysis of patterns of disease in defined populations & why they occur. The World Bank publishes much of the data e.g. related to HIV & tuberculosis.

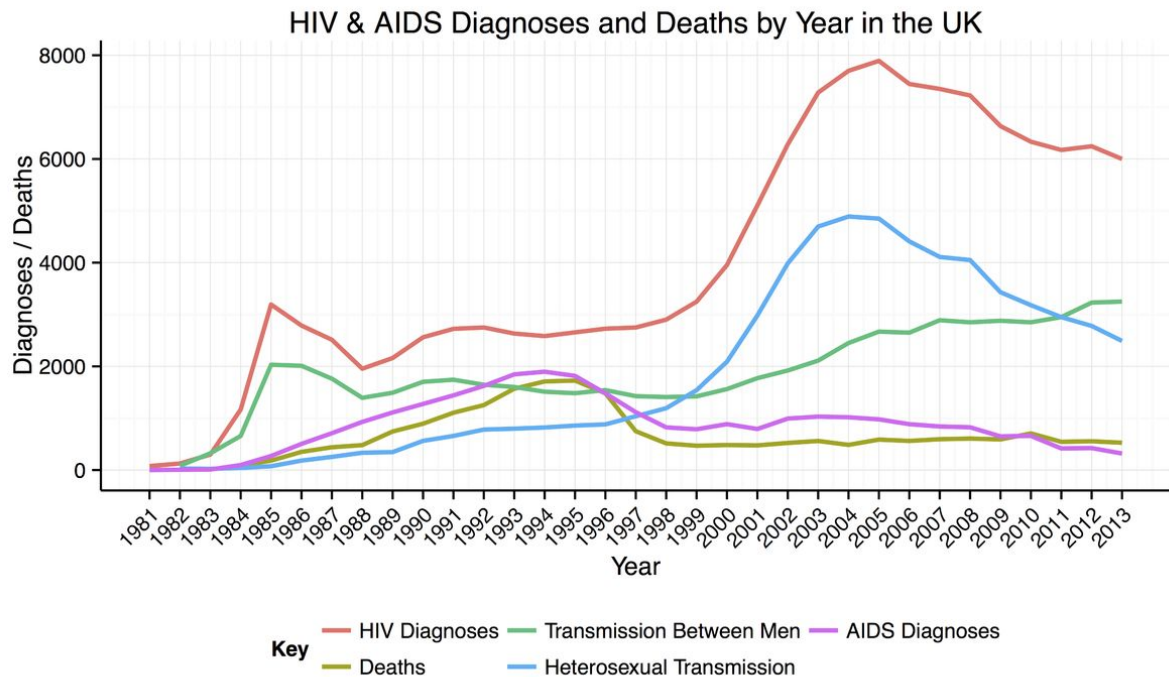


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What are notifiable diseases? Give some examples.



What are notifiable diseases? Give some examples.

Public Health England (PHE) was previously called the Health Protection Agency (HPA) and aims to prevent epidemics by detecting highly contagious 'notifiable diseases' as early as possible.

Medical practitioners & laboratories have a legal duty to report symptoms of these conditions (e.g. cholera, anthrax, malaria) within 3 days by submitting a form.



How can the spread of HIV be prevented?



How can the spread of HIV be prevented?

- Take PEP
- Take multi-drug treatment (HIV is biologically difficult to control due to high antigen variability)
- Use clean needles
- Screen blood donations to ensure they are not HIV positive (ethically important not to outsource cheap blood e.g. from prison donations)
- Education
- Use of condoms



How can the spread of TB be prevented?



How can the spread of TB be prevented?

- combination of drugs & vaccinations (expensive)
- cover mouth & nose when coughing/ sneezing
- quarantine (socially isolating)

