

Infectious Diseases

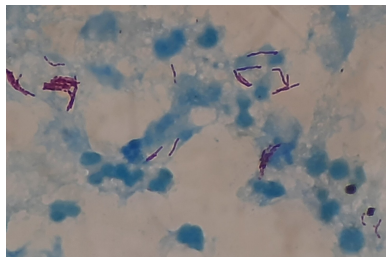
A-Level Biology ■ Topic 10

A-Level Biology



What we will cover

- 1 The four diseases
- 2 Malaria & vectors
- 3 Controlling disease
- 4 Antibiotics
- 5 Antibiotic resistance



TB bacteria in sputum

The four diseases

cholera 霍乱

bacterium ■ contaminated water

TB 结核病

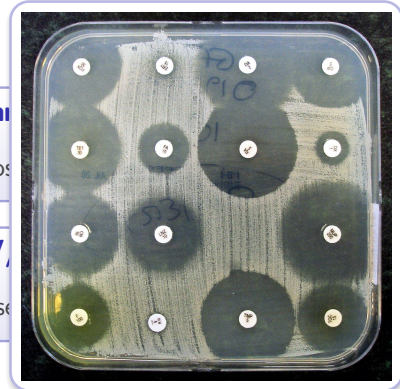
bacterium ■ airborne droplets

malaria

protocist ■ mosquito

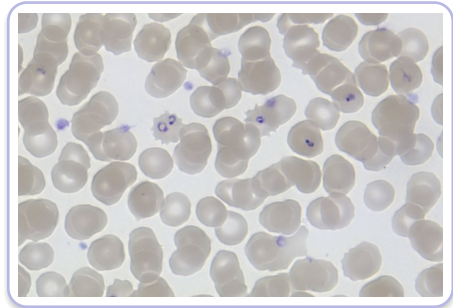
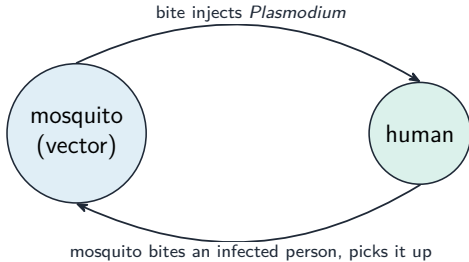
HIV/AIDS

virus ■ blood, sex



antibiotic zones

Malaria needs a vector



plasmodium

Controlling disease

biological

drugs, vaccines

social

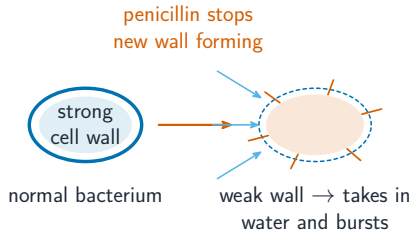
behaviour, education

economic

cost, supply

Each disease needs all three: e.g. malaria – nets & insecticide (bio), removing still water (social), funding (economic). HIV has **no cure or vaccine yet**.

Antibiotics

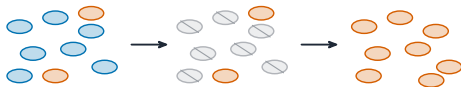


An **antibiotic** 抗生素 kills bacteria: **penicillin** 青霉素 stops them building a **cell wall** 细胞壁, so they take in water & burst.

Antibiotics do **not** work on **viruses** 病毒 – a virus has no wall or reactions to attack.

Antibiotic resistance

1. a few are resistant
2. antibiotic kills non-resistant
3. resistant multiply



(red = resistant mutant)

A **mutation** 突变 can make a bacterium **resistant** 耐药性; the antibiotic kills the rest, so survivors take over (natural selection). Slow it: use antibiotics only when needed, finish the course, cut farm use.

Worked example – why antibiotics fail

A patient takes antibiotics for flu and does not improve. Explain, and say how resistance spreads.

- Flu is a **virus**. Antibiotics target **bacterial** structures (cell walls, 70S ribosomes).
- A virus has none of these and replicates inside host cells $\Rightarrow$ **no effect**.
- Meanwhile the antibiotic **selects** for resistant bacteria already present by chance mutation.
- Resistance genes also spread **horizontally** on **plasmids**, even between species.

Antibiotics **select**, they do not cause resistance. Plasmid transfer is why resistance spreads so much faster in bacteria than by inheritance alone.

Topic 10 – key takeaways

1

Pathogens

cholera, malaria, TB, HIV – know the spread

2

Vectors

malaria needs a mosquito vector

3

Antibiotics

kill bacteria, not viruses

4

Resistance

spreads by natural selection – use wisely

Check yourself

- 1 Which pathogen type causes malaria?
- 2 What is the mosquito called in malaria spread?
- 3 Why don't antibiotics work on viruses?
- 4 How does antibiotic resistance spread?



Answers 1. a protist (Plasmodium) 2. a vector 3. no cell wall or reactions to target 4. natural selection