

Defence against disease · supported focus

International Baccalaureate · IB Diploma · Biology · SL

Scope and prerequisites

Supported SL focus. First assessment 2025; current subject brief acquired; full Biology guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.

Prerequisites: read the stated quantities and units, use arithmetic and the model conditions below. Each lesson develops its own method before independent transfer.

These are original or explicitly fictional teaching examples, not actual measurements or completed assessed learner investigations.

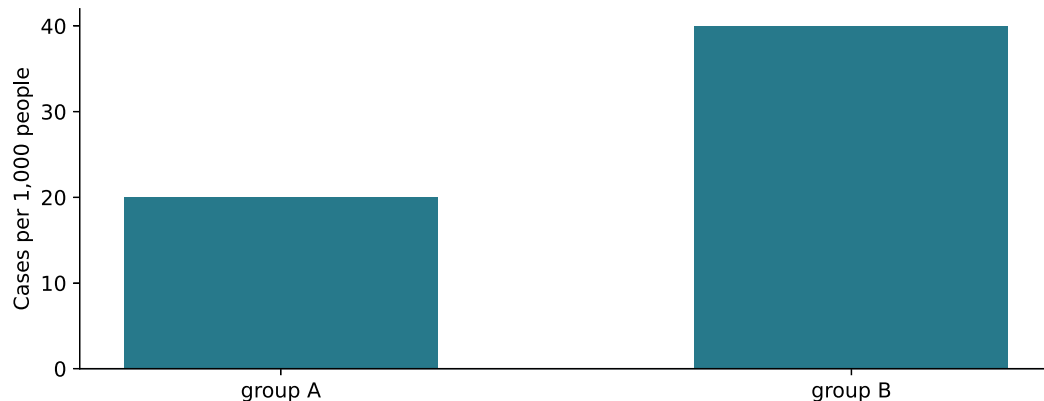
Disease transmission and immune response

■ What would explain this observation?

- An antibiotic may help against a bacterial infection but fail against a viral illness. Treatment depends on the causal organism and the evidence supporting diagnosis.
- Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

■ Build the model

- **Pathogens** cause infectious disease. Physical barriers, phagocytosis and specific immune responses reduce infection. Antibodies bind particular **antigens**. Vaccination exposes the immune system to antigen safely enough to develop memory.
- pathogen : An agent that causes disease; antigen: A structure recognized by a specific immune response.



■ Choose evidence that can test it

- After vaccination, memory cells can support a faster secondary response. Antibiotic resistance arises through heritable variation and selection; an individual bacterium does not choose to become resistant because it needs to survive.
- Use published infection data to compare rates per equal population size. Distinguish prevalence at a time from new cases over a period. In school, use safe simulations or approved cultures rather than collecting unknown pathogens.

■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: 18 cases occur in 900 people. Rate per 1,000 = cases / population $\times$ 1,000. Rate = $18/900 \times 1,000 = 20$ cases per 1,000. A second group with 10 cases in 250 people has 40 per 1,000, even though it has fewer cases.

Example:

12 cases occur among 600 people. Find cases per 1,000 people. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

■ Check the conclusion and its limits

- Antibiotics do not act on viruses in the same way they act on bacteria. A vaccine is not an immediate cure for an established infection.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Warn:

Every antibiotic is effective against every viral infection. This claim is false: Antibiotics do not act on viruses in the same way they act on bacteria. A vaccine is not an immediate cure for an established infection.

Key:

Disease transmission and immune response: After vaccination, memory cells can support a faster secondary response. Antibiotic resistance arises through heritable variation and selection; an individual bacterium does not choose to become resistant because it needs to survive.