

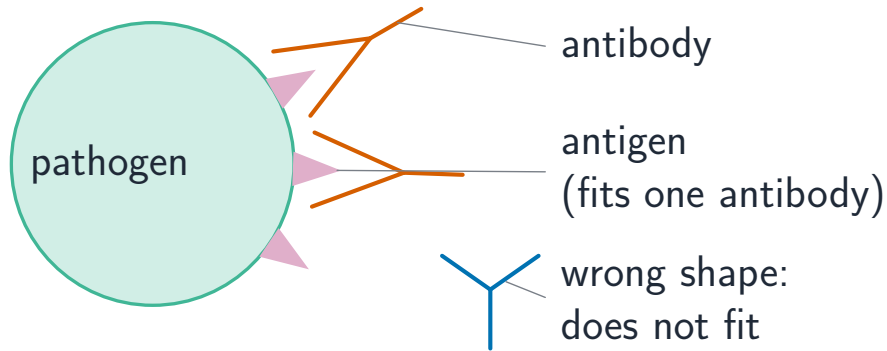
Exercise walk-through

10.1

Diseases and immunity

IGCSE Biology

Antigens and antibodies



Each pathogen carries
antigens .

Lymphocytes make
antibodies (proteins).

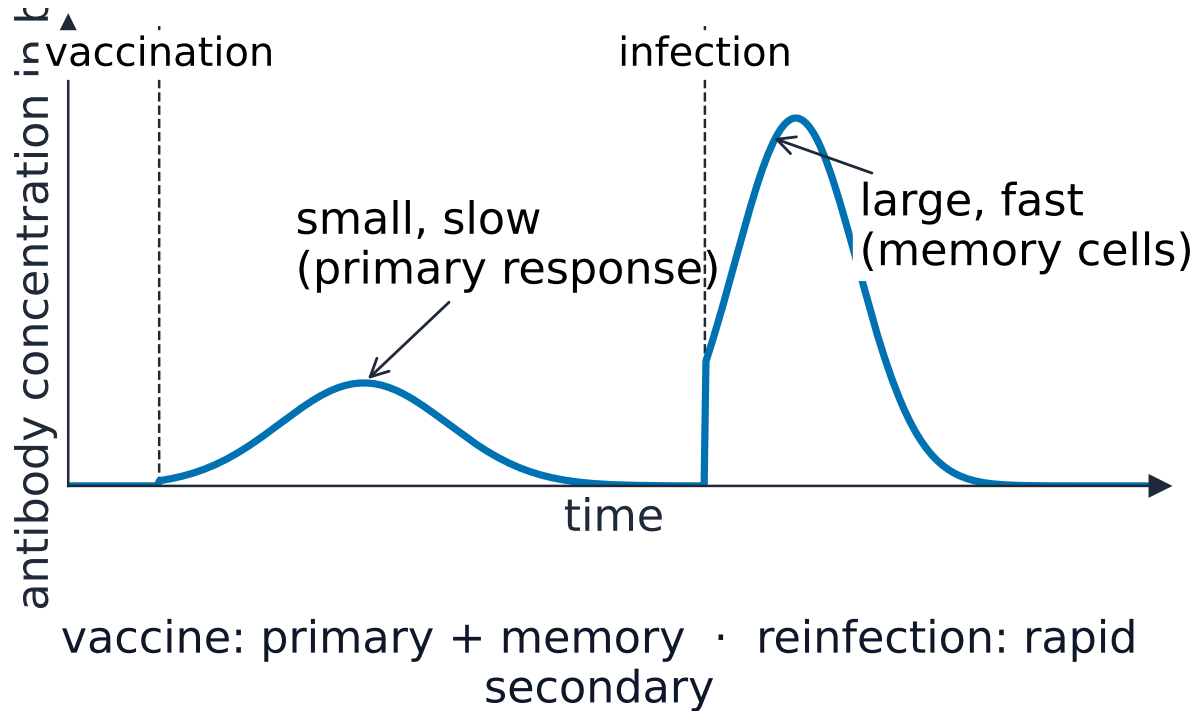
An antibody's shape is **complementary** to one antigen – it fits only that pathogen.

Vaccination

Vaccination puts in weakened pathogens/antigens.

- lymphocytes make antibodies
- **memory cells** stay for years
- next time: a fast, large response

Vaccination, in detail



After vaccination, memory cells give a fast, large response if the real pathogen arrives

Active vs passive immunity

active immunity

your own antibodies (infection/vaccine); **memory cells** → long-term

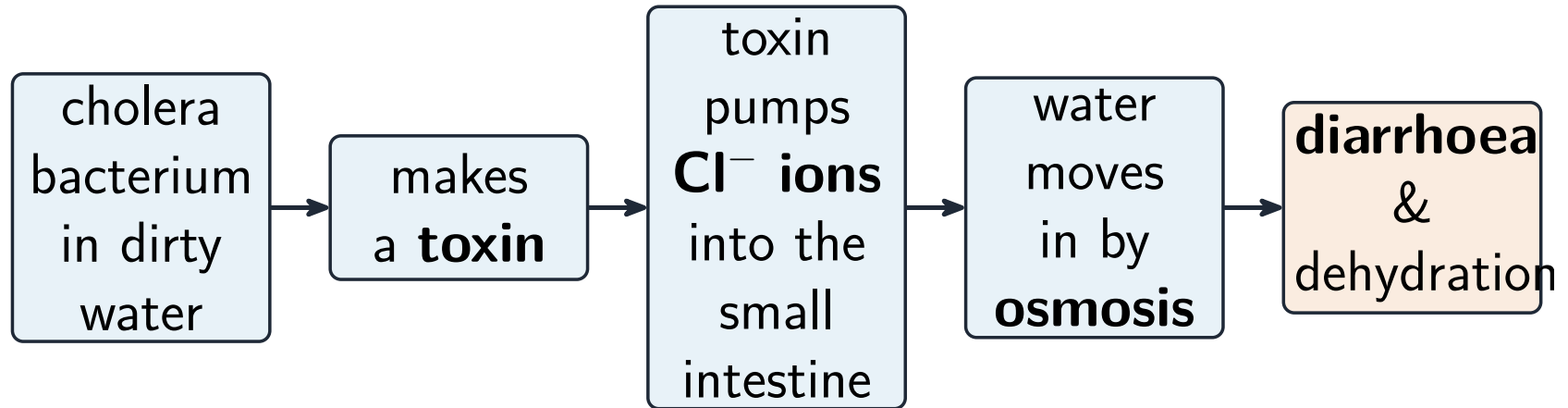
passive immunity

antibodies from another (placenta, breast milk); **no memory** → short-term

Cholera

Cholera spreads in dirty water. Its **toxin** :

- pumps chloride ions into the gut
- water follows by **osmosis**
- → **diarrhoea** & **dehydration**



Exercises 2.1-2.3

2.1 Define a pathogen.

[1]

2.2 State two of the body's defences against pathogens.

[2]

2.3 State two mechanical barriers that stop pathogens entering the body.

[2]

Exercises 2.1-2.3

2.1 Define a pathogen.

[1]

2.1

- a pathogen is an organism that **causes disease**

2.2 State two of the body's defences against pathogens.

[2]

2.2

- any **two** of: skin / nose hairs / mucus / stomach acid / white blood cells

2.3 State two mechanical barriers that stop pathogens entering the body.

[2]

2.3

- any **two** of: skin as a barrier / nose hairs / mucus trapping pathogens / cilia sweeping mucus away

Exercises 2.4·2.5

2.4 Explain why an antibody against measles does not protect against influenza. [2]

2.5 Give two methods of controlling the spread of a disease carried in water. [2]

Exercises 2.4·2.5

2.4 Explain why an antibody against measles does not protect against influenza. [2]

2.4

- an antibody has a shape **complementary to one antigen**
 - measles and influenza have **different antigens**, so the measles antibody cannot bind
-

2.5 Give two methods of controlling the spread of a disease carried in water. [2]

2.5

- any **two** of: chlorinate water / treat sewage / boil water / hand washing

Exercise 3.1

3.1 An antibody is able to bind to one pathogen because its shape is:

[1]

☐

A the same as the antibody

B complementary to the pathogen's antigen

C larger than the pathogen

D always changing

Exercise 3.1

3.1 An antibody is able to bind to one pathogen because its shape is:

[1]

☐

A the same as the antibody

B complementary to the pathogen's antigen

C larger than the pathogen

D always changing

3.1 B

- an antibody's shape is **complementary to the pathogen's antigen**
- A, C and D are not how binding works

Exercise 3.2 (a)

3.2 A child is vaccinated against measles.

(a) Describe how the vaccine gives long-term protection.

[3]

Exercise 3.2 (a)

3.2 A child is vaccinated against measles.

(a) Describe how the vaccine gives long-term protection.

[3]

(a)

- vaccine antigens make lymphocytes produce **antibodies**
- **memory cells** form
- if the real pathogen arrives, antibodies are made **fast**, so you do not become ill

Exercise 3.2 (b)

3.2 A child is vaccinated against measles.

(b) State the difference between active and passive immunity.

[2]

Exercise 3.2 (b)

3.2 A child is vaccinated against measles.

(b) State the difference between active and passive immunity.

[2]

(b)

- **active:** your own body, long-term, memory cells
- **passive:** another body's antibodies, short-term, no memory cells

Exercise 3.3 (a)

3.3 A country runs a vaccination programme against a viral disease.

(a) Describe how the vaccine produces long-term protection.

[4]

Exercise 3.3 (a)

3.3 A country runs a vaccination programme against a viral disease.

(a) Describe how the vaccine produces long-term protection.

[4]

(a)

- vaccine introduces antigens (weakened/dead/partial pathogen)
- lymphocytes recognise them and make **specific antibodies**
- **memory cells** remain, so later antibodies are faster and larger

Exercise 3.3 (b)

3.3 A country runs a vaccination programme against a viral disease.

(b) Explain why the protection is described as active immunity.

[2]

Exercise 3.3 (b)

3.3 A country runs a vaccination programme against a viral disease.

(b) Explain why the protection is described as active immunity.

[2]

(b)

- the person's **own lymphocytes** make the antibodies
- memory cells remain, so protection is **long lasting**

Exercise 3.3 (c)

3.3 A country runs a vaccination programme against a viral disease.

(c) A newborn baby receives antibodies in its mother's breast milk. Name this type of immunity and explain why it lasts only a few months. [3]

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3.3 A country runs a vaccination programme against a viral disease.

(c) A newborn baby receives antibodies in its mother's breast milk. Name this type of immunity and explain why it lasts only a few months. [3]

(c)

- **passive** immunity
- antibodies were made by the **mother**, not the baby
- no memory cells, so the antibodies are **broken down** and protection fades

Exercise 3.3 (d)

3.3 A country runs a vaccination programme against a viral disease.

(d) Describe how a phagocyte destroys a pathogen that has entered the blood. [2]

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3.3 A country runs a vaccination programme against a viral disease.

(d) Describe how a phagocyte destroys a pathogen that has entered the blood. [2]

(d)

- the phagocyte **engulfs** the pathogen
- **enzymes digest** and destroy it

Exercise 3.3 (e)

3.3 A country runs a vaccination programme against a viral disease.

(e) When most of the population is vaccinated, unvaccinated people also become less likely to catch the disease. Explain why. [2]

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3.3 A country runs a vaccination programme against a viral disease.

(e) When most of the population is vaccinated, unvaccinated people also become less likely to catch the disease. Explain why. [2]

(e)

- too few people left who can catch and pass it on
- the pathogen cannot spread easily – **herd immunity**