

Exercise walk-through

11.1

The immune system

A-Level Biology

Types of immunity

- **active** – your body makes its own antibodies (slow, **lasting**)
- **passive** – ready-made antibodies (fast, **short**)

Each can be **natural** or **artificial** .

	natural	artificial
passive	after an infection (your body responds)	vaccination (safe dose of antigen)
	antibodies passed from mother to baby	injection of ready-made antibodies

The cells of the immune response

neutrophils

the commonest phagocyte – a lobed nucleus, short-lived, first to arrive

macrophages

larger and longer-lived; they also **present antigen** to lymphocytes

B-lymphocytes B

divide into plasma cells, which secrete **antibodies**

T-helper cells T

recognise presented antigen and **activate** B cells and other T cells

T-killer cells

destroy the body's own infected cells

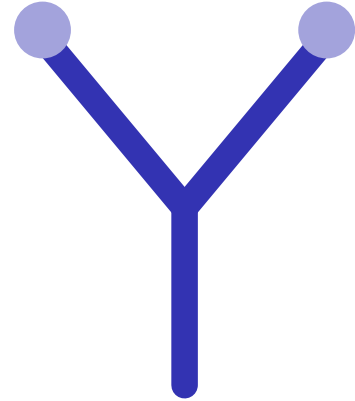
memory cells

remain after the infection, giving the fast, large **secondary** response

Phagocytosis is non-specific and immediate; the lymphocyte response is specific and slow the first time. The vaccine's whole purpose is to make the *second* response the first one you need.

Check yourself

- 1 What does a phagocyte display after digesting a pathogen?
- 2 Which cells give long-term immunity?
- 3 Which part of an antibody binds the antigen?
- 4 What protects the unvaccinated when most are immune?



Answers 1. the pathogen's antigen 2. memory cells 3. the variable region 4. herd immunity

Exercises 2.1-2.2

2.1 State what an antigen is, and the difference between a self and a non-self antigen.[2]

2.2 Name the cells that (a) make antibodies and (b) remain to give long-term immunity.[2]

Exercises 2.1·2.2

2.1 State what an antigen is, and the difference between a self and a non-self antigen.[2]

2.1

- an antigen is a molecule (usually a protein) on a cell surface that the immune system recognises; a self antigen is the body's own (ignored), a non-self antigen is foreign and triggers a response

2.2 Name the cells that (a) make antibodies and (b) remain to give long-term immunity.[2]

2.2

(a)

- plasma cells

(b)

- memory cells

Exercises 3.1-3.2

3.1 What does a macrophage do **after** digesting a pathogen?

[1]

☐

A makes antibodies

B displays the pathogen's antigen on its surface

C becomes a memory cell

D divides to form plasma cells

3.2 Why is the secondary immune response faster than the primary response?

[1]

☐

A there are more pathogens

B memory cells are already present and respond quickly

C phagocytes work faster the second time

D the antigen has changed shape

Exercises 3.1-3.2

3.1 What does a macrophage do **after** digesting a pathogen?

[1]

☐

A makes antibodies

B displays the pathogen's antigen on its surface

C becomes a memory cell

D divides to form plasma cells

3.1 B

- A macrophage displays the antigen to alert other immune cells

3.2 Why is the secondary immune response faster than the primary response?

[1]

☐

A there are more pathogens

B memory cells are already present and respond quickly

C phagocytes work faster the second time

D the antigen has changed shape

3.2 B

- Memory cells are already present, giving a quicker, larger response

Exercises 3.3-3.4

3.3 Describe the sequence of events in the primary immune response, from a macrophage presenting an antigen to the production of antibodies. [4]

3.4 Explain why a person who has recovered from a disease is often immune to that same disease for many years. [2]

Exercises 3.3-3.4

3.3 Describe the sequence of events in the primary immune response, from a macrophage presenting an antigen to the production of antibodies. [4]

3.3

- a macrophage engulfs the pathogen and displays its antigen; a T-helper cell with a matching receptor is activated; it activates the matching B-lymphocyte, which divides; into plasma cells that secrete antibodies

3.4 Explain why a person who has recovered from a disease is often immune to that same disease for many years. [2]

3.4

- memory cells made in the first infection remain in the body; they respond rapidly and strongly if the same pathogen returns, destroying it before illness