

Immunity

Revision notes · Antigens, antibodies, active immunity, vaccination and passive immunity.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Immunity Spec 10.1.6–10.1.15 Supplement

Antigens, antibodies and active immunity Spec 10.1.6, 10.1.7, 10.1.8, 10.1.9, 10.1.10

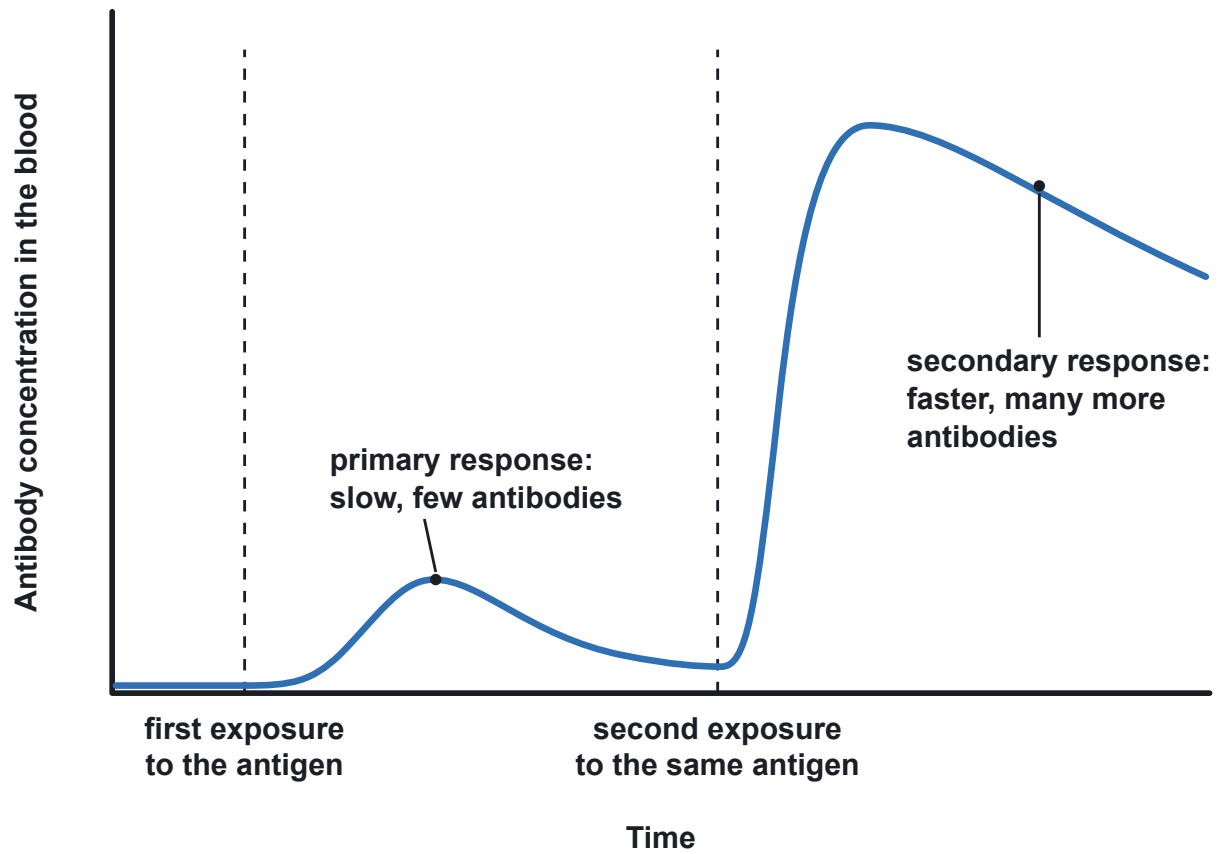
Each pathogen has its own **antigens**. Antigens are molecules on the surface of the pathogen, and they have specific shapes.

Antibodies are proteins made by white blood cells (lymphocytes). An antibody has a shape that is **complementary** to one specific antigen, so it fits that antigen and no others. This means that a different antibody is needed for each pathogen.

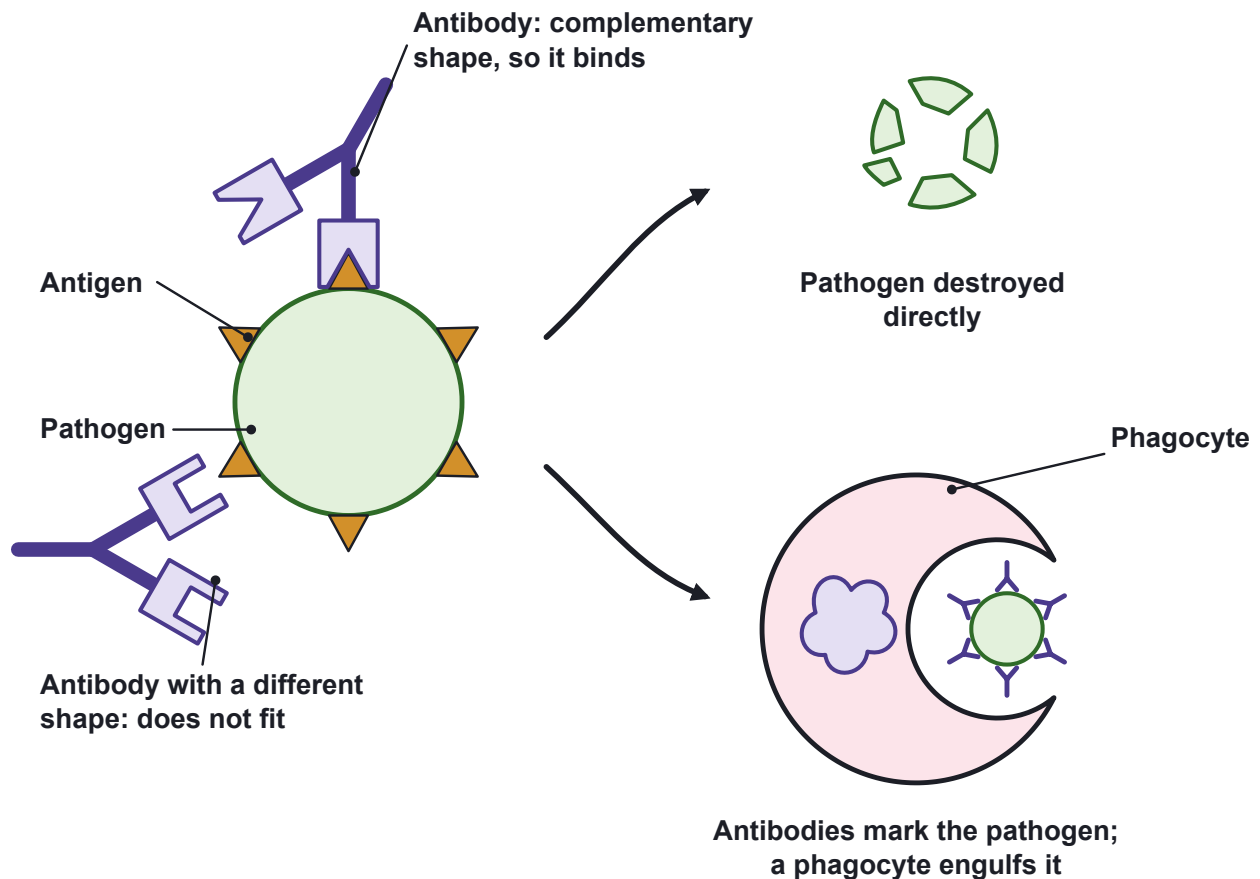
Antibodies bind to antigens. This leads to either direct destruction of the pathogens or marking of the pathogens so that phagocytes destroy them.

Active immunity is defence against a pathogen by antibody production in the body. It is gained in two ways:

- after an infection by a pathogen (the body makes antibodies and recovers)
- by vaccination



Memory cells made after the first exposure make the **secondary response** faster and bigger than the primary response.



Each antibody is **complementary** to one antigen. Binding leads to direct destruction of the pathogen or marks it for destruction by **phagocytes**.

Exam tip: Use the word 'complementary' for the shape of antibody and antigen. An antibody is specific to one antigen.

Vaccination Spec 10.1.11, 10.1.12

Vaccination gives **active immunity** without the person having to suffer the disease.

1. Weakened pathogens or their antigens are put into the body.
2. The antigens stimulate an immune response by lymphocytes, which produce antibodies.
3. Memory cells are produced that give long-term immunity. If the real pathogen enters later, memory cells respond quickly and make large amounts of antibody.

When a large proportion of the population is vaccinated, the pathogen has **fewer susceptible hosts** to infect. It is passed on less often, so the disease spreads less, and people who cannot be vaccinated are protected too.

Common mistake: Vaccines contain weakened pathogens or antigens, not antibodies. The person makes the antibodies.

Passive immunity Spec 10.1.13, 10.1.14, 10.1.15

Passive immunity is a short-term defence against a pathogen by antibodies acquired from another individual. The person's own lymphocytes do not make the antibodies.

Antibodies pass from mother to baby across the placenta before birth, and in breast milk after birth.

Breast-feeding is important for passive immunity in infants. The baby's immune system is not yet fully developed, and antibodies in the milk protect the baby against pathogens, for example in the gut.

Memory cells are not produced in passive immunity. The antibodies are broken down, so the protection is short-term and the baby is not protected if the pathogen returns later.

Active and passive immunity		
	Active immunity	Passive immunity
Antibodies made by	The person's own lymphocytes	Another individual (passed on)
Source	Infection or vaccination	Placenta or breast milk
Memory cells	Produced	Not produced
Length of protection	Long-term	Short-term

Exam tip: The key contrast is memory cells. No memory cells means short-term protection.

Quick check

1. What is an antibody?
2. What gives long-term immunity after vaccination?
3. Name two ways a baby gets antibodies from its mother.
4. Why is passive immunity short-term?

Quick check answers

Immunity

1. A protein that binds to a specific antigen.
2. Memory cells.
3. Across the placenta and in breast milk.
4. No memory cells are produced.