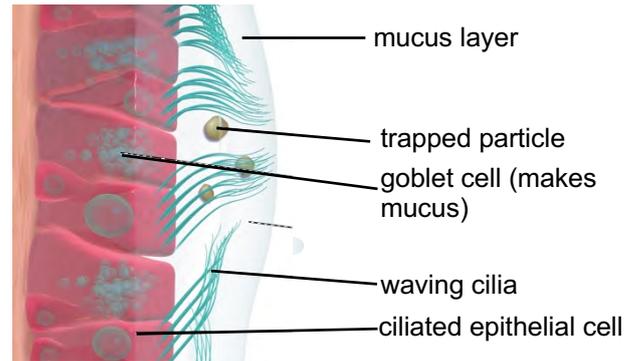


Barriers to infection

The body tries to stop **pathogens** (disease-causing microorganisms) getting into tissues. Skin acts as a barrier, and cuts are quickly healed by **platelets** and other substances in the blood.

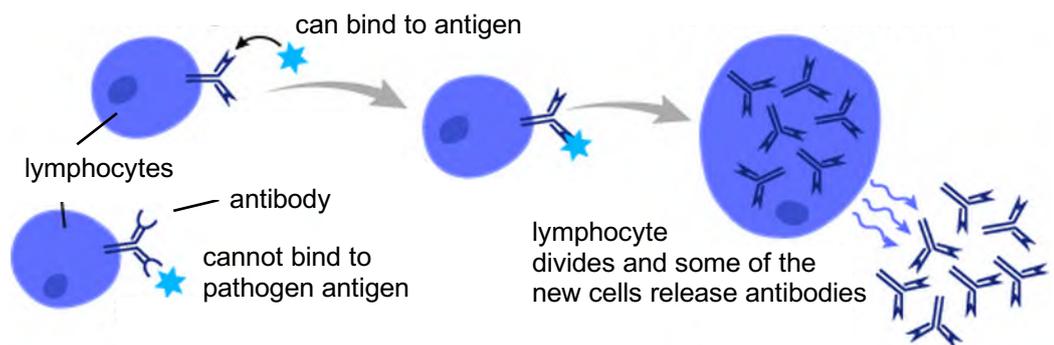


The tubes in the gas exchange system produce about 2 litres of sticky mucus each day. This traps small particles, which ciliated epithelial cells sweep up to the throat to be swallowed. Mucus also contains **lysozyme** (an enzyme that attacks the cell walls of some bacteria).

Lymphocytes and antibodies

Cells have **antigens** (proteins and other molecules) on their surfaces. In body tissues, white blood cells use antigens to work out if a cell belongs to the body or not. Foreign cells must be destroyed.

Lymphocytes are white blood cells that have **antibodies** on their surfaces. If the shape of an antibody matches that of a foreign antigen, they lock together. This



activates the lymphocyte, which divides to form many identical cells. Some of these release large quantities of their specific antibody. The foreign cell (or virus) becomes coated in these antibodies, which inactivate it and mark it out for **phagocytes** to surround and ingest.

This process can take days, and so pathogens make people ill before they get better. However, the process forms **memory lymphocytes**, which make the person **immune** (unable to get the disease). If the pathogen invades again, the body is prepared; memory lymphocytes quickly release antibodies in a **secondary response**, which soon destroy the pathogen and the person does not become ill.

Immunity lasts for different lengths of time. Scientists do not yet know how long immunity to COVID-19 lasts or if everyone who gets the disease becomes immune.

Find out

- I. 1. Scientists are developing tests to find out if someone has had COVID-19.
 - a. Names the two types of antibody these tests look for. _____

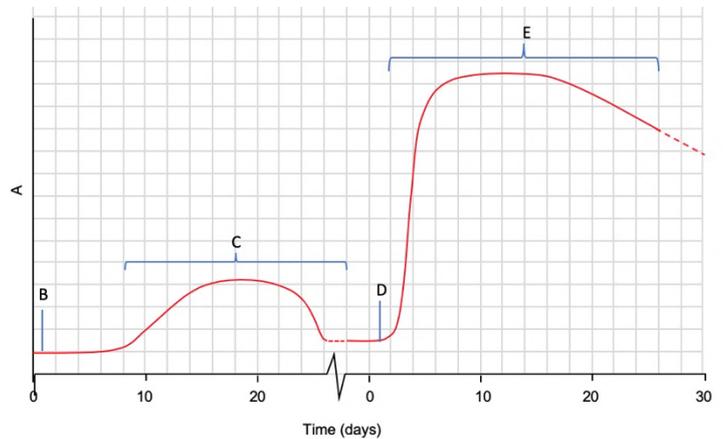
- b. During an infection, which antibody is first to be made? _____
2. White blood cells attack pathogens in tissues. The body tries to stop pathogens reaching tissues, using physical barriers and chemical defences (reactions with substances in pathogens). Complete the table to show some examples. You may need to do research.

Physical barrier	Chemical defence
	lactoferrin (e.g. in earwax)

Test yourself

3. Describe what an antigen is. _____
- _____
4. Explain why most of the body's lymphocytes are not activated by a particular pathogen.
- _____
- _____
5. The graph shows the body's 'immune response'. Add the letters to the labels below.

- ____ primary response
- ____ secondary response
- ____ antibody concentration
- ____ first infection
- ____ second infection



6. Identify two differences in the immune response each time the pathogen enters the tissues. _____
- _____

Check-up

- I. Check your answers.
- II. Some people have suggested that people who test positive for coronavirus antibodies should get an 'Immunity Passport' allowing them to move around freely. Prepare arguments for and against this idea, to use in a debate.

