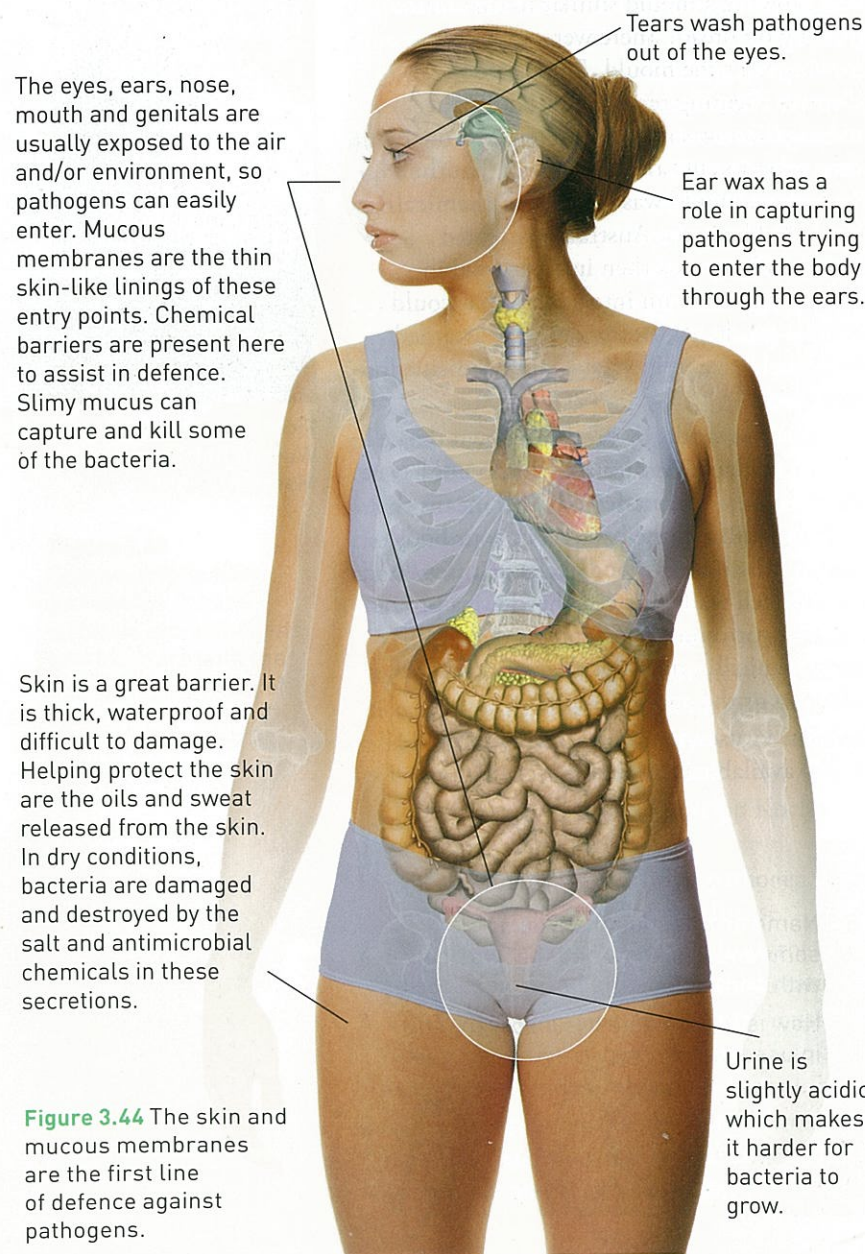


# 3.10 The immune system protects our body in an organised way



The role of your **immune system** is to protect you against foreign invaders by physically stopping them from entering your body, and identifying and attacking them if they manage to enter. Your immune system has three lines of defence against pathogens, each with a different role.



## First line of defence

The first line of defence is to stop the pathogens from getting inside your body (Figure 3.40). It consists of the skin and mucous membranes.

## Second line of defence

Viruses, unlike bacteria, contain a protective coating that allows them to more easily slip through the first line of defence. If a pathogen gets inside your body, the body tries to remove it in one of two ways.

First, a general 'seek and destroy' approach occurs regardless of the type of the pathogen. This is called a general or non-specific immune response. The key parts of the non-specific immune response are:

- > blood clotting, to stop additional infection through skin damage
- > inflammation, to increase the amount of blood cells reaching an infected area
- > fever – some pathogens cannot survive at high temperatures, so heating up the body is one way to destroy them.

Second, **white blood cells** are produced by the body to destroy pathogens. Inflammation increases the amount of blood reaching an infected area so more white blood cells are able to attack the pathogen. The white blood cells may also release chemical messengers that increase the amount of fluid in the infected area, causing swelling.

There are a few different types of white blood cells. Each type has its own role but they all work together. **Phagocytes** (Greek for 'cells that eat') deal with the non-specific immune response. They surround and absorb pathogens, destroying them in a process called phagocytosis.

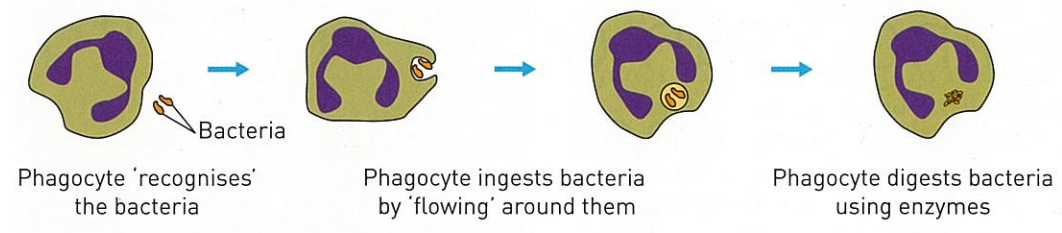


Figure 3.45 The process of phagocytosis

## Third line of defence

Any pathogens that are able to survive after the non-specific secondary response are targeted according to their type. This is called a specific immune response.

The specific immune response has two forms of attack. **B cells** produce special molecules called **antibodies**. These antibodies fit exactly onto a specific part of the pathogen. This will cause the pathogens to become locked together and stop them invading.

**T cells** then recognise the same specific pathogen and attack and kill it. B and T cells may take up to a week to recognise and destroy a pathogen. This is why recovering from an illness takes time.

Both the B and T cells will keep some **memory cells** alive just in case the pathogen tries to invade again. This means the pathogen will be attacked and killed before it does damage a second time. Your body will be protected from re-infection in the future. You are now **immune**.

Unborn babies obtain some natural immunity by receiving antibodies across the placenta from the mother. Antibodies are also passed to babies through breast milk.

One other way to acquire immunity is by ingestion or injection with specific small parts of the pathogen. This is called **vaccination**, or inoculation.

- A vaccine can be:
- > the dead pathogen
  - > a living but non-virulent (weakened) form of the pathogen
  - > parts of the broken up pathogen.

Through vaccination, a person makes antibodies, which usually leads to immunity. Vaccinations are often given as a preventive measure. For instance, the influenza vaccine is recommended for people over 65 years of age because complications from influenza can be life-threatening in older people. Vaccination can also be given when there is an urgent need to provide immunity. For example, a tetanus vaccination may be given after a tetanus-prone injury, such as an open wound caused by a rusty or dirty object, because tetanus can be fatal.

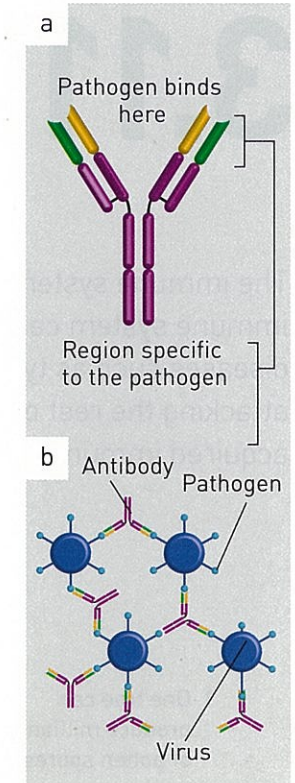
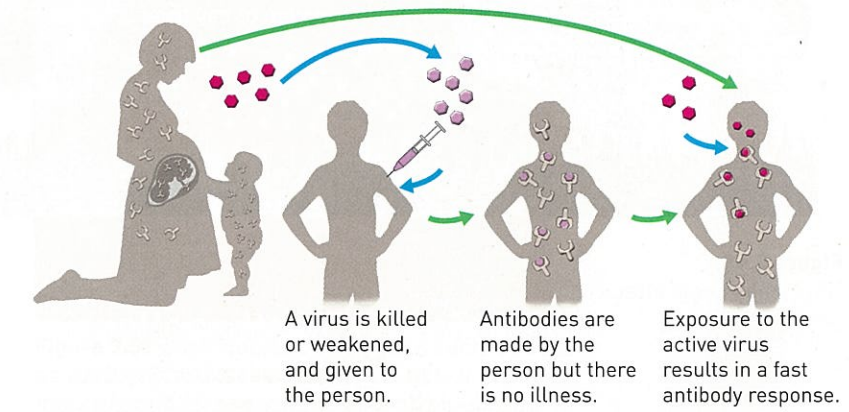


Figure 3.46 (a) Antibodies have regions that are specific to pathogens. (b) Antibodies cause pathogens to clump together.

## Check your learning 3.10

### Remember and understand

- 1 What is the body's major first line of defence?
- 2 In what other ways can the body prevent pathogens from entering?
- 3 Describe in your own words how the non-specific immune response works.

### Apply and analyse

- 4 What are the different types of immunity?
- 5 What is the difference between a vaccination and a vaccine?
- 6 What might a vaccine contain?

Figure 3.47 A person can become protected or immune through active vaccination or antibodies passively being passed on from their mother.