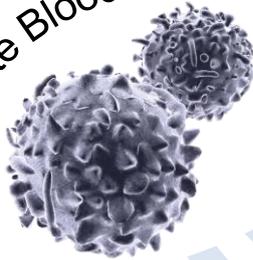


White Blood Cells



## National Curriculum Links

### Key Stage 2

#### Science

Working Scientifically (*Lower KS2 only*)

Animals, including Humans (*Upper KS2 only*)

#### PSHE

Core Theme 1: Health and Wellbeing

#### English

Reading and Comprehension

#### Estimated Teaching Time

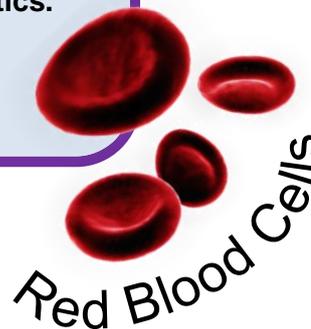
50 minutes

# 3.1 Prevention of Infection The Body's Natural Defences

Section 3.1 covers the topic of disease prevention and the body's own natural defenses.

A detailed presentation and animations show how the body fights harmful microbes on a daily basis.

This section provides the basic knowledge requirements for further learning about vaccinations and antibiotics.

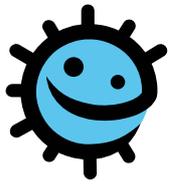


Red Blood Cells

### Learning Outcomes

#### All students will:

- understand that the human body has many natural defences to fight infection.
- understand that our bodies have 3 main lines of natural defences.
- understand that sometimes the body needs help to fight infection.



e-Bug

## 3.1 Prevention of Infection

### The Body's Natural Defences

#### Key Words

Antibodies  
Antigen  
Immune  
Inflammation  
Pathogen  
Phagocytes  
Phagocytosis  
Plasma  
White blood cells

#### Materials Required

- Download the presentation from [www.e-bug.eu](http://www.e-bug.eu)

#### Per student

- Copy of [SH 1](#)

#### Available Web Resources

- A MS PowerPoint presentation of The Body's Defence System, [SH 1](#)
- An animation illustrating how the immune system functions

#### FASCINATING FACT

Some fungal infections like athlete's foot (tinea pedis) don't need to get through our barriers as they can grow on the skin! Our bodies can still out-smart them as we have the potential to fight the infection even though it's on the outside!

#### Background Information

Our body has adapted ways of keeping us free from infections caused by harmful microbes. Three of the ways our body does this are below:

##### 1. Preventing entry

Our skin is the first line of defence stopping many harmful microbes entering our body. If skin has cuts or wounds then the barrier is broken and microbes can enter.

The mucus and cilia (tiny hairs) in our nose trap any microbes and stop them entering our lungs.

The tears in our eyes produce enzymes (although this is a chemical, not a physical barrier) which kill bacteria.

Our stomach produces acid that can kill harmful microbes we may eat (e.g. in contaminated foods) or swallow.

##### 2. Non-specific defence

If a microbe does get into our body then our immune system is called into action! The next line of defence is the use of WBCs. These cells are in our blood carrying out 'surveillance'. When microbes are detected, the white blood cells 'eat' the microbe and kill it. These WBCs are non-specific because they will literally try and engulf and kill anything, they are not fussy!

##### 3. Specific defence

These WBCs are specific in that they target microbes only. Each microbe has a specific shape or marker, called an **antigen**. When these WBCs come across an antigen they don't recognise they start to produce proteins called **antibodies**. The antibodies then attach to the antigens marking them for destruction by other WBCs. The antibody will **ONLY** attach to the specific antigen for which it was created. Antibodies are created rapidly by the WBCs and flow around the blood attaching themselves to the invading microbe or **pathogen**. When all the pathogens are destroyed the antibodies stay in the blood ready to fight the disease should it return. In this way, the body maintains a memory of the disease making you **immune** to diseases you have already had. If the pathogen attacks again the body is ready and quickly produces antibodies.

#### Advance Preparation

1. Copy [SH 1](#) for each student.
2. Download the animation illustrating how the immune system works from [www.e-bug.eu](http://www.e-bug.eu).





# The Body's Defence System

You do not always need medicine to help fight infection. Did you know your body works hard every day to fight harmful microbes without you even knowing it! The body has three lines of defence to stop microbes causing disease.

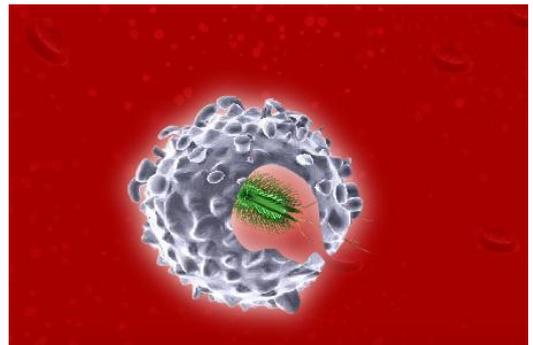
## First Line of Defence - Stops Microbes Entering the Body

1. The Skin: The skin stops microbes entering the body unless it is cut or damaged. Even when damaged the blood clots quickly sealing the cut with a scab stopping microbes getting in.
2. Nose and Lungs: Mucus and tiny hairs in the nose stop microbes from entering the lungs. The mucus is then removed by coughs, sneezes or even swallowed.
3. The Eyes: Tears produce a substance which kills bacteria on the surface of the eye.
4. Stomach: Our stomach produces acid. This acid can kill some microbes if they are found in contaminated food or we swallow them. But some clever microbes can survive this, like the microbes that cause food poisoning, e.g. *Salmonella*

## Second Line of Defence - Non Specific White Blood Cells

The immune system has cells called white blood cells:

1. These usually pick up anything 'foreign' that gets through the first line of defence
2. They engulf microbes and digest them
3. They are known as non-specific because they will attack ANYTHING that is foreign to the body
4. They also trigger swelling and redness by sending more blood to the area



## Third Line of Defence - Specific White Blood Cells

White blood cells develop 'memory'

1. All invading cells have distinctive markers called antigens on their surface
2. When specific white blood cells come across a foreign marker/antigen they produce antibodies which lock onto the invading cells marking them for destruction. These antibodies will ONLY target these specific markers/antigens and no others
3. Once the white blood cells know which antibodies to make, they produce them very quickly. These antibodies then either:
  - a. Immediately start marking invading microbes for destruction
  - b. Stay in the blood after the infection has gone so that they are ready to fight if the infection returns. This is why your body is immune to most diseases you have already had – it remembers how to make the antibodies quickly

