



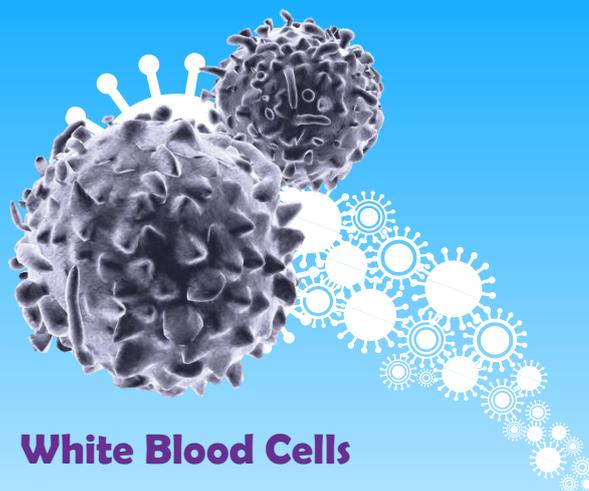
e-Bug

3.1

THE BODY'S NATURAL DEFENSES

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

A detailed presentation and animations showing how the body fights harmful microbes on a daily basis. This section provides the basic knowledge requirements for the final 2 sections of this resource.



White Blood Cells

LEARNING OUTCOMES

All students:

- Will know that the human body has many natural defenses to fight infection
- Will understand that there are 3 main lines of defense
- Will understand that sometimes our body needs help to fight infection

NATIONAL CURRICULUM LINKS

Key Stage 3

Science

Cells and Organisation

Estimated Teaching Time

50 minutes



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

Per student

- Copy of [SH 1](#)

Available Web Resources

- A MS PowerPoint presentation of [SH 1](#)
- An animation illustrating how the immune system functions

Background Information

Our body is extremely efficient at keeping us healthy. It has three major lines of defence:

1. Stopping pathogens entering the body

Our skin is the first line of defence stopping many harmful microbes entering our body.

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

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

2. Non-specific White Blood Cells (WBC)

These WBCs are known as **phagocytes** and are non-specific because they will literally try to engulf and kill anything, they are not fussy! They engulf and digest foreign bodies by a process known as **phagocytosis**. They also trigger an **inflammatory response** by causing blood (makes the area red and hot) and **plasma** (makes the area swell up) to flow to the infected area. All this enables the right cells to get to the area and fight the infection.

3. Specific White Blood Cells (WBC)

These WBCs are specific in that they target microbes only. All invading microbes have a unique molecule on their surface 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 many diseases you have already had. If the pathogen attacks again the body is ready and quickly produces antibodies to fight the infection.

Advance Preparation

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



The Body's Defence System

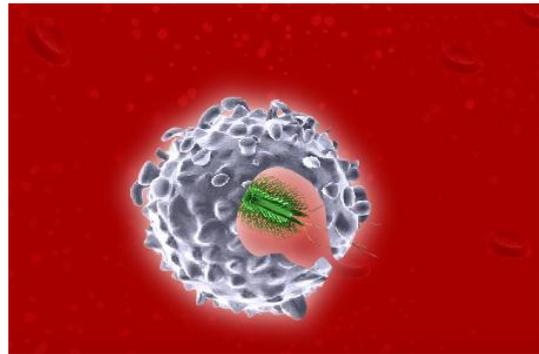
You don't always need medicine to help fight infection. Did you know your body works hard every day to fight harmful microbes without you even knowing? The body has three lines of defence to stop microbes causing disease.

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. The Respiratory System
Mucus and tiny hairs in the nose stop microbes from entering the lungs.
3. The Eyes
Tears produce chemicals called enzymes which kill bacteria on the surface of the eye.

Second Line of Defence – Non-Specific White Blood Cells

1. White blood cells called phagocytes
 - a. These usually pick up anything 'foreign' that get through the first line of defence
 - b. They engulf microbes and digest them
 - c. They are known as non specific because they will attack ANYTHING that is foreign to the body
 - d. They also trigger swelling and redness by
 - i. Increasing blood flow to the area
 - ii. Cause fluid to leak into the damaged area



Third Line of Defence - Specific White Blood Cells

1. Some produce Antibodies
 - a. All invading cells have distinctive markers called antigens on their surface
 - b. 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.
 - c. Once the white blood cells know which antibodies to make, they produce them very quickly. These antibodies then either
 - i. Immediately start marking invading microbes for destruction
 - ii. 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.

