

## The immune system 1

### What is immunity?

Immunity means that you are protected against something. There are different kinds of immunity. This topic is about how different parts of our bodies work together to keep us from getting sick. Immunity to some diseases is passed on from our mothers before we are born. Immunization (having your 'shots') helps our body's immune defence system protect us from diseases.

There are several parts to the immune system:

The skin, tonsils in the throat, adenoids in the ears, sinuses in the nose, the lungs, the bowel, white blood cells and the lymphatic system.

Your body is like a castle. It defends you against germs.



1. What is immunity?
2. List the parts of the immune system.

## Immune system 2

### The body's immune system

Everybody has an inbuilt immune system which protects it from diseases and germs. This system has a lot of different parts which work together to keep out any harmful germs, and attack and destroy any which manage to get inside your body.

Every day your body is exposed to millions of germs, and you do not get sick from them because of your immune system.

Every time you do get sick because of a germ, your immune system works to get rid of it and then it remembers how to fight the infection if the same germ comes again.

Usually the older you get, the more germs you become immune to.



1. What does the immune system do?
2. How does your immune system fight germs?

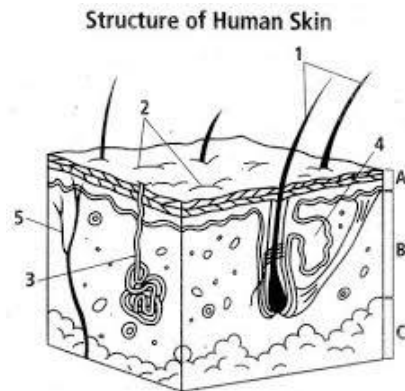
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#### The skin

The skin is the first line of defence in your immune system. You know how you put plastic wrap over leftovers to keep them fresh enough for later? Well, your skin is like a plastic wrap to keep germs from getting into your body.

The epidermis (outside layer of skin) has special cells which warn the body about incoming germs.

Glands in the skin also make substances that can kill some bacteria (anti-bacterial chemicals). This means you don't get infections on your skin unless your skin is damaged, such as by a cut or a graze.



1. Draw the structure of the human skin.
2. How does the skin protect us from germs?

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#### Nose, mouth, eyes, ears, lungs and bowel

This is what happens when your nose, mouth, eyes, lungs and bowel get attacked by germs or dust:

The mucous membranes which line the mouth, throat, lungs and bowel, act like a barrier to germs, just as the skin does.

Saliva in the mouth and the tears which wash your eyes have special enzymes (chemicals) in them which break down the cell walls of many bacteria and viruses.

The mucous that is made in your nose, throat and lungs traps bacteria, viruses and dust.

Acid in your stomach kills most germs, and starts to digest your food.

What are the functions of the following?

1. Saliva
2. Mucous
3. Stomach acid

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### The Lymphatic system

The lymphatic system is made up of:

**Lymph:** a clear fluid that is very similar to the clear liquid in blood, but it carries only white blood cells, not red blood cells.

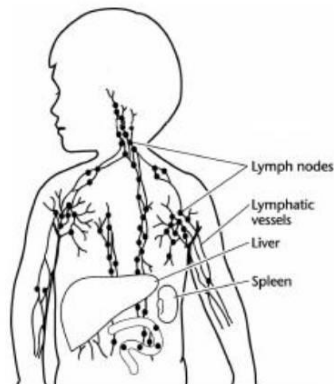
The lymph flows through all the parts of the body picking up fluid around cells and carrying it back to large veins near the heart. It also carries white blood cells to the places where they are needed.

#### Lymph nodes

Some bacteria or viruses that have entered the body are collected by the lymph and passed on to the lymph nodes where they are filtered out and destroyed. Lymph nodes are sometimes called glands.

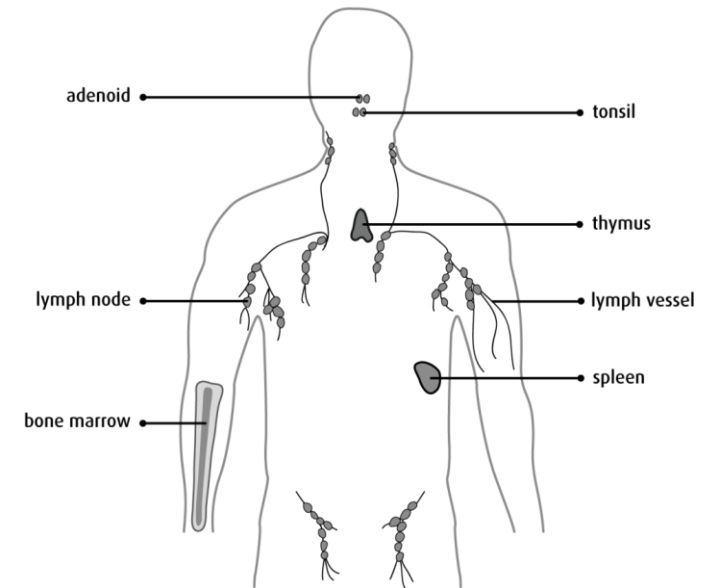
Your doctor can often tell if you have an infection by checking out the lymph nodes (glands) in your neck and under your arms to see if they're swollen. If they are, it shows that they are working to get rid of bacteria or viruses.

1. What is the function of lymph?
2. Where are lymph nodes found?
3. How do they help us?



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### Diagram of the lymphatic system



The spleen clears out worn out blood cells and fights off infection. The thymus trains the T cells (one of the white blood cells) to do their job of looking out for germs or things that don't belong in the body, and destroying them. The bone marrow is where the blood cells are made. The adenoids keep infection out of your ears. The tonsils kill germs that may enter the throat. The lymph vessels carry lymph fluid around the body.

List the functions of the following:

Spleen, thymus, bone marrow, adenoids, tonsils. Copy the diagram.

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### Facts about blood

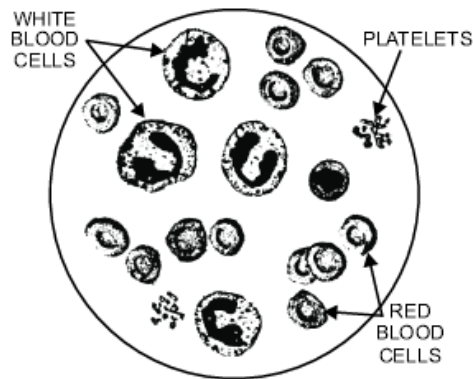
Blood is made up of four parts – plasma, red cells, white cells and platelets. Each part has a special job.

Plasma is a yellow liquid. It helps give you energy and grow.

Red blood cells carry oxygen to your cells.

White blood cells clean the blood and fight germs. When a virus enters your body, white blood cells rush to destroy the virus so you get better.

Platelets help your blood clot. When you cut yourself, a clot forms so the blood stops running. If your blood didn't clot, you could bleed to death.



1. What are the four parts of blood?
2. List the function of each.
3. Draw the diagram.

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### White blood cells

In your blood, you have red blood cells and white blood cells, and in lymph there are white blood cells.

There are several different types of white cells which work together to seek out and destroy bacteria and viruses.

All of them start off in the bone marrow, growing from 'stem cells'. The disease-fighting white blood cells are specialists. Some of the white blood cells are:

*Neutrophils*, which move around the body in the blood and seek out foreign material (things that don't belong in your body).

*Macrophages* are the biggest blood cells. Some live in different parts of the body and help to keep it clean, e.g. in the lungs. Others swim around cleaning up other white blood cells that have been damaged while doing their jobs, e.g. cleaning up pus that has been caused by neutrophils when they work to clear out bacteria from a wound.

*Lymphocytes* work on bacterial and viral infections

There are two different types:

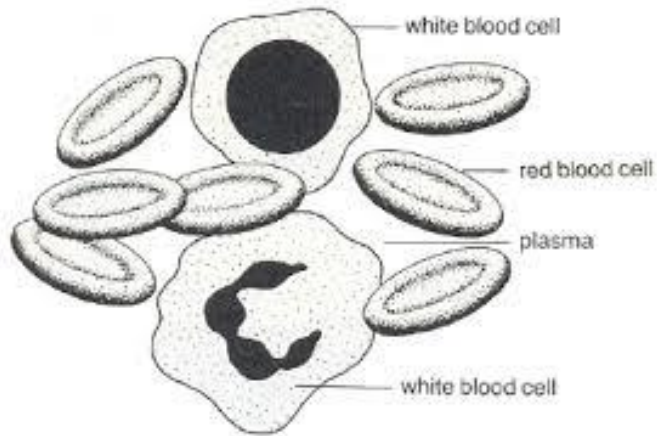
*B cells* produce antibodies. Each cell watches out for a particular germ, and when that germ arrives, the cell starts to produce more antibodies which begin the process of killing that germ. Antibodies attach themselves to the germs so that other cells can recognize that these germs need to be destroyed.

*T cells* look for cells in your body that are hiding invaders (germs) or body cells that are different to normal healthy cells (such as cells that could develop into a cancer) and kill them.

*List the three types of white blood cells and briefly explain what they do.*

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### The difference between red blood cells and white blood cells



The red blood cells are donut shaped and regular. They carry oxygen around the body.

The white blood cells are all different shapes because there are different types. They kill bacteria and viruses in your body.

1. Copy the diagram including the labels.
2. What is the difference in the function of red and white blood cells?

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### How does your immune system know which cells to attack?

Your body has lots of friendly bacteria around it which help your body work properly, e.g. some bacteria inside your bowel help you to digest your food and break it up into the different things that are needed in various parts of the body.

These friendly bacteria live on the surfaces of the body, such as on our skin or inside the bowel. They do not try to invade the body, so the immune system does not try to get rid of them.

Other germs which cause illness, try to enter the body. Antibodies, which are made by the lymphocytes, attach to the invaders so that the other white blood cells can destroy them. They 'tag' them so they can be easily noticed.

As well as attacking germs, your immune system recognizes and destroys other cells which do not belong in your body. The cells in your own body are marked with a special system called *antigens*.

Your immune system can recognize these markings as 'you'. Any cells which do not have the right markings are 'not you' and are therefore attacked. This happens if, for example, you have a blood transfusion with the wrong types of blood cells. Your body's immune system recognizes that these cells do not belong in your body, so it destroys them.

1. What do antibodies do?
2. What do antigens do?

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### How you know your immune system is working

You know your immune system is working:

- if you get better after you are sick
- if cuts heal without getting infected
- if you don't catch the same diseases over and over again
- when you get swollen glands
- when you get swelling and soreness around a cut.

Your immune system is in there working to get rid of any infection. Sometimes the immune system will make a mistake. It may attack your own body as if it were the enemy. This happens when a person has an allergy.

Allergies are caused by the immune system over-reacting to something that is not really a threat, like when pollen triggers hay fever or asthma.

When the immune system is damaged, they get lots of infections and are much more likely to get serious illnesses. Their body cannot recognize the infection or abnormal cells very well and the immune system does not destroy them as well as usual.



*How do you know if your immune system is working well?*

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### How to build a strong immune system

A strong immune system is an immune system that is working well. This means that when an invader comes into your body, it can be destroyed very quickly. It may mean that you catch a cold sometimes, but you will be able to get better quite quickly. It may also mean that you don't catch the cold in the first place because your immune system destroys the germ as soon as it enters your body.

To stay healthy, we should wash our hands before eating and after the toilet, so that we don't get germs coming into our mouths when we handle food or put our hand to our mouth.

To build a strong immune system there are certain foods we should eat. These are fruits, vegetables and other foods from nature. Fruits containing Vitamin C are particularly good. Examples of these are oranges, lemons, apples and pineapples.

The foods that make our immune systems weak are foods containing high sugar and salt, like processed snack foods in packets, sweets, cakes and biscuits.

*Make a list of things we can do to build a strong immune system.*

