What is immunity?

Immunity (say im-yoon-it-i) means that you are protected against something. For example, in the Survivor series on TV, someone can win immunity, which means that they don't have to risk being chosen to leave the group that week.

The body's immune system

Every body 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.

So, let's have a look at the immune system, starting from the outside of the body.

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.

Other defences

Your nose, mouth and eyes are the next point of attack.

> 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.
Lymphatic system

- Lymph is a clear fluid that is very similar to blood plasma, 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 that they are needed.

- 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.

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 specialise. Some of the white blood cells are:

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

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

3. **Lymphocytes** (say lim-fo-sites) 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 recognise 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.

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 - eg. 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.

As well as attacking germs, your immune system recognises and destroys other cells which do not belong in your body. The cells in your own body are marked with a special system called Human Leukocyte Antigen or HLA (say Hew-man lew-ko-site anti-jen).

Your immune system can recognise 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 recognises that these cells do not belong in your body, so it destroys them.

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.

When things go wrong with the immune system

Sometimes the immune system will make a mistake.

1. It may attack your own body as if it were the enemy, eg. insulin dependent diabetes (the type that most often starts in children and young people) is caused by the immune system attacking the cells in the pancreas that make insulin.
2. 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.
3. If tissue is transplanted from one person to another - eg. a skin or organ transplant - then the immune system will attack the new part. The immune system has to be suppressed by drugs to allow the transplant to work.
4. When the immune system is damaged, such as when people have a serious illness called AIDS, they get lots of infections and are much more likely to get cancers. Their body cannot recognise the infection or abnormal cells very well and the immune system does not destroy them as well as usual.
Dr Kate says:

The immune system is absolutely amazing. It deals with millions of bacteria and viruses every day to keep us healthy.

Keeping up to date with immunisations can help your body to build immunity to some serious diseases too.