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The immune system

Lymphocytes, the cancerous cells in lymphoma, are a type of immune system cell. This page tells you about how the immune system works.

On this page

What is the immune system?

Your immune system protects your body against infection and disease. It recognises the cells that belong to your body and tries to get rid of anything that shouldn't be there in case it causes you harm. This includes germs (bacteria, viruses and parasites) and toxins (poisons). Your immune system also helps to destroy cells that are old, damaged or have become abnormal.

There are different parts of your immune system, which work in different ways. There are also different types of immunity.

You have 'innate immunity', which you are born with. This includes:

- **physical barriers** that prevent organisms getting into your body
- **phagocytes** (types of immune cell), which can fight lots of different types of infection and disease.

You also develop 'acquired immunity' throughout your life as you get exposed to infections. This type of immunity is specific to those infections

and prevents you getting the same infections again. Vaccinations expose you to a small dose or inactivated form of the infection so that your immune system can recognise it in future. **Lymphocytes** (a type of white blood cell or immune cell) are important for acquired immunity. They 'remember' infections you have had before so your body can produce lots of immune system cells very quickly if you are exposed to the same infection again. Lymphocytes are also the immune cells that become abnormal in **lymphoma**.

Physical barriers

Physical barriers are the first-line of protection against infection. They include your:

- skin
- mucosa (sometimes called mucous membranes) – the soft, moist lining in certain areas of the body, such as your mouth, nose, gut, and breathing passages.

Your skin prevents any germs getting into your body and also produces oils that can help kill them.

Fluids, such as tears and saliva, wash away germs on the mucosa. Parts of the mucosa also produce sticky mucus, for example, phlegm in your breathing passages. The mucus can trap germs. Proteins and immune cells in the mucus attack and destroy these germs.

Your stomach acid helps to destroy any germs that you swallow.

Immune cells

If a germ gets past your body's physical barriers, you have lots of immune cells to fight infection. There are different types of immune cells. Most of these are types of white blood cell.

Immune cells can be divided into phagocytes and lymphocytes.

Phagocytes

Phagocytes can 'eat' or destroy germs and any of your own cells that are no longer useful to your body. There are several different types, including:

- **Macrophages**, which develop from white blood cells called 'monocytes'. They 'eat' germs and dead, old or abnormal cells. Macrophages can deal with only small numbers of cells. They use chemical messages to signal for help from other immune cells.
- **Neutrophils**, which are found in your **bone marrow** and bloodstream but move into tissues if there is an infection. Like macrophages, they kill and destroy germs, particularly fungi and bacteria, and send out more signals to bring other immune cells to the area.

Lymphocytes and antibodies

Lymphocytes are important in giving you immunity (a rapid immune response) to an infection when you have already had that infection in the past. Antibodies are proteins made by lymphocytes to fight infection.

B lymphocytes (B cells)

B cells are made in the **bone marrow** but live mainly in **lymph nodes** (glands) and other lymphatic tissues, such as the **spleen**.

After they've come into contact with an infection, B cells can turn into 'plasma cells' which despite their name, are nothing to do with the liquid part of blood (which is called 'plasma'). Plasma cells produce a huge range of antibodies (proteins that are also known as immunoglobulins).

Antibodies fight infection by sticking to proteins on the surface of invading organisms. These proteins are known as 'antigens'. Each B cell can react to only one type of antigen. If a B cell is triggered by contact with its specific antigen, it quickly makes copies of itself. These copies can turn into plasma cells and produce large amounts of antibody.

Antibodies fight infection by:

- directly stopping the germ getting into our cells

- telling other **immune cells** (for example, macrophages and neutrophils) that the cell should be destroyed
- switching on proteins called 'complement' to destroy the cells.

They can also stick to toxins (poisons) and stop them doing any harm.

Once the infection has gone, most of the B cells and plasma cells that have been produced in response to the infection die. A few plasma cells remain in the bone marrow for much longer, making antibodies to protect against future infection. A few B cells continue to live in lymph nodes. These can respond again more quickly to the same infection if needed – they are known as 'memory B cells'.

T lymphocytes (T cells)

T cells are made in the **bone marrow** but develop fully in the **thymus**, before moving to live in **lymph nodes**.

Your own cells 'show' antigens to T cells. For example:

- some immune system cells can break down a germ and 'show' antigens to a T cell
- if your own cells are infected, for example with a virus, the T cell can recognise the foreign proteins
- if your own cells become abnormal, they are recognised as different by T cells.

Each T cell can recognise just one type of antigen. If it comes into contact with that antigen, it makes copies of itself. The new cells then become various special types of T cell that work in different ways:

- **Cytotoxic T cells** kill the germ, particularly viruses and tuberculosis (TB) bacteria. They also look out for any of your own cells that might be 'going wrong' (such as becoming a cancer cell) and kill them too.
- **Helper T cells** support the fight against infection by telling **B cells** to make more antibodies and by 'switching on' more **macrophages and neutrophils**.
- **Memory T cells** are left behind once the infection has gone – only a few of them are needed. They allow the immune system to respond quickly if the same infection starts again.

NK cells (natural killer cells) are like T cells, except that they do not develop in the thymus. They don't need to be activated by an antigen but recognise signals from your own cells that tell the NK cells not to kill them. They kill cells that have been infected by a virus or are turning into cancer.

Immune cells and proteins that help lymphocytes

Dendritic cells help direct the work of both B cells and T cells. They show antigens from the infection to these cells in a way that tells them to start attacking that infection. They also help the immune system remember infections so it can act quickly when needed again.

Histiocytes are immune cells that stay in one place in the tissues rather than circulating around the body. They can also tell the lymphocytes that an infection is present.

Complement is the name of a group of proteins that are made in the liver and found in the bloodstream. The proteins are switched on by contact with germs and by antibodies. Once switched on, the complement proteins change so that they join together and stick to the germ. They then either punch holes in the germ to burst it or signal to macrophages to 'eat' it.

What can go wrong with the immune system?

The immune system does not always work perfectly. It might over-react, causing allergies and **autoimmune conditions**. It might not work as well as it should, causing **immunodeficiency**. Problems with your immune system can also contribute to the **development of lymphoma**. Sometimes the immune system does not recognise abnormal cells, which can allow cancer to develop.

The immune system and cancer

As well as protecting you from invading viruses, fungi and bacteria, your immune system should also protect you from your own cells if they go wrong. You might hear this called ‘cancer surveillance’.

When a cancer (such as a lymphoma) develops, it means that the immune system, for some reason, has not detected the cancerous cells or has not been able to get rid of them. This does not always mean that the immune system was weak. Often it happens because the cancerous cells looked, on the surface, very like a normal cell. They didn’t stand out and therefore weren’t detected by the immune system and were able to start growing. Cancer cells also develop ways to prevent the immune system attacking them. For example, some cancer cells make special proteins on their surface that tell **T cells** not to attack them.

References

These are some of the sources we used to prepare this information. The full list of sources is available on request. Please contact us by email at **publications@lymphoma-action.org.uk** or phone on **01296 619409** if you would like a copy.

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Further reading

- Glossary
- Lymphoma and the immune system
- Symptoms of lymphoma
- The lymphatic system
- What is lymphoma?

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