

## The immune system

Your immune system protects your body from infection and disease. Lymphocytes, the white blood cells that become cancerous in lymphoma, are a type of immune system cell. This information summarises how the immune system works and what lymphocytes do.

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We have separate information about the topics in **bold font**. Please get in touch if you'd like to request copies or if you would like further information about any aspect of lymphoma. Phone 0808 808 5555 or email **[information@lymphoma-action.org.uk](mailto:information@lymphoma-action.org.uk)**.

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## What is the immune system?

Your immune system protects your body against infection and disease. It recognises cells and proteins that belong in your body and tries to get rid of anything that doesn't belong. 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.

Your immune system includes:

- physical barriers that stop germs getting into your body
  - specialised immune cells that fight any germs that do get into your body.
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## Physical barriers

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

- Your skin, which helps stop germs getting into your body. It also produces proteins and oils that can kill them.
  - Mucosa, the moist, protective layer of cells that lines many parts of your body, such as your mouth, gut and airways. Cells in your mucosa produce a thick fluid called mucus, which contains immune cells and proteins that help kill germs.
  - Tears and saliva, which can wash germs away.
  - Stomach acid, which helps destroy any germs that you swallow.
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## Immune cells

You have lots of specialised immune cells in your body. They circulate in your bloodstream and your **lymphatic system** checking for any germs that get past your body's physical barriers. They also check for any of your own cells that have become abnormal.

There are lots of different immune cells and proteins that help your immune system work effectively. Most of them are types of white blood cell. They can be broadly grouped into phagocytes and lymphocytes.

## Phagocytes

Phagocytes are your immune system's first responders. They 'eat' germs and cells that have become abnormal. They also send out chemical messages to signal for help from other immune cells.

- Neutrophils are the most common type of white blood cell. They make up about 70% of all your white blood cells. They are a type of phagocyte. Neutrophils develop in your **bone marrow** and circulate in your bloodstream. They are very sensitive to the effects of **chemotherapy** and other cancer treatments, which can make your neutrophil counts low (**neutropenia**). If you have neutropenia, you have a higher than usual risk of infection.
- Macrophages are an important type of phagocyte in your tissues. They break germs or damaged cells into smaller pieces. They then 'show' the pieces to **T cells**, which activates the T cells.

## Lymphocytes

Lymphocytes are your immune system's memory. They help your body remember infections you've had before so your immune system can respond quickly if you encounter them again. Lymphocytes are the cells that grow out of control if you have **lymphoma**.

Lymphocytes are important in giving you immunity to infections you've had in the past. They also give you immunity to infections you've been vaccinated against.

There are three main types of lymphocyte: B lymphocytes (B cells), T lymphocytes (T cells) and natural killer cells (NK cells).

### B lymphocytes (B cells)

B cells develop in your **bone marrow** but live mainly in your **lymph nodes** and other lymphatic tissues, such as your **spleen**.

Each B cell has special receptors on its surface that react to only one particular type of germ or cell. If a B cell meets the germ or cell it reacts to, it is activated and makes lots of copies of itself. This allows your body to respond to the threat very quickly.

B cells make antibodies (also known as immunoglobulins).

### Antibodies

Antibodies are proteins that stick to the surface of germs or cells. This can:

- stop the germ infecting you
- act like a flag to tell immune cells to kill the germ or cell
- make the germs or cells clump together so it's easier for your immune system to find them
- activate substances that kill the germ or cell.

B cells make antibodies in response to particular germs. As well as fighting the infection, antibodies also help protect you from future infections with the same germ.

### T lymphocytes (T cells)

T cells are made in your **bone marrow** but develop fully in your **thymus**. They mostly live in your **lymph nodes**.

T cells can't recognise germs or abnormal cells by themselves. They only respond if other immune cells show them the abnormal cells or germs and tell the T cells to react.

Each T cell has receptors on its surface that can only react to one particular type of germ or abnormal cell. If it is shown that germ or cell, the receptors stick to it and activate the T cell to make copies of itself. The new cells develop into one of two main types of T cell that work in different ways:

- **Cytotoxic T cells** kill germs, including germs that have got inside your own cells. They can also kill any of your own cells that might have become abnormal (such as cancer cells).
- **Helper T cells** tell B cells to make more antibodies and switch on other immune cells.

### **NK cells (natural killer cells)**

NK cells are similar to B and T lymphocytes, but they don't only react to one particular type of germ or cell. Instead, they can respond to many different types. They work by recognising signals from your own cells. These signals tell the NK cells **not** to kill them. NK cells kill cells that **don't** produce these signals. This includes cells that have been infected by viruses, or cells that are showing early signs of cancer.

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## **What can go wrong with the immune system?**

Your immune system doesn't always work perfectly.

- If it overreacts, it can cause allergic reactions.
- If it mistakenly attacks your own, healthy cells, it can cause [autoimmune conditions](#).
- If it doesn't work as well as it should ([immunodeficiency](#)), you might develop infections easily, or not get rid of them as quickly as other people.
- If the cells in your immune system grow out of control, they might become cancerous. This happens if you have lymphoma. We have separate information on [how lymphoma and its treatment affect your immune system](#).

### **The immune system and cancer**

As well as protecting you from germs, your immune system should protect you from your own cells if they go wrong.

When a cancer (such as a lymphoma) develops, it means that the immune system has not managed to detect the abnormal cells or has not been able to get rid of them. Sometimes, this might be because there is a problem with your immune system. However, it can also happen in people who have a healthy immune system. This is because cancerous cells can look, on the surface, very like a healthy cell, so your immune system doesn't recognise them. It can also happen because some cancer cells develop ways to stop the immune system reacting to them – for example, by making special proteins on their surface that tell your immune cells not to attack them.

Some **targeted cancer treatments** work by helping your immune system to recognise cancer cells, or by switching off the signals cancer cells use to stop your immune system reacting to them.

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## References

The full list of references for this page is available on our website.

Alternatively, email [publications@lymphoma-action.org.uk](mailto:publications@lymphoma-action.org.uk) or call 01296 619400 if you would like a copy.

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