Immune system explained

Summary

- The immune system is a complex network of cells and proteins that defends the body against infection.
- The immune system keeps a record of every germ (microbe) it has ever defeated so it can recognise and destroy the microbe quickly if it enters the body again.
- Abnormalities of the immune system can lead to allergic diseases, immunodeficiencies and autoimmune disorders.

The immune system is made up of special organs, cells and chemicals that fight infection (microbes). The main parts of the immune system are: white blood cells, antibodies, the complement system, the lymphatic system, the spleen, the thymus, and the bone marrow. These are the parts of your immune system that actively fight infection.

The immune system and microbial infection

The immune system keeps a record of every microbe it has ever defeated, in types of white blood cells (B- and T-lymphocytes) known as memory cells. This means it can recognise and destroy the microbe quickly if it enters the body again, before it can multiply and make you feel sick.

Some infections, like the flu and the common cold, have to be fought many times because so many different viruses or strains of the same type of virus can cause these illnesses. Catching a cold or flu from one virus does not give you immunity against the others.

Parts of the immune system

The main parts of the immune system are:

- white blood cells
- antibodies
- complement system
- lymphatic system
- spleen
- bone marrow
- thymus.

White blood cells

White blood cells are the key players in your immune system. They are made in your bone marrow and are part of the lymphatic system.

White blood cells move through blood and tissue throughout your body, looking for foreign invaders (microbes) such as bacteria, viruses, parasites and fungi. When they find them, they launch an immune attack.

White blood cells include lymphocytes (such as B-cells, T-cells and natural killer cells), and many other types of immune cells.

Antibodies

Antibodies help the body to fight microbes or the toxins (poisons) they produce. They do this by recognising substances called antigens on the surface of the microbe, or in the chemicals they produce, which mark the microbe or toxin as being foreign. The antibodies then mark these antigens for destruction. There are many cells, proteins and chemicals involved in this attack.

Complement system

The complement system is made up of proteins whose actions complement the work done by antibodies.

Lymphatic system

The **lymphatic system** is a network of delicate tubes throughout the body. The main roles of the lymphatic system are to:

- manage the fluid levels in the body
- react to bacteria
- deal with cancer cells
- deal with cell products that otherwise would result in disease or disorders
- absorb some of the fats in our diet from the intestine.

The lymphatic system is made up of:

- lymph nodes (also called lymph glands) -- which trap microbes
- lymph vessels -- tubes that carry lymph, the colourless fluid that bathes your body's tissues and contains infection-fighting white blood cells
- white blood cells (lymphocytes).

Spleen

The **spleen** is a blood-filtering organ that removes microbes and destroys old or damaged red blood cells. It also makes disease-fighting components of the immune system (including antibodies and lymphocytes).

Bone marrow

Bone marrow is the spongy tissue found inside your bones. It produces the red blood cells our bodies need to carry oxygen, the white blood cells we use to fight infection, and the platelets we need to help our blood clot.

Thymus

The thymus filters and monitors your blood content. It produces the white blood cells called T-lymphocytes.

The body's other defences against microbes

As well as the immune system, the body has several other ways to defend itself against microbes, including:

- **skin** - a waterproof barrier that secretes oil with bacteria-killing properties
- **lungs** - mucous in the lungs (phlegm) traps foreign particles, and small hairs (cilia) wave the mucous upwards so it can be coughed out
- **digestive tract** - the mucous lining contains antibodies, and the acid in the stomach can kill most microbes
- **other defences** - body fluids like skin oil, saliva and tears contain anti-bacterial enzymes that help reduce the risk of infection. The constant flushing of the urinary tract and the bowel also helps.

Fever is an immune system response

A rise in body temperature, or **fever**, can happen with some infections. This is actually an immune system response. A rise in temperature can kill some microbes. Fever also triggers the body's repair process.

Common disorders of the immune system

It is common for people to have an over- or underactive immune system.
Overactivity of the immune system can take many forms, including:

- **allergic diseases** - where the immune system makes an overly strong response to allergens. Allergic diseases are very common. They include allergies to foods, medications or stinging insects, anaphylaxis (life-threatening allergy), hay fever (allergic rhinitis), sinus disease, asthma, hives (urticaria), dermatitis and eczema
- **autoimmune diseases** - where the immune system mounts a response against normal components of the body. Autoimmune diseases range from common to rare. They include multiple sclerosis, autoimmune thyroid disease, type 1 diabetes, systemic lupus erythematosus, rheumatoid arthritis and systemic vasculitis.

Underactivity of the immune system, also called **immunodeficiency**, can:

- **be inherited** - examples of these conditions include primary immunodeficiency diseases such as common variable immunodeficiency (CVID), x-linked severe combined immunodeficiency (SCID) and complement deficiencies
- **arise as a result of medical treatment** - this can occur due to medications such as corticosteroids or chemotherapy
- **be caused by another disease** - such as HIV/AIDS or certain types of cancer.

An underactive immune system does not function correctly and makes people vulnerable to infections. It can be life threatening in severe cases.

People who have had an organ transplant need immunosuppression treatment to prevent the body from attacking the transplanted organ.

Immunoglobulin therapy

Immunoglobulins (commonly known as antibodies) are used to treat people who are unable to make enough of their own, or whose antibodies do not work properly. This treatment is known as immunoglobulin therapy.

Until recently, immunoglobulin therapy in Australia mostly involved delivery of immunoglobulins through a drip into the vein – known as intravenous immunoglobulin (IVIg) therapy. Now, subcutaneous immunoglobulin (SCIg) can be delivered into the fatty tissue under the skin, which may offer benefits for some patients. This is known as subcutaneous infusion or SCIg therapy.

Subcutaneous immunoglobulin is similar to intravenous immunoglobulin. It is made from plasma – the liquid part of blood containing important proteins like antibodies.

Download the SCIg introduction fact sheet to read more about this type of treatment.

Many health services are now offering SCIg therapy to eligible patients with specific immune conditions. If you are interested, please discuss your particular requirements with your treating specialist.

Immunisation

Immunisation works by copying the body's natural immune response. A vaccine (a small amount of a specially treated virus, bacterium or toxin) is injected into the body. The body then makes antibodies to it.

If a vaccinated person is exposed to the actual virus, bacterium or toxin, they won't get sick because their body will recognise it and know how to attack it successfully. Vaccinations are available against many diseases, including measles and tetanus.

The immunisations you may need are decided by your health, age, lifestyle and occupation. Together, these factors are referred to as HALO, which is defined as:

- **health** - some health conditions or factors may make you more vulnerable to vaccine-preventable diseases. For example, premature birth, asthma, diabetes, heart, lung, spleen or kidney conditions, Down syndrome and HIV will mean you may benefit from additional or more frequent immunisations
- **age** - at different ages you need protection from different vaccine-preventable diseases. **Australia's National Immunisation Program** sets out recommended immunisations for babies, children, older people and other people at risk, such as Aboriginal and Torres Strait Islanders. Most recommended vaccines are available at no cost to these groups
- **lifestyle** - lifestyle choices can have an impact on your immunisation needs. Travelling overseas to certain places, planning a family, sexual activity, smoking, and playing contact sport that may expose you directly to someone else's blood, will mean you may benefit from additional or more frequent immunisations
- **occupation** - you are likely to need extra immunisations, or need to have them more often, if you work in an occupation that exposes you to vaccine-preventable diseases or puts you into contact with people who are more susceptible to problems from vaccine-preventable diseases (such as babies or young children, pregnant women, the elderly, and people with chronic or acute health conditions). For example, if you work in aged care, childcare, healthcare, emergency services or sewerage repair and maintenance, discuss your immunisation needs with your doctor. Some employers help with the cost of relevant vaccinations for their

employees.

View the **HALO graphic** to find out more.

Where to get help

- Your GP
- A specialist (ask your GP for a referral -- for example, the specialist you need may be a dermatologist, rheumatologist or clinical immunology/allergy specialist)
- **Allergy & Anaphylaxis Australia** 1300 728 000
- **Immune Deficiencies Foundation of Australia** (IDFA) 1800 100 198

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