

## Immune System Disorders

The human body's immune system is a complex network of organs, cells and proteins located throughout the body that defends against infections and other invaders, whilst protecting the body's own cells. Immune system disorders include allergic diseases, immunodeficiencies and autoimmunity.

### An overview of the immune system

The body's immune system defends against infections from germs (such as bacteria, viruses, fungi, parasites) and other invaders (such as cancer cells) whilst protecting the body's own cells.

The immune system involves a complex network of organs, cells and proteins located throughout the body, which include:

- **White blood cells, also known as leukocytes**
  - Around half the white blood cells in healthy people are **T cells (also known as T lymphocytes)**, which are the most important cells in the immune system. T cells recognise the body's own cells, identify germs and invaders, including cancer, and coordinate the rest of the immune system. The thymus is an organ that lies in the central part of the chest, behind the sternum, and it is required for the development of T cells (thymus derived cells).
  - One of the roles of T cells is to help another type of white blood cell called **B cells (also known as B lymphocytes)**, to produce antibodies. Haematopoietic stem cells in the bone marrow generate B cells (bone marrow derived cells) and other white blood cells.
  - **Phagocytes** (such as neutrophils and macrophages) eat and kill antibody coated foreign invaders.
- **Antibodies, also known as immunoglobulins**
  - Antibodies recognise germs so they can be removed by the rest of the immune system.
  - The amount of antibodies that recognise germs in the blood is shown by the **Immunoglobulin G (IgG)** level.
  - In people with primary immunodeficiencies due to antibody deficiencies, Immunoglobulin Replacement Therapy (IRT) is usually given to raise the levels of IgG to defend against infections.
  - In people with allergies, **Immunoglobulin E (IgE)** to specific allergens is usually raised.
- **Cytokines and chemokines, also known as signalling proteins**
  - Cytokines (such as interferons) provide information about how the immune response cells should react.
  - Chemokines aid in the positioning of immune cells, drawing them to lymphoid organs or sites of infection.
- **Complement system**
  - This system contains over 20 different proteins and is named for its ability to "complement" the killing of germs (pathogens) by antibodies.
  - It provides a mechanism to sense germs and tissue damage, and respond directly, for example by binding to the bacteria and killing them.

As well as defending the body against infections and cancer, the immune system is involved with other systems in the body, such as the endocrine system and the nervous systems.

In most people their immune system is an effective network that responds and adapts to defend the body against infections and cancer. The immune system can also protect the body from germs that infect the body more than once, using specific memory cells. However, some people have overactive immune responses (autoimmunity or allergies) or under reactive immune systems (immunodeficiencies).

### Disorders of the immune system

Overactivity of the immune system can take many forms. In allergic diseases the immune system makes an excessive response to proteins in substances (known as allergens). In autoimmune diseases the immune system mounts a response against normal components of the body.

- **Allergic diseases** are extremely common and include food, drug or insect allergy, hay fever (allergic rhinitis), sinus disease, asthma, hives (urticaria) and eczema (atopic dermatitis). Anaphylaxis is the most severe type of allergic reaction and is potentially life-threatening. For fast facts about allergic diseases go to [www.allergy.org.au/patients/fast-facts](http://www.allergy.org.au/patients/fast-facts)
- **Autoimmune diseases** range from common to rare. These include multiple sclerosis, autoimmune thyroid disease, type 1 diabetes, systemic lupus erythematosus (lupus), rheumatoid arthritis and vasculitis. For Fast Facts about autoimmune diseases go to [www.allergy.org.au/patients/fast-facts/autoimmune-diseases](http://www.allergy.org.au/patients/fast-facts/autoimmune-diseases)

Underactivity of the immune system, also called immunodeficiency, can be inherited, acquired as a result of medical treatment or caused by another disease. Immunodeficiency predisposes people to infections and/or swellings and can be life threatening in severe cases.

- **Primary immunodeficiencies** are conditions in which the immune system does not function correctly, leading to increased infections or swellings. These are usually inherited and include Common Variable Immune Deficiency (CVID), X-linked Severe Combined Immunodeficiency (SCID) and Hereditary Angioedema (HAE). For Fast Facts about primary immunodeficiencies go to [www.allergy.org.au/patients/fast-facts/primary-immunodeficiencies](http://www.allergy.org.au/patients/fast-facts/primary-immunodeficiencies)
- **Acquired immunodeficiencies** include AIDS (acquired immunodeficiency syndrome), that is due to human immunodeficiency virus (HIV). PIDs are different to AIDS, as PID are caused by defects in the genes that control the immune system, and may be inherited.
- **Secondary immunodeficiencies** may be caused by immunosuppression treatment, that is most often required for recipients of cancer chemotherapy and transplants, to prevent rejection or graft versus host disease. This can also make people more susceptible to infections.

Clinical immunology/allergy specialists diagnose, treat and manage patients with immune system disorders. These specialists are listed on the ASCIA website [www.allergy.org.au/patients/locate-a-specialist](http://www.allergy.org.au/patients/locate-a-specialist)

Research into immune system disorders has been active in recent decades. Australia and New Zealand have strong track records in these areas. This makes immunology and allergy a dynamic and constantly changing field of medicine.

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