

# IMMUNE SYSTEM



The immune system is a network of cells and organs that work together to help defend your body against infection, cancer, damage by poisons, irritant chemicals, and to some degree, injuries. When the immune system identifies that an abnormal or foreign substance (antigen or allergen) has entered your body, it goes to work by attacking, producing antibodies, or releasing histamine (an aggressive substance often producing allergies) to fight this substance and prevent it from causing harm to a body organ.

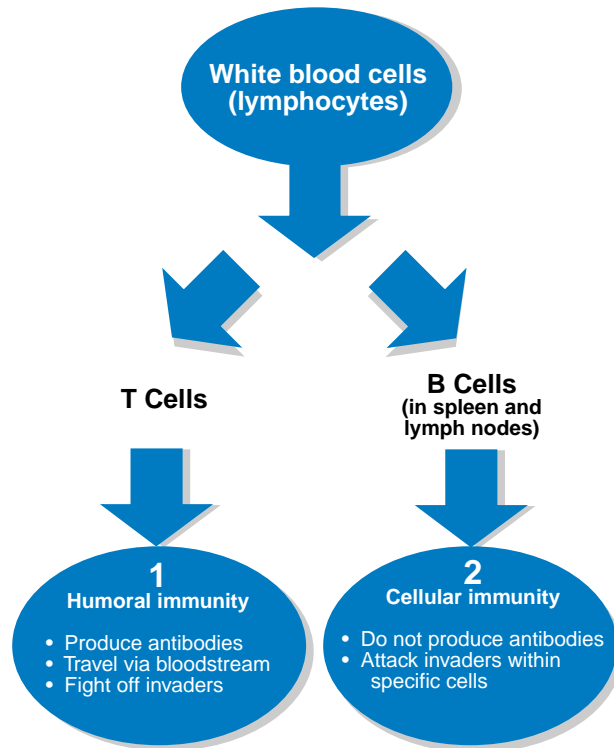


## IMMUNE SYSTEM DISORDERS

There are two types of immune system disorders:

1. Immunodeficiency diseases – the immune system is weakened and unable to defend threats made against good health.
2. Allergies and autoimmune diseases – the immune system overreacts, even to harmless substances. (See Allergy chapter.)

The key actors in the immune defense system are white blood cells (lymphocytes) which are manufactured in enormous quantities and produce cells. There are two major kinds of lymphocytes: B cells and T cells.



**B Cells** B cells produce antibodies that circulate in the bloodstream to act against "invaders" that are also circulating in the bloodstream. Each B cell is programmed to make a specific antibody. When a new invader (antigen) is recognized, the B cells form an antibody against the antigen. These antibodies are specific and only react against the antigen that caused them to be produced. For example, a flu antibody will attack only antigens on the surface of the flu-causing virus.

After an infection is conquered, the antibody levels decrease; but in the process, the B cells store memory cells in the lymph nodes to respond if the antigen once again attempts to invade the body. These cells have allowed scientists to develop vaccines that stimulate antibodies and memory cells and protect a person from that specific disease-producing antigen.

**T Cells** T cells are activated in the thymus gland (located just above the heart). Some T cells direct and regulate the immune responses and some attack the antigens directly, rather than by producing fighting antibodies. Just like the B cells, each T-cell recognizes and responds to a particular antigen and when exposed to this antigen, it attaches to the invading agent and destroys it. Once T cells have been activated, they multiply and form into four different types that 1) recognize invading antigens, 2) destroy antigens, 3) stimulate antibody production, and 4) suppress killers and help stop the response once the danger has passed.



The memory capacity is one reason for the immune system's efficiency. It is largely due to this memory that we maintain our good health. Immunity may be acquired, as in chickenpox. Once the body has had chickenpox, the immune system will prevent another eruption of the disease, even though the chickenpox virus may remain in the body for years. Immune responses also develop when a small dose of an antigen is intentionally injected into the system as a vaccine (eg, for polio, diphtheria, tetanus, or measles). These vaccines are altered so that they do not cause a maximum response, but simply enough to create an immunity to the disease. The most important result of a vaccine is to prepare the memory in certain white blood cells to block an invasion, should one occur. The memory for many antigens is lifelong.

The immune system does not attack everything foreign that enters the body. Most foods, drinks, and drugs do not trigger an immune response. However, the immune system does respond to germs, viruses, and infections.

## AUTOIMMUNE DISEASES

Sometimes the immune system malfunctions and produces antibodies, not for foreign invaders (eg, bacteria), but to target against some of the body's own normal, healthy tissues. The mistaken attack may be directed against a particular organ, such as the thyroid gland, or cause more generalized illnesses such as:

### ■ ADDISON'S DISEASE

This disease results in damaged adrenal glands. It lowers the body's ability to handle stress.

**SIGNS AND SYMPTOMS** Fatigue; low blood pressure; weakness; nausea and vomiting.

**DRUG TREATMENT** Hormonal therapy should be administered immediately.

### ■ AUTOIMMUNE THYROID DISEASE

This disease may result in an overactive or underactive thyroid and frequently may swell, resulting in a swollen thyroid (goiter).

**SIGNS AND SYMPTOMS** Weight loss; tremor; restlessness.

**TREATMENT** Raising the head of the bed may improve sleeping.

**DRUG TREATMENT** Injection of antithyroid drugs or thyroid hormone is given.

**SURGICAL TREATMENT** Possible removal of the thyroid may be required.



## ■ INSULIN-DEPENDENT DIABETES MELLITUS

Pancreas cells are destroyed and are unable to produce enough insulin to control glucose.

SIGNS AND SYMPTOMS	Frequent urination; increased appetite; increased thirst; weight loss.
TREATMENT	A restricted diet and exercise is important.
DRUG TREATMENT	Insulin is required.

## ■ MULTIPLE SCLEROSIS

Multiple sclerosis results in damage to the nerve fiber coverings.

SIGNS AND SYMPTOMS	Muscle weakness; speech difficulties; blurred vision.
DRUG TREATMENT	No specific therapy but sometimes treated with a short term course of corticosteroids.

## ■ MYASTHENIA GRAVIS

Myasthenia gravis results in damaged muscle nerve receptors (commonly in the face).

SIGNS AND SYMPTOMS	Weakness; breathing difficulties; swallowing and speaking difficulties; fever.
TREATMENT	Complete rest, liquid or soft diet (sometimes through a tube), range of motion exercises.
DRUG TREATMENT	Mestinon has proven helpful and is administered orally or by injection.

## ■ PERNICIOUS ANEMIA

Stomach lining cells are attacked and destroyed by body-produced antibodies.

SIGNS AND SYMPTOMS	Weakness; tingling and numbness of the extremities; gastrointestinal disorders; sore tongue.
TREATMENT	Intramuscular injection of Vitamin B 12 is given.

## ■ RHEUMATOID ARTHRITIS

Rheumatoid arthritis is a destructive connective tissue disorder causing the body to reject its own tissue cells and resulting in thickened membranes and joint swelling.

SIGNS AND SYMPTOMS	Stiffness; joint pain; tenderness.
TREATMENT	Rest and mild exercise for joint function is important.
DRUG TREATMENT	Aspirin-type drugs and/or steroids are given for pain and inflammation.
SURGICAL TREATMENT	Replacement of damaged joints is sometimes necessary.



## ■ SYSTEMIC LUPUS ERYTHEMATOSUS

Systemic lupus erythematosus results in damage to several organs resulting in progressive loss of function in the kidneys, lungs, and joints, with tumors of the skin and nervous system.

SIGNS AND SYMPTOMS	Rash typically appears over the cheekbones; arthritis; weakness; fatigue; weight loss.
TREATMENT	The patient should avoid stress and direct sunlight.
DRUG TREATMENT	This varies with the severity of the case, but mostly treated with steroids.

## ■ VITILIGO

Vitiligo is the absence of cells that produce skin pigment.

SIGNS AND SYMPTOMS	Milk-white patches.
DRUG TREATMENT	Corticosteroid drugs are sometimes required.

## IMMUNODEFICIENCY DISEASE

With some infections, the immune system may win the first battle against the infection, but it is only a temporary victory. For instance, chickenpox is caused by a virus that can lie dormant in the body and reemerge during adulthood as "shingles". Another example is herpes simplex, caused by a virus that can be dormant in the nerves and reappear as an outbreak after the initial infection. These outbreaks are more likely to occur when the immune system is weakened, (when all or part of the immune system is unable to function properly and impairs the immune response). This leaves the body without defense against infections and diseases.

Other known causes to interfere with the function of the immune system are trauma (including surgery), poor nutrition, illness, and lack of rest. The immune system and the nervous system are linked in several ways. When the body is under stress, the brain directs the body to release certain hormones that can alter the effects of antibodies and lymphocytes.

## ■ SEVERE COMBINED IMMUNODEFICIENCY DISEASE (SCID)

Some children are born with SCID, a rare genetic disorder, depriving the child of a functional immune system. To prevent lethal diseases from developing in these children, they are kept in a germfree environment and are often referred to as "bubble babies." This disease requires lifelong therapy and, in some cases, bone marrow transplantation.



## ■ ACQUIRED HYPOGAMMAGLOBULINEMIA

This disease decreases production of antibodies that defend against bacterial infections and result in recurrent infections of the respiratory track, skin, and gastrointestinal track.

**DRUG TREATMENT** The necessary treatment is gamma globulin replacement.

## ■ HIV/AIDS (See the Infections Chapter, Infectious Diseases HIV/AIDS.)

## A HEALTHY IMMUNE SYSTEM

You can keep your immune system protected, healthy, and working effectively by avoiding potential hazards, keeping up to date on recommended adult immunizations, protecting yourself against allergies, and against acquired immunodeficiency diseases, such as HIV by practicing safe sex. The steps are:

**Lifestyle** Healthy lifestyle choices are the best way to protect yourself from contracting the human immunodeficiency virus (HIV) – the cause of AIDS. If you have a drug habit or addiction, seek help through social service groups and counseling. Sexually active individuals should insist that a condom always be used.

**Infant Feeding** Mothers can give their babies a good start in life by breast feeding. The mother's antibodies are passed through the breast milk to her baby and provide protection against disease until antibodies develop in the baby's body.

**Immunizations** Childhood immunizations provide immunity against common, yet potentially serious infections. Some need to be repeated to boost immunity. Immunity to rubella (German measles) is very important to women of childbearing age.

Immunizations for the flu and pneumococcal pneumonia need to be added as you age or develop respiratory diseases.

If you are traveling outside of the United States, you may be at risk for illnesses not covered by routine recommended immunizations. Inquire about various immunizations from your doctor or local health clinic.



## IMMUNE SYSTEM PHYSICIANS

Many physicians treat diseases of the immune system. The doctor or clinic you choose should depend on your condition.

**Rheumatologist** A rheumatologist is an internist or pediatrician with advanced training and certification in diseases of the musculoskeletal system and autoimmune diseases. They treat people for lupus erythematosus, scleroderma, and rheumatoid arthritis.

**Oncologist/Hematologist** An oncologist/hematologist is an internist or pediatrician who has advanced training in the treatment of cancer and the immune system. They also have expertise in treating complications of the immune system resulting from the side effects of chemotherapy.

Refer to a specialist from your health plan panel of physicians or get a referral from your primary care physician to find the specialist who is best qualified to treat your condition.





### ON THE HORIZON

An oral vaccine that disarms rotavirus, which causes diarrhea leading to dehydration and possible death, may save hundreds of thousands of children. Work is being done to make this available and affordable worldwide.



## WHAT TO DO

SEVERITY LEVEL	SYMPTOM	POSSIBLE DIAGNOSIS
 <p>Seek Medical Help Immediately!</p>	Fatigue, low blood pressure, weakness, nausea, vomiting	Addison's disease
 <p>Make an appointment to see your doctor</p>	<p>Weakness, breathing difficulties, fever, difficulty swallowing/ speaking</p> <p>Fever, joint/muscle pain, swollen lymph nodes, hives</p> <p>Weight loss, tremor, restlessness</p> <p>Frequent urination, increased appetite and thirst, weight loss</p> <p>Muscle weakness, difficulty speaking, blurry vision</p> <p>Weakness, tingling/numbness of extremities, gastrointestinal problems, sore tongue</p> <p>Stiffness in joints, pain in joints</p> <p>Rash on cheeks, arthritis, fatigue, weight loss</p> <p>Weight loss, frequent infections, swollen glands, skin cancer, diarrhea</p>	<p>Myasthenia gravis</p> <p>Immune complex disorder</p> <p>Autoimmune thyroid disease</p> <p>Diabetes mellitus</p> <p>Multiple sclerosis</p> <p>Pernicious anemia</p> <p>Rheumatoid arthritis</p> <p>Lupus erythematosus</p> <p>AIDS</p>