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HIV/AIDS > TREATMENT

Immunosuppression: Causes and Risk Factors

Medications, disease, and surgical procedures can suppress the immune system

By Naveed Saleh, MD, MS | Updated on February 09, 2021

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Immunosuppression is the state in which your immune system is not functioning as well as it should. Immunosuppression can be caused by certain diseases but can also be induced by medications that suppress the immune system. Some medical procedures can also cause immunosuppression.

The immune systen ans that help the body stave off infec m, infections that the body might othe erious and even fatal.

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Medication Causes

There are a number of medications that are taken to reduce inflammation. Certain types, classified as immunosuppressants, do so by suppressing specific parts of the immune system or the immune system as a whole.

Immunosuppressants are used for treating a wide variety of inflammatory and autoimmune diseases, as well as to prevent the rejection of tissues in organ transplant recipients.[1]

Corticosteroids

Corticosteroids, also known simply as steroids, are oral, topical, inhaled, and intravenous drugs used to temper the immune response.

Because steroids reduce inflammation, they are prescribed to treat a wide range of disorders, including:

Allergies such as contact dermatitis, allergic rhinitis, and anaphylaxis
Autoimmune diseases like ulcerative colitis and Crohn's disease
Blood disorders like hemolytic anemia, lymphoma, and leukemia
Hormonal disorders like Addison's disease
Inflammatory eye conditions like uveitis and optic neuritis
Obstructive respiratory diseases like asthma and chronic obstructive pulmonary disease (COPD)
Rheumatic disorders like rheumatoid arthritis and vasculitis[2]

Immunosuppressio use of high-dose corticosteroids. For ppression will

Long-term users of prednisone, one of the most commonly prescribed steroids, are at an increased risk of bacterial, viral, and fungal infections.

> Even when presc ral prednisone
> can increase the ear to 76% after
> 10 years of use.[4]

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Chemotherapy I

Chemotherapy is us ple with cancer
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Chemotherapy drug e quickly. These
include cancer cells astrointestinal
tract. Damage to th cts, including hair
loss, mucosal inflan

Another fast-replic the bone marrow. These tissues are re s that help fight infection. The supp he high risk of infections in people [5]

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Monoclonal Ant

Monoclonal antibod luced in the lab that mimic the natural antibodies that the body produces to fight disease. These drugs are increasingly used to treat a variety of diseases, including:

Autoimmune disorders, like rheumatoid arthritis, ulcerative colitis, Crohn's disease, and multiple sclerosis (MS)
Cancers, like breast cancer, brain cancer, colorectal cancer, non-Hodgkin lymphoma (NHL), and chronic lymphocytic leukemia (CLL)
Viral-induced disorders, like progressive multifocal leukoencephalopathy (PML) and pure red cell aplasia (PRCA)

> Monoclonal antibodies can also be used to prevent organ transplant rejection by preventing the body from launching an immune assault against the foreign tissues. [6]

Because monoclonal antibodies alter the normal function of the immune system, it can lead to an imbalance in immune cells and an increased risk of infection. In fact, certain types of monoclonal antibodies are associated with an increased risk of specific infections. [7]

Examples of Monoclonal Antibody-Induced Infections

Drug	Used For	May Increase Risk Of
Avastin (bevacizumab)	Colorectal, lung, kidney, cervical, and ovarian cancer	Sepsis

Drug	Used For	May Increase Risk Of
Erbitux (cetuximab)	Head, neck, and colorectal cancer	*Staphylococcus aureus* skin infections, sepsis
Lemtrada (alemtuzumab)	CLL and MS	Cytomegalovirus (CMV), herpes zoster (shingles), pneumocystis pneumonia, toxoplasmosis, histoplasmosis, candidiasis
Simulect (basiliximab)	Prevent organ transplant rejection	CMV, herpes simplex (HSV), aspergillosis, candidiasis, protozoal infections
Zinbryta (daclizumab)	MS	Tuberculosis, CMV, HSV, influenza, aspergillosis, candidiasis

TNF Inhibitors

Tumor necrosis factor-alpha (TNF-α) inhibitors are immunosuppressant drugs that treat inflammatory conditions like rheumatoid arthritis, psoriatic arthritis, plaque psoriasis, ankylosing spondylitis, ulcerative colitis, and Crohn's disease. Also called TNF blockers, the drugs work by inhibiting the action of an inflammatory compound known as tumor necrosis factor.

The immunosuppressive effect of TNF-α inhibitors can significantly increase the risk of so-called "opportunistic infections." These are common infections that an intact immune system can usually control but one that can turn serious if the immune system is suppressed.

> TNF-α inhibitors are associated with an increased risk of tuberculosis and fungal infections like histoplasmosis, coccidioidomycosis, and blastomycosis.[8]

This class of drug includes such commonly prescribed agents as:

Cimzia (certolizumab pegol)
Enbrel (etanercept)
Humira (adalimumab)
Remicade (infliximab)
Simponi (golimumab)

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Medical Cau

Temporary immunc :y of common infections, includin weaken the immune respon ther facets of the immune system are nosuppression can occur.

HIV

The human immunodeficiency virus (HIV) is characterized by the progressive deterioration of the immune system. The virus preferentially targets white blood cells called CD4 T-cell lymphocytes that are responsible for signaling and coordinating the immune response.

As the CD4 T-cell numbers are progressively depleted, the body is left vulnerable to an ever-widening range of HIV-associated opportunistic infections. The degree of impairment can be measured by a blood test known as a CD4 count.

> A normal CD4 count is generally defined as 500 or above. When the CD4 count falls beneath 500, a person is considered immunosuppressed. When it falls beneath 200, a person is said to have AIDS and be immunocompromised.

Opportunistic infections associated with HIV include:

Candidiasis
Coccidioidomycosis
Cryptococcosis
HIV encephalopathy (AIDS dementia)
Histoplasmosis
Kaposi sarcoma
Tuberculosis
Pneumocystis jiroveci pneumonia
Toxoplasmosis

Asplenia

Asplenia is the term used to describe the absence of normal spleen function. The spleen plays a key role in the immune response, and the loss of splenic function is associated with serious infection risks.

Asplenia may be congenital but can also occur due to underlying diseases that damage the spleen, including:

Cirrhosis
Hemolytic anemia
Leukemia
Lymphoma
Malaria
Sickle cell disease

> Asplenia increases the risk of *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitides*, and sepsis by as much as 200-fold.[9]

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Primary Immunodeficiency

Inherited immune disorders, called primary immunodeficiencies (PID), are considered rare. Even so, there are more than 300 different PIDs that are known to impair different facets of the immune response. These include:

Chronic granulomatous disease
Common variable immunodeficiency (CVID)
Immunoglobulin A deficiency
Severe combined immunodeficiency[10]

With PID, the immune system fails to produce enough immune cells, such as B-cells or T-cells, to launch an effective defense. PID is generally diagnosed at a young age and is often progressive, increasing the risk of infection as a person ages. The types of infections seen in people with PID vary by the type of immune cell affected.

> The treatment of PID is complicated and requires specialist care, in part because people with PID don't respond well to immunization and instead require an infusion of immune cells to provide them with an adequate immune defense.[10]

Medical Procedures

There are several procedures that can cause immunosuppression, either

Splenectomy

The surgical removal of the spleen, called a splenectomy, is sometimes needed to treat a spleen injury, lymphoma, and autoimmune diseases like idiopathic thrombocytopenic purpura.[11]

Asplenia is a consequence of splenectomy and one that manifests an increased risk of *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Neisseria meningitides.* These infections are more likely to occur within the first few years of having a splenectomy.[9]

Radiation Therapy

Radiation therapy is commonly used to treat certain types of cancer and can cause immunosuppression if the radiation damages bone marrow or other components of the immune system.

With that said, newer targeted technologies, like stereotactic body radiotherapy (SBRT), are better able to spare normal tissues and reduce the risk of radiation-induced immunosuppression.[12]

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Bone Marrow Ablation

Prior to a stem cell transplant or bone marrow transplant, the recipient will undergo a procedure known as bone marrow ablation in which radiation or high-dose chemotherapy kills all cancer cells as well as the bone marrow itself. It is a procedure used in people with lymphoma or leukemia to make room for the transplanted stem cells.

Without an intact immune system, people who undergo such transplants are at high risk of infection until the bone marrow rebuilds itself.

During this time, the recipient is vulnerable to fungal lung infections (including cryptococcosis and candidiasis) as well as CMV and community-acquired respiratory viruses like respiratory syncytial virus (RSV) and influenza.[13]

A Word From Verywell

If you have any form of immunosuppression, you will likely need to avoid contact with people who may carry contagious illnesses, including schoolchildren and toddlers. You may also need to avoid public places, wear a face mask whenever out in public, and wash your hands frequently with soap and water.

Speak with your doctor to better understand ways to avoid infection if you have temporary or chronic immunosuppression.

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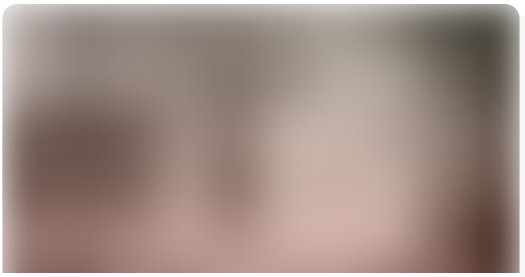

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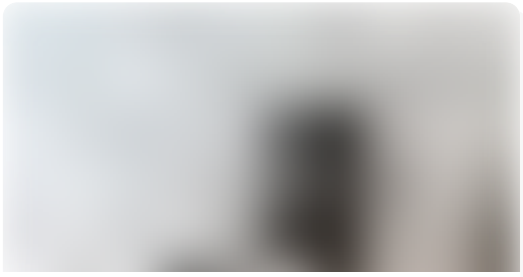

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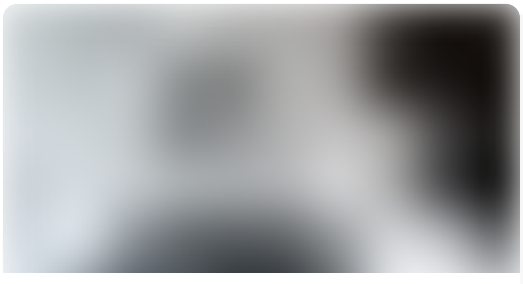

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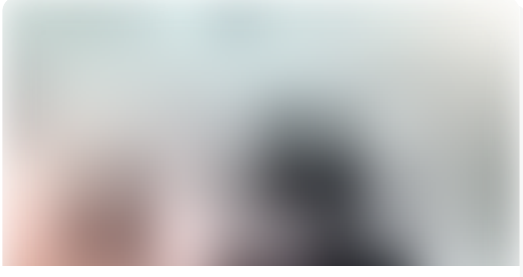

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