

IL7R Gene

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Interleukin 7 receptor

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1. Introduction

The *IL7R* gene provides instructions for making a protein called interleukin 7 (IL-7) receptor alpha chain. This protein is one piece of both the IL-7 receptor and the thymic stromal lymphopoietin (TSLP) receptor. These receptors are embedded in the cell membrane of immune system cells. The IL-7 receptor is found in B cells and T cells as well as the early blood-forming cells that give rise to them. The TSLP receptor is found in several types of immune cells, including B cells, T cells, monocytes, and dendritic cells. These cells identify foreign substances and defend the body against infection and disease.

At the cell surface, the IL-7 receptor interacts with a protein called IL-7. IL-7 is a cytokine, which is a protein that regulates the activity of immune system cells. The receptor and cytokine fit together like a lock and its key, triggering a series of chemical signals inside the cell. In early blood-forming cells, signaling through the IL-7 receptor ensures the development of mature B cells and T cells. IL-7 receptor signaling also stimulates the later growth and division (proliferation) and survival of these cells.

Similarly, the TSLP receptor interacts with the cytokine TSLP. Attachment of TSLP to its receptor triggers a set of signals that support proliferation and maturation of a variety of immune system cells.

2. Health Conditions Related to Genetic Changes

2.1. Multiple Sclerosis

A common variation of the *IL-7R* gene increases the risk of developing multiple sclerosis. This condition affects the brain and spinal cord (central nervous system), causing muscle weakness, poor coordination, numbness, and a variety of other health problems. The genetic variation involved in multiple sclerosis affects a single protein building block (amino acid) in the IL-7 receptor alpha chain, specifying the amino acid isoleucine at position 244 instead of the amino acid threonine (written as Thr244Ile). The IL-7 receptor that contains this version of the alpha chain is not embedded in the cell surface but is instead found inside the cell. It is not clear if this alpha chain variant affects the TSLP receptor.

Because the *IL7R* gene is involved in regulation of the immune system, changes in it might be involved in the autoimmune response and inflammation that damage nerves and the protective coating surrounding them (the myelin sheath), leading to the signs and symptoms of multiple sclerosis. (Autoimmunity occurs when the immune system malfunctions and attacks the body's own tissues and organs, in this case tissues of the nervous system.) However, it is unclear exactly what role the *IL-7R* gene variant plays in development of multiple sclerosis. It is likely that a combination of genetic and environmental factors is involved.

2.2. Other Disorders

Mutations in the *IL7R* gene can cause a form of severe combined immunodeficiency (SCID), in which affected individuals have decreased immune function and are prone to recurrent and persistent infections. Affected individuals with *IL7R* gene mutations have few or no T cells but normal numbers of B cells and another type of immune cell called NK cells. This form of the condition is called T⁻B⁺NK⁺ SCID. Many *IL7R* gene mutations that cause SCID prevent the production of the IL-7 receptor alpha chain, which impairs IL-7 receptor and TSLP receptor signaling. Without this signaling, development of T cells is disrupted. A lack of T cells reduces the immune system's ability to fight infections, leading to recurrent infections in people with T⁻B⁺NK⁺ SCID.

Mutations in the *IL7R* gene can also cause cancers of blood-forming cells, specifically B-cell acute lymphoblastic leukemia (ALL), which is characterized by elevated numbers of B cells in the blood, and T-cell ALL, characterized by elevated numbers of T cells. The mutations associated with these cancers lead to an altered IL-7 receptor alpha chain. With this alteration, signaling pathways like those triggered by the IL-7 receptor or the TSLP receptor are constantly turned on (constitutively active) even without cytokine interaction. Constant signaling increases proliferation and survival of B cells or T cells, leading to ALL.

3. Other Names for This Gene

- CD127
- CD127 antigen
- CDW127
- IL-7 receptor subunit alpha
- IL-7R subunit alpha
- IL-7R-alpha
- IL-7RA
- IL7RA
- IL7RA_HUMAN
- ILRA
- interleukin 7 receptor alpha chain
- interleukin 7 receptor isoform H5-6
- interleukin-7 receptor subunit alpha
- interleukin-7 receptor subunit alpha precursor

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