NCF1 Gene

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neutrophil cytosolic factor 1

genes

1. Introduction

The *NCF1* gene provides instructions for making a protein called neutrophil cytosolic factor 1 (also known as p47-phox). This protein is one part (subunit) of a group of proteins that forms an enzyme complex called NADPH oxidase, which plays an essential role in the immune system. NADPH oxidase is primarily active in immune system cells called phagocytes. These cells catch and destroy foreign invaders such as bacteria and fungi. NADPH oxidase is also thought to regulate the activity of immune cells called neutrophils. These cells play a role in adjusting the inflammatory response to optimize healing and reduce injury to the body.

The presence of foreign invaders stimulates phagocytes and triggers the assembly of NADPH oxidase. This enzyme participates in a chemical reaction that converts oxygen to a toxic molecule called superoxide. Superoxide is used to generate several other compounds, including hydrogen peroxide (a strong disinfectant) and hypochlorous acid (the active ingredient in bleach). These highly reactive, toxic substances are known as reactive oxygen species. Phagocytes use these substances to kill foreign invaders, preventing them from reproducing in the body and causing illness.

2. Health Conditions Related to Genetic Changes

2.1. Chronic granulomatous disease

Mutations in the *NCF1* gene account for about 25 percent of cases of chronic granulomatous disease. People with this disorder are at increased risk of developing recurrent episodes of infection and inflammation due to a weakened immune system. The mutations that cause this disorder occur in both copies of the *NCF1* gene in each cell. Ninety-five percent of affected individuals have a mutation known as delta GT that deletes two DNA building blocks from the *NCF1* gene in an area called exon 2 (written as 75_76delGT). This genetic change leads to the production of an abnormally short, nonfunctional version of neutrophil cytosolic factor 1. Other, less common mutations also disrupt the function or production of neutrophil cytosolic factor 1. Without this protein, NADPH oxidase cannot assemble or function properly. As a result, phagocytes are unable to produce reactive oxygen

species to kill foreign invaders and neutrophil activity is not regulated. A lack of NADPH oxidase leaves affected individuals vulnerable to many types of infection and excessive inflammation.

2.2. Williams syndrome

The *NCF1* gene is located in a region of chromosome 7 that is often deleted in people with Williams syndrome. Williams syndrome is a developmental disorder that affects many parts of the body. As a result of the deletion of part of chromosome 7, some people with this condition are missing one copy of the *NCF1* gene in each cell. Researchers have found that the loss of this gene is a protective factor that appears to lower the risk of developing high blood pressure (hypertension). People with Williams syndrome whose *NCF1* gene is not deleted have a higher risk of developing hypertension.

People with only one copy of the *NCF1* gene have reduced levels of the neutrophil cytosolic factor 1 protein, which decreases the activity of NADPH oxidase and results in the production of fewer reactive oxygen species. Studies suggest that reactive oxygen species play an important role in blood vessel changes related to hypertension.

3. Other Names for This Gene

- NCF1_HUMAN
- p47-phox
- p47phox
- SH3PXD1A

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