CYBB gene

cytochrome b-245 beta chain

Normal Function

The *CYBB* gene provides instructions for making a protein called cytochrome b-245, beta chain (also known as p91-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. Within this complex, the cytochrome b-245, beta chain has an alpha chain partner (produced from the *CYBA* gene). Both alpha and beta chains are required for either to function and the NADPH oxidase complex requires both chains in order to be functional. 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.

Health Conditions Related to Genetic Changes

Chronic granulomatous disease

More than 650 mutations in the *CYBB* gene have been found to cause 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. Mutations in the *CYBB* gene cause approximately 70 percent of all cases of this condition. Most of these mutations change single building blocks of protein (amino acids) in the cytochrome b-245 beta chain or cause it to be abnormally short and nonfunctional. An altered protein not only diminishes the function of the beta chain, but the function of its alpha chain partner as well. Without these subunits, 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.

Other Names for This Gene

- CGD91-phox
- CY24B_HUMAN
- cytochrome b(558) subunit beta
- cytochrome b-245 heavy chain
- cytochrome b-245, beta polypeptide
- cytochrome b558 subunit beta
- GP91-1
- GP91PHOX
- neutrophil cytochrome b 91 kDa polypeptide
- p91-PHOX
- superoxide-generating NADPH oxidase heavy chain subunit

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of CYBB (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=1536[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28CYBB%5BTIAB%5D%29+OR+%28NOX2%5BTIAB%5D%29+OR+%28p91phox%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1080+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- CYTOCHROME b(-245), BETA SUBUNIT; CYBB (https://omim.org/entry/300481)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/1536)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=CYBB[gene])

References

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Genomic Location

The *CYBB* gene is found on the X chromosome (https://medlineplus.gov/genetics/chromosome/x/).

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