LAMP2 gene

lysosomal associated membrane protein 2

Normal Function

The *LAMP2* gene provides instructions for making a protein called lysosome-associated membrane glycoprotein 2 (LAMP-2). As its name suggests, this protein is found in the membrane of cellular structures called lysosomes. Lysosomes are compartments in the cell that digest and recycle different types of materials. The LAMP-2 protein helps transport cellular materials or digestive enzymes into the lysosome. Slightly different versions (isoforms) of the LAMP-2 protein are produced: LAMP-2A, LAMP-2B, and LAMP-2C. These isoforms have slightly different functions and are found in different tissues throughout the body.

The LAMP-2A isoform helps transport certain proteins into the lysosome to be broken down. The LAMP-2B isoform is needed to transport materials into lysosomes using a formation of cellular structures called autophagic vacuoles (or autophagosomes). Cellular material is first enclosed in an autophagic vacuole inside the cell. The autophagic vacuole attaches (fuses) to a lysosome to transfer the cellular material into the lysosome where it can be broken down. The LAMP-2B isoform is involved in the fusion between autophagic vacuoles and lysosomes. LAMP-2B is the main isoform found in the heart and the muscles used for movement (skeletal muscles). The LAMP-2C isoform helps transport building blocks of DNA and RNA (nucleotides) into the lysosome to be broken down.

Health Conditions Related to Genetic Changes

Danon disease

More than a hundred variants (also called mutations) in the *LAMP2* gene have been found to cause Danon disease. Danon disease is a condition characterized by weakening of the heart muscle (cardiomyopathy), weakening of skeletal muscles (myopathy), and intellectual disabilities.

The *LAMP2* gene variants that cause Danon disease lead to the production of very little or no functional LAMP-2 protein. Most variants affect all three isoforms of the LAMP-2 protein. However, variants that affect only the LAMP-2B isoform also cause Danon disease, likely because this isoform is largely found in muscle and heart cells.

Studies have shown that in cells without the LAMP-2 protein, fusion between autophagic vacuoles and lysosomes occurs more slowly, which leads to the accumulation of autophagic vacuoles. People with Danon disease have an abnormally large number of autophagic vacuoles in their heart and skeletal muscle cells. This accumulation likely leads to the breakdown of these cells, causing the heart problems and muscle weakness seen in people with Danon disease. The cause of the other signs and symptoms of Danon disease is unclear, but it is likely related to the accumulation of vacuoles in other affected tissues.

Some people with *LAMP2* gene variants develop hypertrophic cardiomyopathy without the other characteristic features of Danon disease. Hypertrophic cardiomyopathy is a thickening of the heart muscle that may make it harder for the heart to pump blood. In people with *LAMP2* gene mutations, the lower left chamber of the heart, called the left ventricle, is usually the affected region. People with hypertrophic cardiomyopathy caused by *LAMP2* gene variants often have cardiac preexcitation, which is an abnormality of the electrical signals that control the heartbeat. It is unclear whether this is a separate condition or a milder form of Danon disease. Furthermore, it is unknown why some people with *LAMP2* gene variants develop hypertrophic cardiomyopathy but not the other features of Danon disease.

People who have a *LAMP2* gene variant are thought to account for 1 to 4 percent of individuals with hypertrophic cardiomyopathy.

Other Names for This Gene

- CD107 antigen-like family member B
- CD107b
- LAMP-2
- LAMP2_HUMAN
- LAMPB
- LGP110

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of LAMP2 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=3920[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=(LAMP2%5BTIAB%5D)+AND+((Genes%5BMH%5D)+OR+(Genetic+Phenomena%5BMH%5D))+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- LYSOSOME-ASSOCIATED MEMBRANE PROTEIN 2; LAMP2 (https://omim.org/entry/309060)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/3920)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=LAMP2[gene])

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Genomic Location

The *LAMP2* gene is found on the X chromosome (https://medlineplus.gov/genetics/chromosome/x/).

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