CTSD gene

cathepsin D

Normal Function

The *CTSD* gene provides instructions for making an enzyme called cathepsin D. Cathepsin D is one of a family of cathepsin proteins that act as protease enzymes, which modify proteins by cutting them apart. Cathepsin D is found in many types of cells and is active in lysosomes, which are compartments within cells that digest and recycle different types of molecules. By cutting proteins apart, cathepsin D can break down certain proteins, turn on (activate) other proteins, and regulate self-destruction of the cell (apoptosis).

Cathepsin D is produced as an inactive enzyme, called a preproenzyme, which has extra protein segments attached. These segments must be removed, followed by additional processing steps, for the enzyme to become active. The mature, active cathepsin D enzyme is made up of two parts, one light chain and one heavy chain.

Health Conditions Related to Genetic Changes

CLN10 disease

At least seven mutations in the *CTSD* gene have been found to cause CLN10 disease. The signs and symptoms of CLN10 disease are usually present at birth and include muscle rigidity, respiratory failure, and severe seizures; death typically occurs in infancy. Rarely, CLN10 disease can develop later in life with poor coordination and balance (ataxia), loss of speech, a gradual loss in intellectual functioning (cognitive decline), and vision loss.

CTSD gene mutations found to cause CLN10 disease that is present at birth lead to a complete lack of cathepsin D enzyme activity. As a result, proteins and fats are not broken down properly and abnormally accumulate within lysosomes. While these substances accumulate in cells throughout the body, nerve cells appear to be particularly vulnerable to damage caused by the abnormal cell materials. Early and widespread loss of nerve cells in CLN10 disease leads to severe signs and symptoms and death in infancy.

In the later-onset cases of CLN10 disease, *CTSD* gene mutations likely result in the production of a cathepsin D enzyme whose function is greatly reduced but not

eliminated. As a result, some proteins and fats are broken down by the enzyme, so it takes longer for these substances to accumulate in lysosomes and cause nerve cell death.

Other Names for This Gene

- CATD_HUMAN
- cathepsin D preproprotein
- ceroid-lipofuscinosis, neuronal 10
- CLN10
- CPSD
- lysosomal aspartyl peptidase
- lysosomal aspartyl protease

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of CTSD (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=1509[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28CTSD%5BTIAB%5D%29+OR+%28cathepsin+D%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

- CATHEPSIN D; CTSD (https://omim.org/entry/116840)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/1509)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=CTSD[gene])

References

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Genomic Location

The *CTSD* gene is found on chromosome 11 (https://medlineplus.gov/genetics/chromosome/11/).

Last updated October 1, 2016