XDH gene

xanthine dehydrogenase

Normal Function

The *XDH* gene provides instructions for making an enzyme called xanthine dehydrogenase. This enzyme is involved in the normal breakdown of purines, which are building blocks of DNA and its chemical cousin, RNA. Specifically, it carries out the final two steps in the process: the conversion of a molecule called hypoxanthine to another molecule called xanthine, and the conversion of xanthine to uric acid, a waste product that is normally excreted in urine and feces.

Xanthine dehydrogenase has been studied extensively because it can be involved in the production of molecules called superoxide radicals. Specifically, xanthine dehydrogenase is sometimes converted to another form called xanthine oxidase, which produces superoxide radicals. These molecules are byproducts of normal cell processes, and they must be broken down regularly to avoid damaging cells. Superoxide radicals are thought to play a role in many diseases, including heart disease and high blood pressure (hypertension).

Researchers suspect that xanthine dehydrogenase plays a role in milk production (lactation) in women. However, the enzyme's role in lactation is unclear.

Health Conditions Related to Genetic Changes

Hereditary xanthinuria

At least 12 mutations in the *XDH* gene have been found to cause hereditary xanthinuria type I, a condition that most often affects the kidneys. These mutations reduce or eliminate the activity of xanthine dehydrogenase. As a result, the enzyme is not available to carry out the last two steps of purine breakdown. Because xanthine is not converted to uric acid, affected individuals have high levels of xanthine and very low levels of uric acid in their blood and urine.

The excess xanthine can accumulate in the kidneys and other tissues. In the kidneys, xanthine forms tiny crystals that occasionally build up to create kidney stones. These stones can impair kidney function and ultimately cause kidney failure. Less commonly, xanthine crystals build up in the muscles, causing pain and cramping. In some people with hereditary xanthinuria, the condition does not cause any health problems.

Other Names for This Gene

- xanthine dehydrogenase/oxidase
- xanthine oxidoreductase
- XO
- XOR

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of XDH (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=7498[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28xanthine+oxidase%5BTI%5D%29+OR+%28xanthine+dehydrogenase%5BTI%5D%29%29+OR+%28xanthine+oxidoreductase%5BTI%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+720+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- XANTHINE DEHYDROGENASE; XDH (https://omim.org/entry/607633)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/7498)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=XDH[gene])

References

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- Sakamoto N, Yamamoto T, Moriwaki Y, Teranishi T, Toyoda M, Onishi Y, Kuroda S, Sakaguchi K, Fujisawa T, Maeda M, Hada T. Identification of a new point mutationin the human xanthine dehydrogenase gene responsible for a case of classical typeI xanthinuria. Hum Genet. 2001 Apr;108(4):279-83. doi: 10.1007/s004390100477. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/11379872)
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Genomic Location

The *XDH* gene is found on chromosome 2 (https://medlineplus.gov/genetics/chromosome/2/).

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