BCKDHB gene

branched chain keto acid dehydrogenase E1 subunit beta

Normal Function

The *BCKDHB* gene provides instructions for making one part, the beta subunit, of a group of enzymes called the branched-chain alpha-keto acid dehydrogenase (BCKD) enzyme complex. Two beta subunits connect with two alpha subunits, which are produced from the *BCKDHA* gene, to form a critical piece of the enzyme complex called the E1 component.

The BCKD enzyme complex is responsible for one step in the normal breakdown of three protein building blocks (amino acids). These amino acids—leucine, isoleucine, and valine—are obtained from the diet. They are present in many kinds of food, particularly protein-rich foods such as milk, meat, and eggs. The BCKD enzyme complex is active in mitochondria, which are specialized structures inside cells that serve as energy-producing centers. The breakdown of leucine, isoleucine, and valine produces molecules that can be used for energy.

Health Conditions Related to Genetic Changes

Maple syrup urine disease

More than 90 mutations in the *BCKDHB* gene have been identified in people with maple syrup urine disease. These mutations most often cause the severe, classic form of the disorder, which becomes apparent soon after birth. Maple syrup urine disease gets its name from the distinctive sweet odor of affected infants' urine. It is also characterized by poor feeding, vomiting, lack of energy (lethargy), abnormal movements, and delayed development.

Most *BCKDHB* gene mutations change single amino acids in the beta subunit of the BCKD enzyme complex. Other mutations insert or delete small amounts of DNA in the gene. A particular mutation is most common in people of Ashkenazi (eastern and central European) Jewish descent; this mutation replaces the amino acid arginine with the amino acid proline at position 183 in the beta subunit (written as Arg183Pro or R183P).

Mutations in the *BCKDHB* gene disrupt the normal function of the BCKD enzyme complex, preventing it from effectively breaking down leucine, isoleucine, and valine. As

a result, these amino acids and their byproducts build up in the body. This accumulation is toxic to cells and tissues, particularly in the nervous system. The buildup of these substances can lead to seizures, developmental delay, and the other health problems associated with maple syrup urine disease.

Other Names for This Gene

- 2-oxoisovalerate dehydrogenase beta subunit
- BCKDH E1-beta
- branched chain keto acid dehydrogenase E1, beta polypeptide
- branched chain keto acid dehydrogenase E1, beta polypeptide (maple syrup urine disease)
- ODBB_HUMAN

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of BCKDHB (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=594[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28BCKDHB%5BTIAB%5D%29+OR+%28branched+chain+keto+acid+dehydrogenase+AND+E1+AND+beta%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- BRANCHED-CHAIN KETO ACID DEHYDROGENASE E1, BETA POLYPEPTIDE; BCKDHB (https://omim.org/entry/248611)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/594)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=BCKDHB[gene])

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Genomic Location

The *BCKDHB* gene is found on chromosome 6 (https://medlineplus.gov/genetics/chromosome/6/).

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