MMUT gene
methylmalonyl-CoA mutase

Normal Function
The MMUT gene provides instructions for making an enzyme called methylmalonyl CoA mutase. This enzyme is active in mitochondria, which are specialized structures inside cells that serve as energy-producing centers.

Methylmalonyl CoA mutase is responsible for a particular step in the breakdown of several protein building blocks (amino acids), specifically isoleucine, methionine, threonine, and valine. The enzyme also helps break down certain types of fats (lipids) and cholesterol. First, several chemical reactions convert the amino acids, lipids, or cholesterol to a molecule called methylmalonyl CoA. Then, working with a compound called adenosylcobalamin (AdoCbl), which is a form of vitamin B12, methylmalonyl CoA mutase converts methylmalonyl CoA to a compound called succinyl-CoA. Other enzymes break down succinyl-CoA into molecules that are later used for energy.

Health Conditions Related to Genetic Changes
Methylmalonic acidemia

More than 200 mutations in the MMUT gene have been identified in people with methylmalonic acidemia, a condition characterized by feeding difficulties, developmental delay, and long-term health problems. These genetic changes prevent the production of functional methylmalonyl CoA mutase or reduce the activity of the enzyme. As a result, certain proteins and lipids are not broken down properly. This defect allows methylmalonyl CoA and other toxic compounds to build up in the body’s organs and tissues, causing the signs and symptoms of methylmalonic acidemia.

Mutations that prevent the production of any functional methylmalonyl CoA mutase lead to a form of methylmalonic acidemia designated mut^0^ Mut^0^ is the most severe form of this disorder and has the poorest outcome. Mutations that alter the structure of the enzyme but do not completely eliminate its activity lead to a form of the condition designated mut^−^ The mut^−^ form is typically less severe, with more variable symptoms than the mut^0^ form.
Chromosomal Location

Cytogenetic Location: 6p12.3, which is the short (p) arm of chromosome 6 at position 12.3

Molecular Location: base pairs 49,430,360 to 49,463,298 on chromosome 6 (Homo sapiens Updated Annotation Release 109.20190905, GRCh38.p13) (NCBI)

Credit: Genome Decoration Page/NCBI

Other Names for This Gene

• MCM
• methylalonyl-CoA mutase
• methylamly-CoA isomerase
• methylmalonyl CoA mutase
• methylmalonyl Coenzyme A mutase
• methylmalonyl Coenzyme A mutase precursor
• MUT
• MUTA_HUMAN

Additional Information & Resources

Educational Resources

• Basic Neurochemistry (sixth edition, 1999): Methylmalonyl-CoA mutase deficiency prevents the isomerization of methylmalonyl-CoA to succinyl-CoA
  https://www.ncbi.nlm.nih.gov/books/NBK27933/#A3117

• Biochemistry (fifth edition, 2002): Propionyl CoA Is Converted into Succinyl CoA in a Reaction That Requires Vitamin B12
  https://www.ncbi.nlm.nih.gov/books/NBK22387/#A3065

Clinical Information from GeneReviews

• Isolated Methylmalonic Acidemia
  https://www.ncbi.nlm.nih.gov/books/NBK1231
Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28MUT%5BTI%5D%29+OR+%28methylmalonyl+Coenzyme+A+mutase%5BTIAB%5D%29+OR+%28methylmalonyl+CoA+mutase%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D+OR+Genetic+Phenomena%5BMH%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- METHYLMALONYL-CoA MUTASE
  http://omim.org/entry/609058

Research Resources

- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=MMUT%5Bgene%5D

- HGNC Gene Symbol Report

- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:4594

- NCBI Gene

- UniProt
  https://www.uniprot.org/uniprot/P22033

Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15643616

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/11161845

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16182581
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2657357/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/10923046
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17597648

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/20301409

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12402345

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16281286

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