Amish lethal microcephaly

Amish lethal microcephaly is a disorder in which infants are born with a very small head and underdeveloped brain.

Infants with Amish lethal microcephaly have a sloping forehead and an extremely small head size. They may also have an unusually small lower jaw and chin (micrognathia) and an enlarged liver (hepatomegaly).

Affected infants may have seizures and difficulty maintaining their body temperature. Often they become very irritable starting in the second or third month of life. A compound called alpha-ketoglutaric acid can be detected in their urine (alpha-ketoglutaric aciduria), and during episodes of viral illness they tend to develop elevated levels of acid in the blood and tissues (metabolic acidosis). Infants with this disorder typically feed adequately but do not develop skills such as purposeful movement or the ability to track faces and sounds. Affected infants live only about six months.

Frequency

Amish lethal microcephaly occurs in approximately 1 in 500 newborns in the Old Order Amish population of Pennsylvania. It has not been found outside this population.

Causes

Mutations in the \textit{SLC25A19} gene cause Amish lethal microcephaly.

The \textit{SLC25A19} gene provides instructions for producing a protein that is a member of the solute carrier (SLC) family of proteins. Proteins in the SLC family transport various compounds across the membranes surrounding the cell and its component parts. The protein produced from the \textit{SLC25A19} gene transports a molecule called thiamine pyrophosphate into the mitochondria, the energy-producing centers of cells. This compound is involved in the activity of a group of mitochondrial enzymes called the dehydrogenase complexes, one of which is the alpha-ketoglutarate dehydrogenase complex. The transport of thiamine pyrophosphate into the mitochondria is believed to be important in brain development.

All known individuals with Amish lethal microcephaly have a mutation in which the protein building block (amino acid) alanine is substituted for the amino acid glycine at position 177 of the \textit{SLC25A19} protein, written as Gly177Ala or G177A. Researchers believe that this mutation interferes with the transport of thiamine pyrophosphate into the mitochondria and the activity of the alpha-ketoglutarate dehydrogenase complex, resulting in the abnormal brain development and alpha-ketoglutaric aciduria seen in Amish lethal microcephaly.
Inheritance Pattern
This condition is inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

Other Names for This Condition
- Amish microcephaly
- MCPHA
- microcephaly, Amish type

Diagnosis & Management
Genetic Testing Information
- What is genetic testing? https://primer/testing/genetictesting

Other Diagnosis and Management Resources

Additional Information & Resources
Health Information from MedlinePlus

Genetic and Rare Diseases Information Center
- Amish lethal microcephaly https://rarediseases.info.nih.gov/diseases/8606/amish-lethal-microcephaly

Additional NIH Resources
- NINDS Fact Sheet: Microcephaly https://www.ninds.nih.gov/Disorders/All-Disorders/Microcephaly-Information-Page
Educational Resources

• Amish, Mennonite and Hutterite Genetic Disorder Database
  http://www.biochemgenetics.ca/plainpeople/singleview.php?id=2360

• Lucille Packard Children's Hospital: Microcephaly

• MalaCards: microcephaly, amish type
  https://www.malacards.org/card/microcephaly_amish_type

• Orphanet: Amish lethal microcephaly
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=99742

Patient Support and Advocacy Resources

• Birth Defect Research for Children
  https://www.birthdefects.org/

• March of Dimes Foundation
  https://www.marchofdimes.org/

Clinical Information from GeneReviews

• Amish Lethal Microcephaly
  https://www.ncbi.nlm.nih.gov/books/NBK1365

Scientific Articles on PubMed

• PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Microcephaly%5BMAJR%5D%29+AND+%28%28Amish%5BALL%5D%29+OR+%28mcpha%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

• MICROCEPHALY, AMISH TYPE
  http://omim.org/entry/607196

Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12376931

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/14623217
Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/20301539

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17035501
Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1595310/

• OMIM: MICROCEPHALY, AMISH TYPE
http://omim.org/entry/607196

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12185364

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/20583149

Reprinted from Genetics Home Reference:

Reviewed: July 2013
Published: June 25, 2019

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services