Adenosine monophosphate deaminase deficiency

Adenosine monophosphate (AMP) deaminase deficiency is a condition that can affect the muscles used for movement (skeletal muscles). In many affected individuals, AMP deaminase deficiency does not cause any symptoms. People who do experience symptoms typically have fatigue, muscle pain (myalgia), or cramps after exercise or prolonged physical activity (exercise intolerance). Following strenuous activity, they often get tired more quickly and stay tired longer than would normally be expected. In rare cases, affected individuals have more severe symptoms including severe muscle weakness, low muscle tone (hypotonia), and muscle wasting (atrophy), but it is unclear whether these symptoms are due solely to AMP deaminase deficiency or additional health conditions. Exercise intolerance associated with AMP deaminase deficiency usually becomes apparent in childhood or early adulthood.

Frequency

AMP deaminase deficiency is one of the most common inherited muscle disorders in white populations, affecting 1 in 50 to 100 people. The prevalence is lower in African Americans, affecting an estimated 1 in 40,000 people, and the condition is even less common in the Japanese population.

Causes

AMP deaminase deficiency is caused by mutations in the $AMPD1$ gene, which provides instructions for producing an enzyme called AMP deaminase. This enzyme is found in skeletal muscles, where it plays a role in producing energy. Skeletal muscle cells need energy to function and move the body.

Mutations in the $AMPD1$ gene often result in an AMP deaminase enzyme that cannot function and as a result, energy production in skeletal muscle cells is decreased. Skeletal muscles are particularly sensitive to decreases in energy during periods of exercise or increased activity when energy demands increase. The lack of AMP deaminase activity can result in fatigue, muscle weakness or pain, or other muscle problems in some people with AMP deaminase deficiency.

It is not known why some people with this condition do not experience symptoms. Researchers speculate that additional factors, both genetic and environmental, may determine whether a person develops the signs and symptoms of AMP deaminase deficiency.

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**
- AMP deaminase deficiency
- exercise-induced myopathy
- MAD deficiency
- MADA deficiency
- muscle AMP deaminase deficiency
- myoadenylate deaminase deficiency

**Diagnosis & Management**

**Genetic Testing Information**
- What is genetic testing? [primer/testing/genetictesting](https://primer/testing/genetictesting)

**Other Diagnosis and Management Resources**

**Additional Information & Resources**

**Health Information from MedlinePlus**
- Encyclopedia: Muscle Aches [https://medlineplus.gov/ency/article/003178.htm](https://medlineplus.gov/ency/article/003178.htm)
- Health Topic: Muscle Disorders [https://medlineplus.gov/muscledisorders.html](https://medlineplus.gov/muscledisorders.html)

**Genetic and Rare Diseases Information Center**
Educational Resources

- MalaCards: myopathy due to myoadenylate deaminase deficiency
  https://www.malacards.org/card/myopathy_due_to_myoadenylate_deaminase_deficiency

- Merck Manual Home Edition for Patients and Caregivers: Muscles

- Orphanet: Adenosine monophosphate deaminase deficiency
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=45

Patient Support and Advocacy Resources

- Metabolic Support (UK)
  https://www.metabolicsupportuk.org/

- Muscular Dystrophy Association: Myoadenylate Deaminase Deficiency
  https://www.mda.org/disease/metabolic-myopathies/types/myoadenylate-deaminase-deficiency

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28AMP+deaminase+deficiency%5BTIAB%5D%29+OR+%28myoadenylate+deaminase+deficiency%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

- MYOPATHY DUE TO MYOADENYLATE DEAMINASE DEFICIENCY
  http://omim.org/entry/615511

Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17463303

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12117480

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/18338202
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16040263

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12783984

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/19353846


Reviewed: July 2016
Published: May 14, 2019

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