



What is Adenosine Deaminase Deficiency?

Adenosine deaminase (ADA) deficiency is an inherited disease characterized by repeated, persistent, and potentially life-threatening infections. Symptoms are due to a defect in the production of an enzyme called adenosine deaminase. Without normal levels of this enzyme, toxic chemicals build up within the immune system leading to severe immunodeficiency, a state in which the body's ability to fight infectious disease is absent or severely compromised. The severe form of ADA deficiency is also known as ADA-deficient severe combined immunodeficiency (SCID).¹

What are the symptoms of Adenosine Deaminase Deficiency and what treatment is available?

ADA deficiency varies in severity and age of onset, even within families. The most common and severe form (SCID) is usually diagnosed within the first six months of life.¹ Without restoration of immune function, most children die before age two. Approximately 15% of children have a delayed onset, occurring between six months and the first few years of life. Rarely, diagnosis of ADA deficiency does not occur until the teens or early adulthood.²

Symptoms of ADA deficiency may include²:

- Recurrent infection
- Lymphopenia (decrease in lymphocytes, a type of white blood cell)
- Failure to thrive (not gaining weight or growing well)
- Chronic diarrhea
- Dermatitis (red, swollen, itchy skin)
- Rib abnormalities
- Liver abnormalities
- Neurological abnormalities, including hearing loss

While infections and failure to thrive may initially be less severe in those with delayed or late-onset ADA deficiency, recurrent ear infections, sinusitis, and upper respiratory infections are frequent. Chronic lung damage is commonly present at the time of diagnosis.²

Treatment for infections may include specific antibiotic, antifungal, and antiviral medications, and intravenous immunoglobulin therapy. Complete or partial restoration of immune function may be achieved through bone marrow/stem cell transplantation (which may be curative) or life-long enzyme replacement therapy (ERT).²

SCID is included in some newborn screening panels in the United States and is expected to be adopted by more states in the near future.³

How is Adenosine Deaminase Deficiency inherited?

ADA deficiency is an autosomal recessive disease caused by mutations in the *ADA* gene.¹ An individual who inherits one copy of an *ADA* gene mutation is a "carrier" and is not expected to have related health problems. An individual who inherits two mutations in this gene, one from each parent, is expected to be affected with ADA deficiency.

If both members of a couple are carriers, the risk for an affected child is 25% in each pregnancy; therefore, it is especially important that the reproductive partner of a carrier be offered testing.





Who is at risk for Adenosine Deaminase Deficiency?

ADA deficiency can occur in individuals of all races and ethnicities. In the general population, it is estimated to affect 1 in 333,000^{1,4} individuals, with an approximate carrier frequency of 1 in 289.

Having a relative who is a carrier or who is affected can increase an individual's risk of being a carrier. Consultation with a genetics health professional may be helpful in determining carrier risk and appropriate testing.

What does a positive test result mean?

If a gene mutation is identified, an individual should speak to a physician or genetics health professional about the implications of the result and appropriate testing for the reproductive partner and at-risk family members.

What does a negative test result mean?

A negative result reduces, but does not eliminate, the possibility that an individual carries a gene mutation. The likelihood of being a carrier is also influenced by family history, medical symptoms, and other relevant test results.

Where can I get more information?

- National Institute of Allergy and Infectious Disease: <http://www.niaid.nih.gov/topics/immuneDeficiency/Understanding/Pages/scid.aspx>
- Genetics Home Reference: <http://ghr.nlm.nih.gov/condition/adenosine-deaminase-deficiency>

References

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2. Hershfield M. Adenosine Deaminase Deficiency. *GeneReviews* Available at: <http://www.ncbi.nlm.nih.gov/books/NBK1483/?report=printable>. Accessed Mar 15, 2012.
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4. Chinen J and Shearer W Advances in basic and clinical immunology 2009 *J Allergy Clin Immunol*. 2010; 125(3): 563-568.

