

# Newborn Screening for X-linked Adrenoleukodystrophy: Information for Parents



**Baby boy  
with ABCD1  
gene mutation**

## What is newborn screening?

Newborn screening involves laboratory testing on a small sample of blood collected from newborns' heels. Every state has a newborn screening program to identify infants with rare disorders, which would not usually be detected at birth. Early diagnosis and treatment of these disorders often prevents serious complications.

## What is adrenoleukodystrophy (ALD)?

ALD is one of over 40 disorders included in newborn screening in New York State. It is a rare genetic disorder. People with ALD are unable to breakdown a component of food called very long chain fatty acids (VLCFA). If VLCFA are not broken down, they build up in the body and cause symptoms.

## How does New York State screen for ALD?

NYS screens for ALD by measuring the amount of a specific VLCFA (C26:0) in a sample of the baby's blood. If VLCFA are elevated on the newborn screen, then genetic testing is done to look for a mutation in the *ABCD1* gene. A mutation in the *ABCD1* gene causes ALD.

## My baby boy had a positive newborn screen for ALD. Does he have ALD?

It is very likely that your baby has ALD because a mutation was found in the gene that causes the disorder.

## How do I confirm that my baby boy has ALD?

Your doctor will ask you to take your baby to see a special doctor, called a biochemical geneticist because they are experts at diagnosing ALD. Additional blood tests will be ordered by the specialist to confirm the diagnosis. The VLCFA testing will be repeated by a diagnostic lab. A blood sample will also be sent to the Newborn Screening Program for repeat genetic testing.

## What are the symptoms of ALD?

There are usually no clues at birth that a baby has ALD. X-linked ALD occurs in males. The symptoms of ALD can be different from one boy to the next. The disorder is called adrenoleukodystrophy because symptoms may involve the adrenal glands and a brain abnormality called leukodystrophy. There are three main types: childhood onset, Addison disease only and adult onset. There is no way to tell which type a boy will have until they develop symptoms.

### Childhood Onset

Symptoms of the childhood onset type may include either adrenal symptoms, brain symptoms or both.

**Adrenal symptoms:** The adrenal glands are responsible for producing the hormones that respond to stress. A low level of these hormones can happen in boys with ALD and is also known as Addison disease. Without treatment, symptoms of

Addison disease include vomiting, fatigue, low blood pressure, weakness, increased skin pigmentation and coma.

**Brain symptoms:** Leukodystrophy is a loss of the protective coating ("white matter") around the nerves that make up the brain. Boys with X-linked ALD may develop leukodystrophy during childhood that causes increasing loss of developmental skills, seizures and eventually death. About 1/3 (30%) to 1/2 (50%) of boys with ALD develop leukodystrophy anytime from 3 to 21 years of age.

### Adult Onset

Up to 40% of men with ALD will have the adult onset type, which may begin as early as the 20s. The adrenal symptoms are the same as the childhood type, but the neurological symptoms may be different. The neurological symptoms are called adrenomyeloneuropathy (AMN), which varies from progressive weakness of the legs and paralysis over decades to a progressive brain disease similar to the childhood onset.

### Addison Disease Only

About 10% of boys with ALD will only develop adrenal symptoms anytime from age 2 to adulthood. This type is called Addison disease only because leukodystrophy never develops, but most boys with this type will develop AMN in adulthood.

Some women who are carriers of ALD develop milder neurological symptoms similar to AMN in men. The symptoms may begin around 30 years old.

## What is the treatment for ALD?

Boys with ALD should regularly see doctors specializing in Neurology and Endocrinology. They will need to have a brain study called an MRI every year and blood tests to check their adrenal hormones every six months. Boys with adrenal symptoms are treated with steroid hormone replacement therapy as soon as the hormone blood tests are abnormal. As soon as leukodystrophy can be seen on a brain study (MRI), boys are treated with a hematopoietic stem cell transplant (HSCT). Because HSCT is a very serious medical procedure, it is not done unless there are signs of leukodystrophy. A dietary supplement, Lorenzo's oil, in conjunction with a special diet lowers very long chain fatty acids and its role as a preventative treatment is under investigation.

## No one else in my family has ALD. Is it still possible for my baby to have the condition?

Even if no one in your family has ALD, it is possible for your baby to have the condition. If your baby is diagnosed with ALD, your doctor will suggest genetic counseling to discuss the chance for your other family members to have ALD.

## Why do only boys have ALD?

Only boys have ALD because it is caused by a mutation in a gene (*ABCD1*) on the X chromosome, called "X-linked inheritance." Males only have one X chromosome so they have one *ABCD1* gene. Males with a nonfunctioning *ABCD1* gene have ALD. Females have 2 X chromosomes, so they have two *ABCD1* genes. Females with one *ABCD1* gene mutation will be carriers. When a mother is a carrier of ALD, each son has a 50% chance of inheriting the disorder.

When your baby goes in for his first visit with the biochemical geneticist, they will ask for a blood sample from the mother. Genetic testing will be done in the blood sample to find out if she is a carrier of ALD.

## What does it mean to be a carrier of ALD?

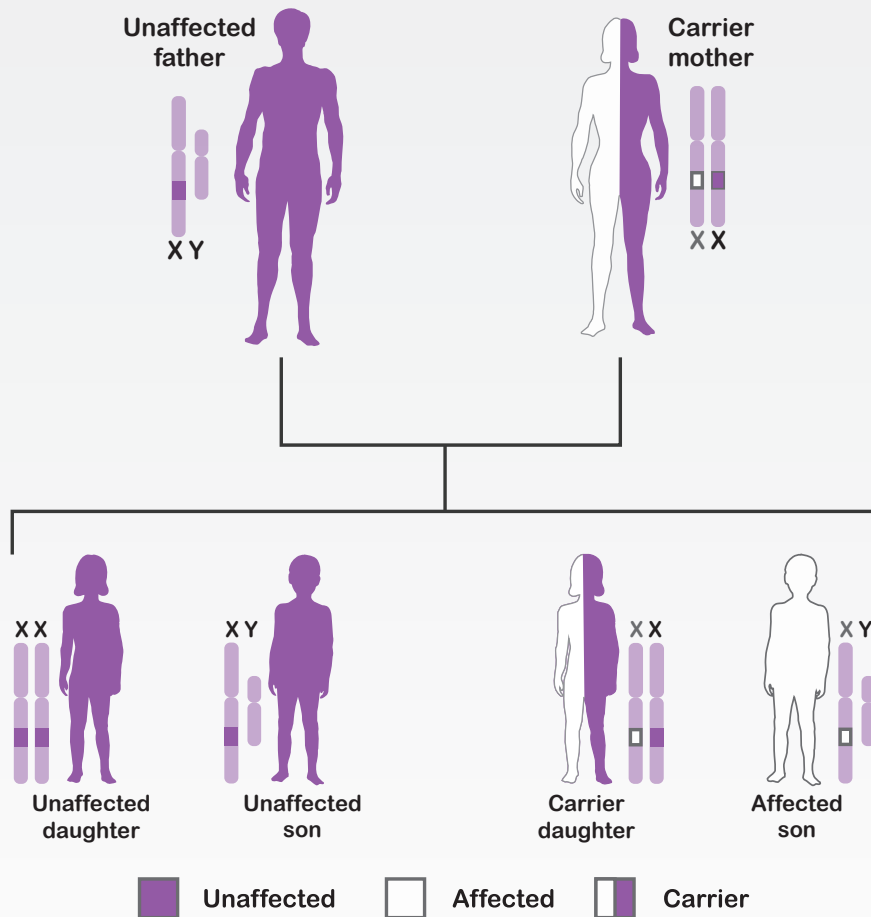
Women who are carriers of ALD do not usually have symptoms. Some women who are carriers of ALD develop milder neurological symptoms similar to AMN in men. The symptoms may begin around 30 years old.

For a woman who is a carrier, there is a 50% chance for each of her sons to have ALD and a 50% chance for each of her daughters to be a carrier.

## Who can I call if I have additional questions about newborn screening for ALD?

Your baby's doctor and the NYS Newborn Screening Program are resources for additional questions about newborn screening for ALD.

### X-linked recessive carrier mother



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