

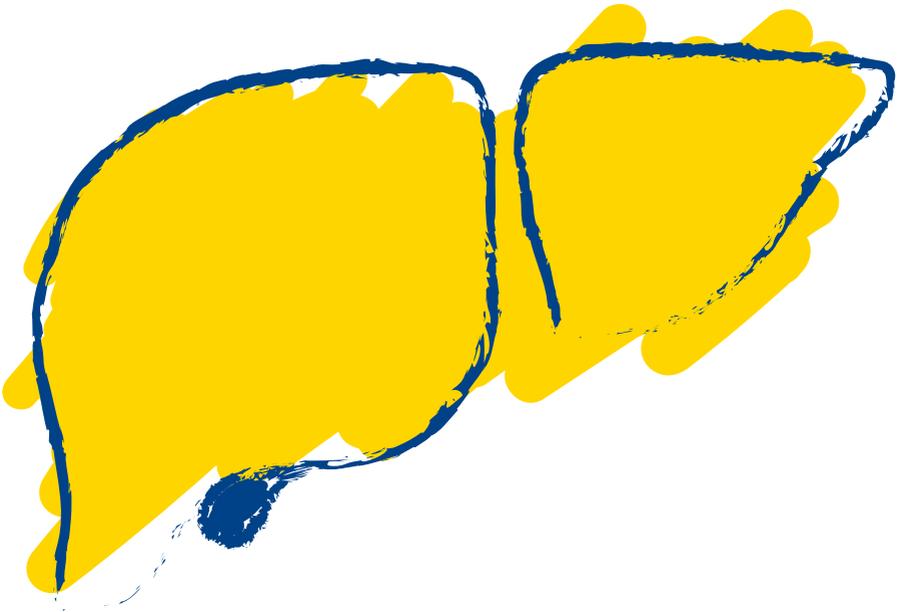


Children's Liver
Disease Foundation

fighting childhood
liver disease

Alpha-1 antitrypsin deficiency

A Guide



An explanation of what alpha-1 antitrypsin deficiency is, its causes and how it is diagnosed and treated

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This information has primarily been written for:

Parents/carers of children with alpha-1 antitrypsin deficiency

Others may also find this information useful:

- Young people with alpha-1 antitrypsin deficiency
- Healthcare professionals who would like to find out more about the condition

You may find it helpful to also read the following CLDF leaflets:

- An Introduction to Liver Disease

What is alpha-1 antitrypsin?

Alpha-1 antitrypsin is a protein in the body. It is made from the food we eat. It is mainly produced by the liver and is then circulated around the body in the bloodstream.

It can be written as alpha-1 or α 1AT.

Why is the alpha-1 antitrypsin protein important?

It is not fully understood why we need alpha-1 antitrypsin or what its main task in the body is. Research has shown that it has a protective role in preventing tissue damage.

Proteases are chemicals in the body known as enzymes. They break proteins down. Alpha-1 antitrypsin stops the proteases from breaking down healthy tissues in the body.

The body makes proteases in response to infections and irritants entering the body. Without the protective effect of alpha-1 antitrypsin, these proteases can cause tissue damage. This can happen over a period of many years. The lungs can be particularly affected because they may be exposed to chemicals in the air (e.g. tobacco smoke) which can speed up damage.

What is alpha-1 antitrypsin deficiency?

Individuals with alpha-1 antitrypsin deficiency produce a slightly different form of alpha-1 antitrypsin protein in the liver.

This abnormal alpha-1 antitrypsin becomes trapped in the liver. This means that it is not carried to other parts of the body so individuals usually, but not always, have low amounts of alpha-1 antitrypsin in their blood. This can lead to damage to the lungs and the liver. This leaflet focuses on the potential damage to the liver.

Around one out of ten children who have alpha-1 antitrypsin deficiency have problems with their liver. Many people affected by the condition will get some scarring of their liver but most will not develop liver disease.

What are the effects of alpha-1 antitrypsin deficiency?

Some people seem to suffer no ill effects whatsoever. However, others do and these can include:

- **Emphysema**
Some people will stay healthy for years but then in their late twenties, or later, develop breathing difficulties due to a condition called 'emphysema'. The disorder can lead to lung damage and early death. Cigarette smoking, including passive smoking, is thought to be a major factor in causing emphysema.
- **Liver damage**
Children can develop inflammation of the liver which can cause liver damage. Inflammation of the liver is called hepatitis but it is not infectious. The liver problem usually becomes apparent in the first four months of a baby's life and may be referred to as neonatal hepatitis.

Some of the signs and symptoms which may be seen at the time of diagnosis are:

- Jaundice (yellowing of the skin/the whites of the eyes)
- Persistently yellow urine
- Pale stools (poo)
- Poor weight gain
- Bleeding, for example, from the tummy button or nose
- Ascites (an abnormal collection of fluid in the abdomen) and portal hypertension (high blood pressure in the blood vessels around the liver).

There is a leaflet available from CLDF which discusses these in more detail.

Are there any treatments or cures for liver disease associated with alpha-1 antitrypsin deficiency?

At the moment there is no specific treatment or cure for alpha-1 antitrypsin deficiency. Despite this the medical teams caring for your child will monitor and manage any symptoms caused by it.

It may be necessary to make a change to your child's diet. This will be done by a dietician. Some points to bear in mind are:

- Babies frequently do better with a special milk formula rather than ordinary milk or breast milk alone. The special milks are more easily absorbed. A specialist dietician can provide advice on increasing the calories your baby takes in by adding extra milk feeds to their diet.
- Older children may require extra calories which can be given in the form of high calorie drinks.
- Changes to the diet are often necessary because babies and children with damaged livers have poor bile production. This means they often don't absorb all of the food that they eat. They can lose weight or have difficulty in gaining weight.
- Children may be given extra vitamins, especially vitamin K, to help the blood to clot normally.

For more information on nutrition you can see CLDF's Nutrition leaflet or speak to your child's dietician.

What will be monitored in a child with alpha-1 antitrypsin deficiency?

Their growth and development will be monitored. Following a new diagnosis babies should be weighed weekly by their health visitor. A member of the liver team will contact the child's health visitor to give them further advice.

How well the liver is working will also be monitored. This can include blood tests, scans and sometimes a liver biopsy. Testing liver function can make sure any complications are recognised at an early stage and are treated quickly.

As a child's condition becomes more stable, they will probably have fewer hospital visits.

CLDF has a leaflet called "An Introduction to Liver Disease" which contains more information on general tests.

What is the likelihood of a child with alpha-1 antitrypsin deficiency developing serious liver problems?

There is no definite way to know whether a child will develop liver problems. A large study was carried out in Sweden in 1976 which showed that approximately 15 out of 100 (15%) children with alpha-1 antitrypsin deficiency had liver disease in infancy.

From the follow-up of these children it was found that:

- **25 out of 100 (25%)** children had no disease symptoms at the age of 10.
- **45 out of 100 (45%)** children had continuing evidence of liver disease in their blood test results.
- **5 out of 100 (5%)** children needed a liver transplant in the first year of life.
- **25 out of 100 (25%)** children needed a liver transplant at some point in their childhood.

A liver biopsy will show the degree of fibrosis (scarring) and liver damage.

If the liver disease gets worse and if there are problems caused by scarring on the liver (cirrhosis) then liver transplantation may be recommended. It's important to know that whilst liver transplantation is a big step, the results of liver transplantation in children are excellent. There is now a 90% one year survival rate reported by transplant centres.

A few children and adults with alpha-1 antitrypsin deficiency are only diagnosed with alpha-1 antitrypsin deficiency when they have problems caused by scarring in the liver. They may have had very mild jaundice or even no jaundice as young children. When this happens liver transplantation may be required.

CLDF has a leaflet called "Liver Transplantation – an overview" which explains liver transplantation in more detail.

What are the signs and symptoms to look out for in a child or young person with alpha-1 antitrypsin deficiency?

- Failure to gain weight or weight loss
- Constant tiredness or lethargy
- Deepening or reappearance of jaundice
- A swollen abdomen. This may be due to an enlarged spleen or an abnormal collection of fluid. Enlargement of the liver and the spleen can also be signs of alpha-1. Sometimes the baby's tummy may be obviously bigger than usual or it may only be noticed when a doctor examines your baby.
- Recurrent nose bleeds
- Vomiting blood
- Blood in the stool. This may be black or red
- Swollen ankles, especially in the evenings

What causes alpha-1 antitrypsin deficiency?

Alpha-1 antitrypsin deficiency is an inherited condition. It is passed on from parents to their children through their genes.

Genes are made up of DNA. They are the instructions contained in the female egg and the male sperm which determine the colour of our skin, eyes, hair and every other detail of our body. Genes come in pairs: we inherit one from our mother and one from our father. An estimated 1 in 40 of the population are carriers of a gene which causes alpha-1 antitrypsin deficiency.

Alpha-1 antitrypsin deficiency occurs when a baby inherits an abnormal gene from each parent. Children with two abnormal genes don't produce alpha-1 antitrypsin properly.

The most common version of the gene is known as the M gene. This produces normal levels of alpha-1 antitrypsin protein.

There are a number of different abnormal genes which may cause alpha-1 antitrypsin deficiency. The Z gene is the most common abnormal version of the gene. This gene causes alpha-1 antitrypsin disease.

Another version of the gene, the S gene, is less common and does not appear to lead to childhood liver disease.

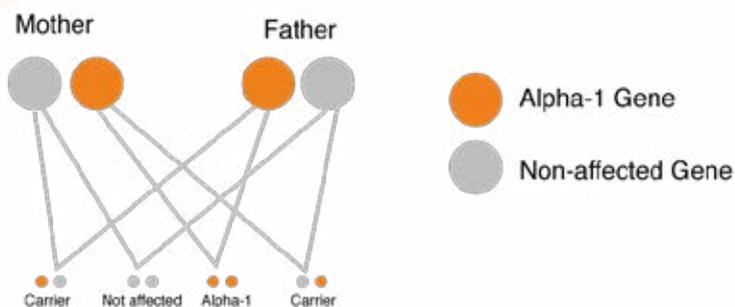
What are the chances of a child inheriting alpha-1 antitrypsin disease from their parents?

Both parents must have at least one copy of the abnormal alpha-1 antitrypsin deficiency gene in order for their child to inherit the disease.

When both parents are carriers:

When an individual is a carrier it means they have one copy of the affected gene but they do not have the disease.

Both parents are carriers



Possible genes child will receive

If both parents are carriers then there is a chance that each parent will pass on the affected gene.

1 out of 4 times, the child of two carriers will inherit two abnormal genes - one gene from each parent. These children will have alpha-1 antitrypsin deficiency.

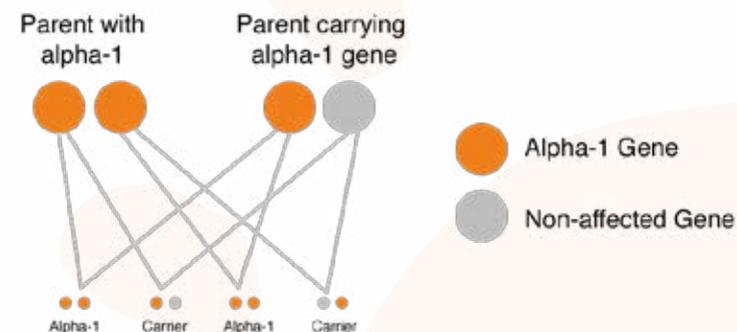
1 out of 4 times, their child will inherit two normal genes. These children will not have any alpha-1 antitrypsin deficiency genes and will be clear of the disease.

2 out of 4 times, their child will inherit one normal gene and one abnormal gene. This child will be a carrier like their parents.

When one parent is a carrier and the other parent has alpha-1 antitrypsin deficiency:

2 out of 4 times, their child will have alpha-1 antitrypsin deficiency.

2 out of 4 times, their child will inherit one normal gene and one abnormal gene. This child will be a carrier like their parents.



If both parents have alpha-1 antitrypsin deficiency:

All children will have alpha-1 antitrypsin deficiency.

Older brothers and sisters of affected children can be tested to see whether they have undiagnosed alpha-1 antitrypsin deficiency, are carriers, or are completely clear.

What is a genetic counsellor?

Genetic counselling is available for individuals affected by alpha-1 antitrypsin deficiency who are planning to have children or are thinking of having siblings of an affected child tested.

Genetic counsellors are specialists in the study of genes who are trained to advise parents who have a child, or children, with a genetically inherited problem or have one themselves. They can provide advice regarding having children in the future and discuss genetic testing for the family.

Many parents find it extremely useful to talk to a genetic counsellor before making a decision regarding whether they would like to go ahead with genetic testing or not and find it useful to discuss the pros and cons with a genetic counsellor. It's advisable to get a referral from your GP or your child's liver team.

Living with alpha-1 antitrypsin deficiency

Alpha-1 antitrypsin deficiency can affect children and young people differently. Whilst some children may become very unwell and require a liver transplant, others lead relatively normal lives and only visit their liver centre once a year for a check-up. As mentioned previously, the outcomes after a liver transplant in children are excellent and post-transplant children and young people can go on to achieve great things.

CLDF supports families and young people with alpha-1 antitrypsin deficiency right from diagnosis to an individual's 25th birthday. To find out more about how we can support you and your family visit childliverdisease.org or see our contact details on the back page to get in touch.

CLDF produces a wide variety of information resources for children and young people up to the age of 25 with liver disease, their families and the healthcare professionals who look after them. This information can be downloaded or ordered from CLDF's website www.childliverdisease.org.

For further enquiries regarding CLDF's information please contact the Health and Research Information Manager by email at hrim@childliverdisease.org or call 0121 212 6029.

Thanks

The booklet has been written, edited and reviewed with the help of staff at each of the specialist paediatric liver centres: Birmingham Children's Hospital, King's College Hospital and Leeds Children's Hospital. Thank you to all of the staff involved who have made the production of this leaflet possible.

Disclaimer

This leaflet provides general information but does not replace medical advice. It is important to contact your/your child's medical team if you have any worries or concerns.

Feedback and Information Sources

Information within this leaflet has been produced with input from the three specialist paediatric liver centres in the UK.

To provide feedback on this leaflet, for more information on the content of this leaflet including references and how it was developed contact Children's Liver Disease Foundation: info@childliverdisease.org

This leaflet has been reviewed in June 2017. It is due to be reviewed by June 2020.

What is Children's Liver Disease Foundation (CLDF)?

CLDF is the UK's leading organisation dedicated to fighting all childhood liver diseases. CLDF provides information and support services to young people up to the age of 25 with liver conditions and their families, funds vital research into childhood liver disease and is a voice for everyone affected.

Are you a young person up to the age of 25 with a liver condition or a family member? CLDF's Families and Young People's teams are here for you, whether you want to talk about issues affecting you, meet and share with others, or just belong to a group which cares, knows what it's like and is fighting to make a difference. You are not alone.

If you are a parent/carer or family member then get in touch with CLDF's Families Team:

Phone: 0121 212 6023 **Email:** families@childliverdisease.org

If you are a young person and want to find out more about CLDF's services you can contact CLDF's Young People's Team:

Phone: 0121 212 6024 **Email:** youngpeople@childliverdisease.org

CLDF have a social media platform called **HIVE** for 11 – 25 year olds with a liver disease/transplant to make new friends, connect and share stories
www.cldfhive.co.uk

Would you like to help us support the fight against childhood liver disease?

All of CLDF's work is funded entirely through voluntary donations and fundraising. Please help us to continue to support young people, families and adults diagnosed in childhood now and in the future. To find out more about fundraising and how you can join the fight against childhood liver disease you can visit www.childliverdisease.org/get-involved. Alternatively, you can email the Fundraising Team at fundraising@childliverdisease.org or call them on **0121 212 6022**.

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