University Hospitals
Bristol and Weston
NHS Foundation Trust

Patient information service
Clinical Genetics

Alpha-1 antitrypsin deficiency

What is alpha 1 antitrypsin?

Alpha 1 antitrypsin (AAT) is a protein produced by the liver. It protects lung tissue from a chemical (elastase) released by white blood cells. Elastase helps fight infections in the lungs. However, if elastase activity is not tightly controlled it can attack healthy lung tissue.

What is alpha 1 antitrypsin deficiency (AATD)?

AATD is a genetic condition where individuals have low levels of AAT in the bloodstream. The production of AAT is either reduced or abnormal.

What are the symptoms of AATD?

The condition is variable. Some people with AATD remain entirely healthy, whilst others experience serious health problems. Symptoms typically start in adulthood, but rarely can affect children.

The most common symptoms relate to the lungs and liver.

Lungs

Adults with AATD are at increased risk of emphysema, a type of lung disease. This can cause a shortness of breath and recurrent chest infections. People who smoke are likely to experience symptoms more severely and at a younger age.

Liver

Liver disease can sometimes occur in children or adults with AATD. This is because the abnormal form of AAT becomes trapped in the liver and can cause liver damage. Many people with AATD will experience some damage to their liver, but only a minority of individuals who are severely affected develop liver failure and then a liver transplantation may be recommended. Severe liver disease can occur in children but it is rare.

How is AATD managed?

Individuals with AATD may be managed by their GP, and/or referred to a specialist to monitor lung and liver problems. If symptoms of lung damage develop they can be treated with medicine, such as antibiotics.

The best way to prevent symptoms is to avoid smoking cigarettes. For individuals with AATD who smoke, stopping is essential. Exposure to passive smoking and lung irritants such as dust particles and certain chemicals should also be avoided, as this increases the risk of lung damage at an earlier age.

It is also advised that individuals keep to their recommended alcohol intake to help protect the liver.

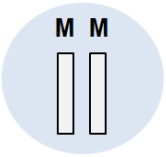
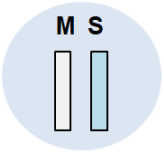
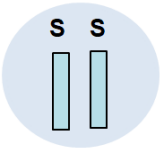
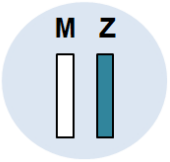
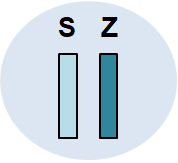
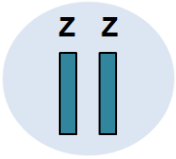
There is no cure for AATD and it is not currently possible to repair the faulty genes. Individuals with AATD and carriers of AATD are encouraged to tell their family members or partners, so they may be able to get tested for AATD.

What causes AATD?

AATD is an inherited condition. It is passed on from parents to their children through their genes. Each person has two copies of the gene that makes AAT. One copy is inherited from each parent. When a couple have a child, they each pass on one of their two copies of the AAT gene. The gene that is passed on is random.

AATD occurs when a baby inherits a faulty copy of the AAT gene from both parents. There are three main forms of the AAT gene. The normal (and most common) form is called ‘M’. This produces a normal level of AAT. ‘S’ and ‘Z’ are two different faulty forms of the gene. They are both associated with lower levels of AAT. The Z form is associated with lower levels than the S form.

The amount of AAT our body produces and our risk of AATD will depend on which two forms of the gene we have:

AAT genes	Risk of AATD	
	No risk	• Most people have two copies of the M form of the gene • Normal levels of AAT
	No risk	• Carry one faulty AAT gene (S) • Slightly reduced levels of AAT • Not expected to develop any disease symptoms
	No risk	• Carry two faulty AAT genes (SS) • Slightly reduced level of AAT • Not expected to develop any disease symptoms
	Slight risk	• Carry one faulty AAT gene (Z) • Moderately reduced levels of AAT • May develop mild disease symptoms
	Increased risk	• Carry two faulty AAT genes (SZ) • Low levels of AAT • May develop disease symptoms
	Significant risk	• Carry two faulty AAT genes (ZZ) • Very low levels of AAT • May develop disease symptoms

How common is AATD?

Around 1 in 2500 people in the UK have AATD. Up to 1 in 10 (10%) people are carriers of the S or Z variant (MS or MZ).

What if I am a carrier of AATD?

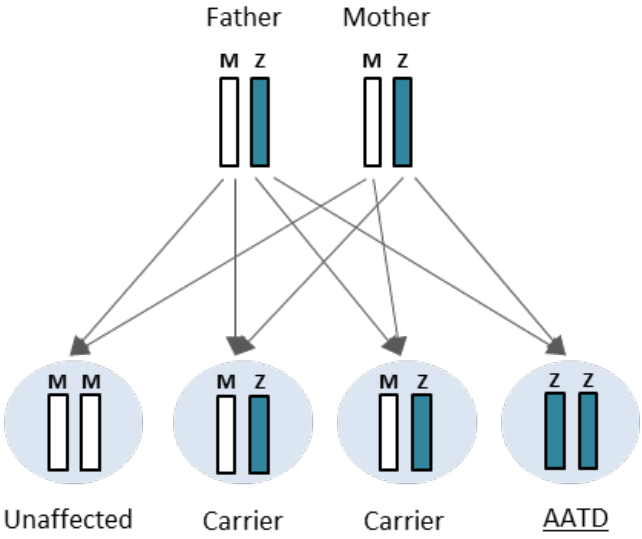
Carriers have levels which are low but much closer to normal. Carriers of AATD are not expected to develop any serious health problems related to the deficiency. They would still be advised to avoid smoking, avoid any exposure to lung irritants and keep to recommended alcohol intake.

How is AATD inherited?

The copy of the AAT gene that is passed on from a parent to their child is random.

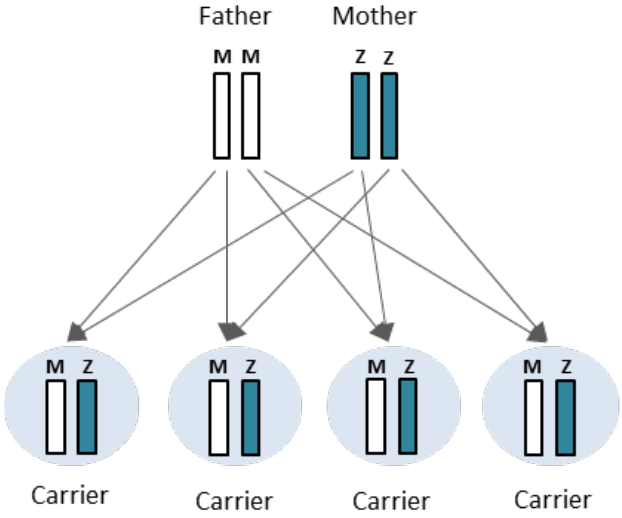
If both parents are carriers

If both parents are carriers there is a 1 in 4 (25%) chance that each parent will pass on the faulty gene and have a child with AATD. There is a 2 in 4 (50%) chance of having a child who is a carrier.



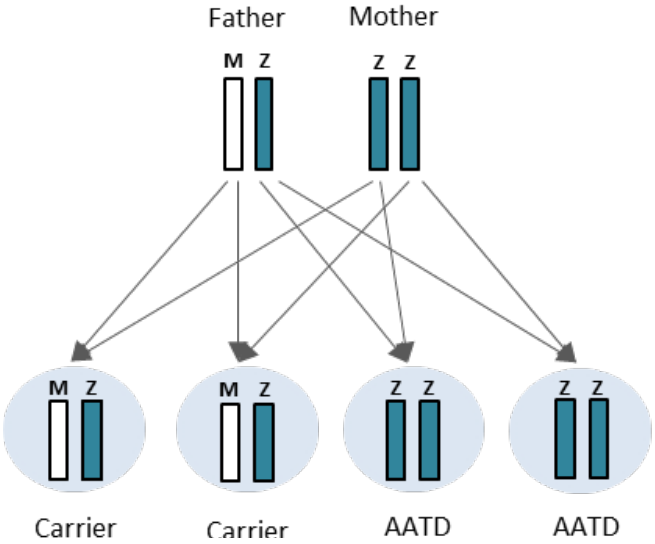
If one parent has AATD

If one parent has AATD then they will always pass on a faulty copy of the gene. All children (100%) will be carriers of AATD.



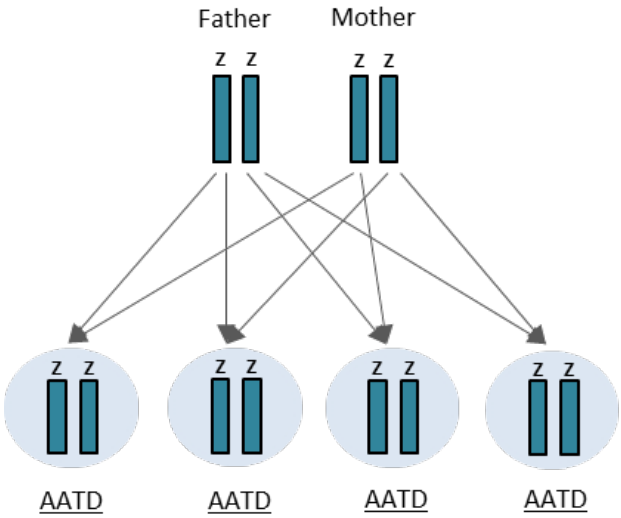
If one parent is a carrier and the other parent has AATD

If one parent is a carrier and the other parent has AATD then there is a 2 in 4 (50%) chance of having a child with AATD. There is a 2 in 4 (50%) chance of having a child who is a carrier.



If both parents have AATD

If both parents have AATD then they will both always pass on a faulty copy of the gene. All children (100%) will have AATD.



How can I have testing for AATD?

You may be tested for AATD if you are showing symptoms of the condition or if you have a first-degree relative (a parent, sibling or child) who has AATD or is a carrier. Testing can be done by your GP or another specialist.

Different tests may be performed to look at the levels of AAT in the blood, and the forms of the AAT gene that are present (M, S, or Z). These tests require a blood sample. Further testing may sometimes be suggested to identify the specific change in the AAT gene that is causing AATD.

Referral for genetic counselling

Some patients may be referred to see a genetic counsellor. This may happen if:

- you have a child with AATD
- you and your partner both have at least one faulty form of the gene, and you may wish to find out more about the implications for your children.
- further genetic testing would be useful to clarify the specific change causing AATD in you or your family member.

Further information

The Alpha-1 UK Support Group

https://www.alpha1.uk/

Notes

As well as providing clinical care, our Trust has an important role in research. This allows us to discover new and improved ways of treating patients.

While under our care, you may be invited to take part in research. To find out more please visit: **www.uhbw.nhs.uk**

Help us prevent the spread of infection in hospital. Please make sure your hands are clean. Wash and dry them thoroughly/use the gel provided. If you have been unwell in the last 48 hours please consider whether your visit is essential.

Smoking is the primary cause of preventable illness and premature death. For support in stopping smoking contact **NHS Smokefree** on **0300 123 1044**.

Drinkline is the national alcohol helpline. If you're worried about your own or someone else's drinking, you can call this free helpline in complete confidence. **Drinkline** on **0300 123 1110.**

For access all patient leaflets and information please go to the following address: **http://foi.avon.nhs.uk/**

Bristol switchboard: 0117 923 0000

Weston switchboard: 01934 636 363

www.uhbw.nhs.uk

For an interpreter or signer please contact the telephone number on your appointment letter.

For this leaflet in large print or PDF format, please email patientleaflets@uhbw.nhs.uk.

Published: **11/12/20** Expires: **31/12/23** SS/CG/AI/ALPHA-1/DEC20