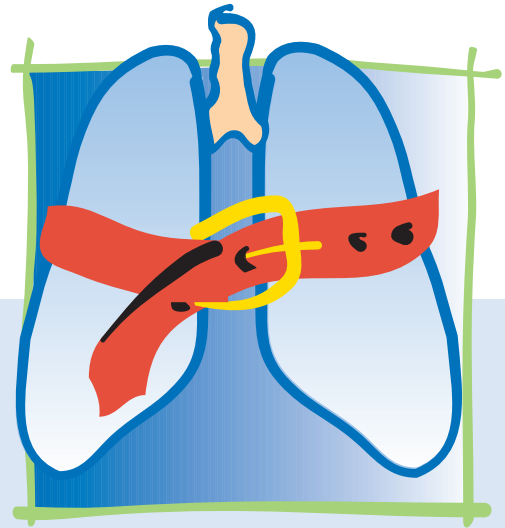


What happens in Alpha-1-Antitrypsin Deficiency?



*Living with
Alpha-1-Antitrypsin
Deficiency*

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Dear Patient,

You have been diagnosed with Alpha-1-Antitrypsin Deficiency by your doctor. This deficiency may already have led to a medical condition or may do so in the future. From numerous discussions with other patients we know that there is a great need for detailed information on this disorder.

The purpose of this brochure is to help you understand the nature of Alpha-1-Antitrypsin Deficiency and to explain the treatment options that are available to you. We also give tips on how to cope with everyday situations, how to enjoy your vacations and how to keep fit despite the disorder.

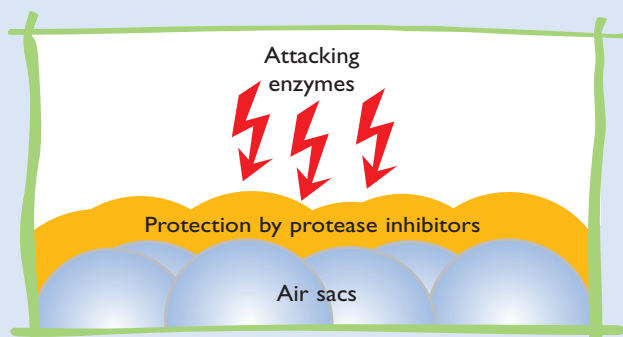
We hope that we have succeeded in preparing a guideline that not only provides answers to frequently asked questions but will also encourage you to ask your doctor any other questions you may have in order to help you manage your life better.

What is Alpha-1-Antitrypsin Deficiency?

Alpha-1-Antitrypsin Deficiency is due to faulty hereditary information leading to a decrease in the production of certain proteins known as proteinase inhibitors (PIs for short). Alpha-1-Antitrypsin (AAT), the most important of these substances, is responsible for protecting the lungs.

These proteins are produced in the liver. However, their main site of action is the lungs.

Protease inhibitors are able to protect the sensitive air sacs in the lungs. The air sacs are attacked by protein-splitting substances called enzymes which are released by the body's defense cells.



Affected individuals with faulty hereditary information have smaller amounts of protective proteins in their bloodstream. This can be determined by measuring the concentration of Alpha-1-Antitrypsin in their blood.

Individuals with severe Alpha-1-Antitrypsin Deficiency have two defective genes (homozygous deficiency type), while others may have one healthy and one defective gene (heterozygous deficiency type). Accordingly, the clinical picture may be mild or severe.

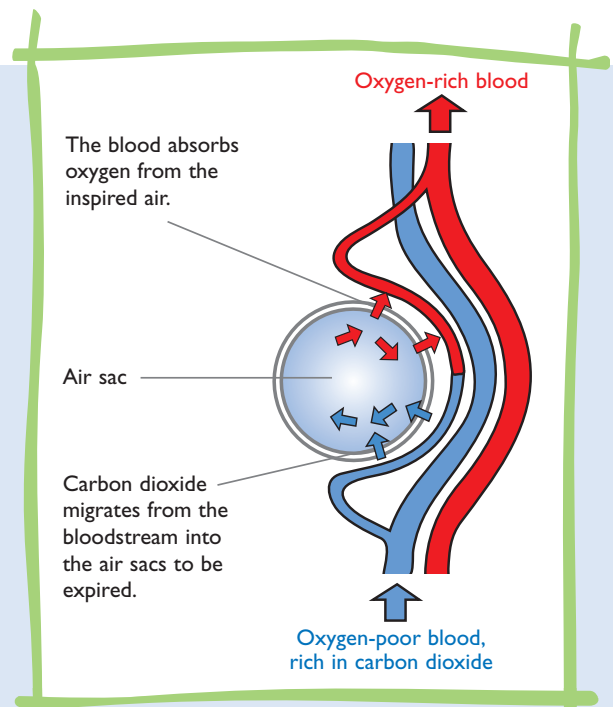
Alpha-1-Antitrypsin Deficiency most frequently affects the lungs. In addition, around 10% of individuals with the homozygous deficiency type develop liver disease in early childhood. This can lead to severe cirrhosis (degeneration of the liver). In some cases both the liver and the lungs are affected.

This brochure deals only with the effects of the disorder on the lungs. We would therefore like to give you a brief description of how the lungs function.

What happens in my Lungs when I breathe?

Air is essential to life. What makes air so vital is the oxygen it contains which you, along with most other creatures, require for nearly all the metabolic processes taking place in your body.

When you breathe in, the air flows through the airways (bronchi) into the air sacs (alveoli). From there the oxygen (O_2) is absorbed into the bloodstream. When you breathe out, you remove carbon dioxide (CO_2) from your body in the opposite direction. Gas exchange in the lungs takes place between the air sacs and the blood vessels surrounding them.



How did my condition develop?

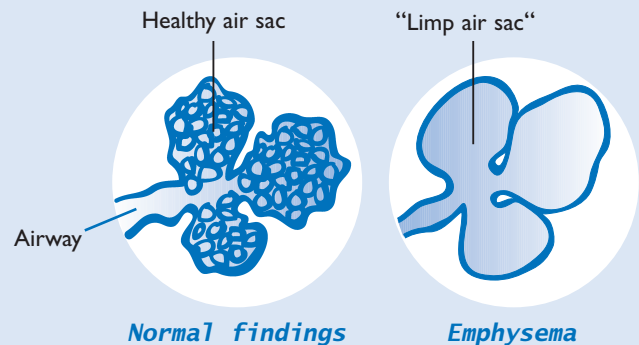
Imagine the lungs as an upside-down tree. Like branches, the airways keep forking off, ending in dense clusters of air sacs – up to 30 million of them – arranged like bunches of grapes. The air sacs are supplied by a network of fine blood vessels. Oxygen-poor blood from the body arrives here, releases its carbon dioxide to the air sacs and is recharged with fresh oxygen.

In order for this exchange of oxygen and carbon dioxide to take place unhindered, the walls of the air sacs are just a few hundredths of a millimeter thick. You can easily imagine how vulnerable such a thin membrane can be to damage or even destruction by inflammatory processes if they are not guarded by protective substances such as protease inhibitors.

Did you know that your lungs present a surface area of 80 square meters for gas exchange? That corresponds to the floor area of a normal three-room apartment.

With every breath you take, not only oxygen but also small suspended particles (dust, harmful gases, viruses and bacteria) are drawn into your respiratory organs. The majority of them are trapped in the nose and upper airways and cause no further harm. The remaining invaders are attacked by your immune system, which includes white blood cells (leukocytes). This “blood police” renders pathogens harmless. Once they have done their work or after a natural aging process, the white blood cells die, releasing extremely aggressive enzymes. One of them, elastase, can be dangerous for you if your lungs do not have enough of the protective substance which in healthy individuals immediately binds to the released elastase and inactivates it: Alpha-1-Antitrypsin (AAT).

If this protective substance is lacking, the elastase attacks the walls of the air sacs, destroying their elasticity and turning them into “limp sacs”, which then collapse with every expiration. The medical term for this disorder, caused by destruction of the air sacs, is pulmonary emphysema or hyperinflation.




What are the consequences?

Destruction of the air sacs leads to narrowing of the airways: “I can’t breathe out!”, is a frequent complaint of sufferers. Breathing in may also be difficult. The loss of gas-exchange surface means that less oxygen is absorbed into the bloodstream. In advanced stages of the disease, carbon dioxide is also no longer adequately removed.

Because your lungs have considerable functional reserves, you may not experience any symptoms for years, despite having Alpha-1-Antitrypsin Deficiency and progressive emphysema. Usually the first symptoms of emphysema such as shortness of breath on exertion occur between the ages of 30 and 40 and vary in severity. It may be accompanied by coughing and phlegm production. Any further stress, for example an infection and especially inhaled tobacco smoke, can accelerate the process of lung destruction.

In summary, your condition is due to:

- Obstruction and narrowing of your airways that may be caused by contraction of the respiratory muscles, inflammation-induced swelling, or congestion with mucus.
 - Loss of elasticity in your lung tissue and destruction of air sacs cause emphysema (hyperinflation).
- 

Are other organs affected by the destruction of the air sacs and narrowing of the airways?

In early lung disease no, but in patients with more advanced disease especially the heart may be affected. Your body tries to counter the impaired gas exchange. It sends less blood to those areas where “ventilation” of the lungs is inadequate, diverting it to those areas where sufficient oxygen is present. As a result, the blood vessels in your lungs narrow. Because the volume of blood flowing through the lungs remains unchanged, pressure in the blood vessels increases.

This means that your heart has to exert more force. The muscles of the right ventricle of your heart, which are responsible for pumping blood to the lungs, have to work harder and struggle against greater resistance.

As a result, the right ventricle becomes enlarged over time. As the condition progresses, your heart approaches the limits of its capacity, until finally it is no longer equal to the task. In addition to emphysema, heart failure then also develops.

How can my condition be treated?

You can and must receive treatment for the duration of your life. Your partner in this endeavor will be a doctor with experience in the disorder, usually a specialist in pulmonary diseases, a pulmonologist.

For further information please consult our website at www.alpha-1-info.com.

Treatment of Alpha-1-Antitrypsin Deficiency has two goals:

- To improve your existing symptoms with the help of medication.
- To prevent further destruction of lung tissue and thus slow the progression of the disease through appropriate measures.

Unfortunately, it is not possible to reverse damage that has already occurred.

The basic requirement for any form of treatment is to **stop smoking tobacco in any shape or form and not to take it up again ever**. This must be observed with no ifs or buts! Tobacco smoke is the most hazardous irritant around. We'll return to this point later.

Your doctor can prescribe short-acting, fast-onset drugs known as beta₂ agonists or anticholinergics for your shortness of breath, including sudden attacks caused by cramping of your bronchi. These drugs are taken in the form of fast-acting sprays (metered-dose aerosols), powder for inhalation or forms suitable for inhalers. You can use these inhalers when you need a fast relieve from your symptoms. Your doctor will tell you more details when and how often you may use them. For maintenance treatment more convenient long-acting inhalers are available. If taken regularly these bronchodilators are also more effective to control and prevent symptoms than short-acting bronchodilators.

Often cortisone is also required during long-term treatment. In many cases you only need to inhale the cortisone. It acts only in the airways and does not have any of the side effects you may – justly – fear. However, there are also situations where you may have to take cortisone tablets. Place your trust in your doctor, who will set up a treatment plan tailored specifically to your needs. Do not be put off by “well-meaning” friends. Always remember that cortisone does not relieve acute shortness of breath. It has an anti-inflammatory action that takes hours or even days to work.

What can I do to prevent further damage to my Lungs?



Depending on the severity of the disease, it may be beneficial and necessary to provide your body with the missing protective protein in the form of regular infusions. We call this form of treatment **augmentation therapy**.

Concentrated Alpha-1-Antitrypsin (AAT) is obtained from the blood of healthy individuals. The infusions increase the concentration of the missing substance to such an extent that they confer protection against further destruction of the air sacs.

Please remember, however, that damage that has already occurred cannot be reversed.

Let us now return to the subject of **smoking**.



Tobacco smoke damages the self-cleaning system of the airways, inactivates any protective proteins present and reduces the effectiveness of medications taken to relieve the condition.

The Alpha-1-Antitrypsin supplied to your lungs through augmentation therapy is also inactivated by smoking. If you are a smoker, you will have to quit immediately. The same applies to passive smoking, meaning that people around you should also abstain from smoking.

**So, once and for all:
No smoking!**

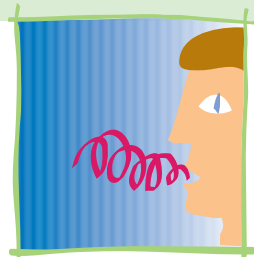


Have a word with your doctor about aids that can help you give up smoking more easily and with less distress. It would be good if other family members who smoke give it up at the same time as you. Alpha-1 centers in Germany and Austria also offer smoking cessation programs. For information see the website at www.alpha-1-center.com.



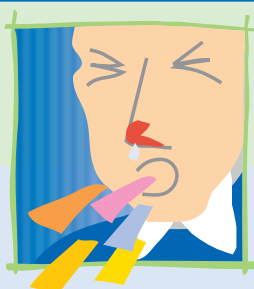
Treatment also includes getting a balanced **diet** with sufficient vitamins. Normal body weight is a desirable goal.

For specific information about the composition of fats, proteins and carbohydrates, ask your doctor.



In any case, it is helpful to have a specially trained physiotherapist teach you **breathing exercises** that are adapted specifically to the disorder. This will help you particularly during physical

exertion. We will talk about the need for regular physical exercise again later.



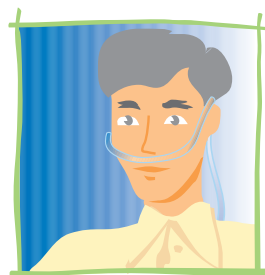
It is especially important to avoid infections!

You've learned that the aggressive enzymes (elastases) are released by white blood

cells in their fight against pathogens. If protective substances are not present on the surfaces of the air sacs, there is a risk of progressive destruction. If you often suffer from acute infections (recognizable from the production of greenish/yellowish phlegm), you can prevent them by following the advice below:

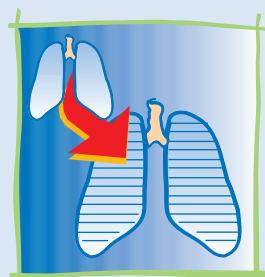
- Wash your hands frequently and use a mask if necessary.
- Avoid contact with people (children!) who have a cold, especially during the winter months.
- Avoid gatherings, which may also include your doctor's waiting room.
- Have a flu vaccination in Sept/Oct every year.
- Have a vaccination against pneumococcus (a common cause of pneumonia) once every five years.

Should you catch an infection despite every precaution, your doctor may prescribe an antibiotic, which you must take consistently and at an early stage. Don't underestimate the situation: pneumonia is a serious complication of your condition.



Emphysema may progress despite all the preventive measures taken, and you may additionally require **oxygen**. Your doctor will decide whether this is necessary based on regular

checks of your blood gases. He or she will also advise you which form of oxygen supply is best for you and how long you should use oxygen every day.



A **lung transplantation** may be the final resort to enable you to resume an active life. You should weigh the benefits and risks of

such an intervention carefully together with your doctor and your family.

How can I cope with my condition in everyday life

- 1** If possible, stay at home if the outside temperature falls below freezing. Otherwise, inhale your medication before leaving home and cover your mouth with a warm scarf.
- 2** During the warm months heed ozone warnings on the radio and TV. If ozone levels are high, try not to venture outside between 10.00 a.m. and 6.00 p.m. and avoid physical stress.
- 3** Explain your condition to others around you. They must appreciate that you are unable to cope easily with situations that pose no problem to healthy individuals and that you are reliant on help from others. Smoking in your vicinity is almost tantamount to an assault.
- 4** Try to accept the fact that your shortness of breath and physical weakness can result in professional and personal limitations.

- 5** Try to accept the phases of discouragement, dejection and even despondency. Contact with other patients with Alpha-1-Antitrypsin Deficiency through special self-help groups may be helpful.
- 6** Take advantage of the support to which the social security system entitles you. Together with your doctor, file an application for a disability ID. This will provide you with the necessary aids according to the severity of your medical disability.
- 7** Your city administration will tell you which institutions are responsible for providing which aids: health insurance funds, pension agencies, or healthcare offices.

What do I have to bear in mind when vacationing or traveling?



Enjoy your vacation! When planning it, however, make sure that the climate (temperature, wind, altitude) won't cause any problems. Make sure that you take along a sufficient supply of medications or that you can obtain them at your destination. This applies especially to emergency medications.



If you're planning a plane journey, many airlines will provide you with oxygen during the flight. Check the costs before booking. For safety reasons you will not be able to carry your own oxygen apparatus on board.

You should not travel by air if:

- You have advanced emphysema.
- You have experienced a lung tear.
- You have a history of heart failure.
- You require long-term oxygen therapy at a flow rate of more than 2 liters per minute.

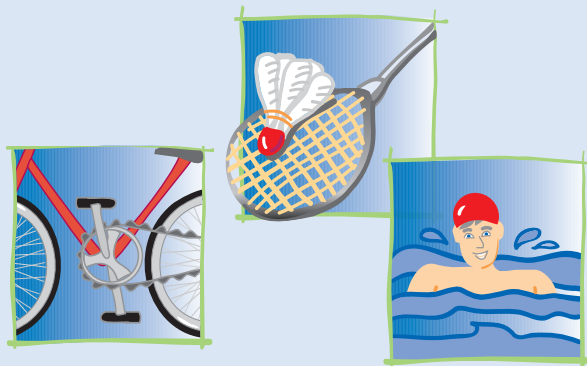
If you travel often by car, ventilation systems with built-in filters that reduce the amount of pollutants entering the car may prove helpful.

How can I stay physically fit despite my condition?

“Use it or lose it.” This also applies to you! Breathing exercises, physiotherapy and physical exercises tailored to your needs and your performance level are part of your overall treatment plan. The rest of your body is healthy. It needs to be exercised; your cardiovascular system needs to be trained.

You should set up an exercise program together with your doctor – one that will be fun and that is adapted to your exercise capacity. A certain amount of exercise is possible in virtually every stage of the disease.

Remember, toned muscles and a well exercised cardiovascular system will put less stress on your lungs and increase your fitness.





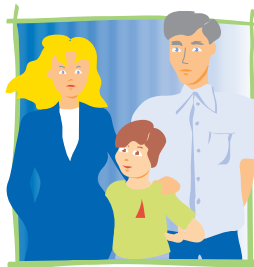
Exercise bikes have proven especially beneficial because they can be used whatever the weather and permit precise adjustment of the level and duration of exertion.

However, it must be a reasonably good exercise bike. It's best to try one out before buying. Even patients who require additional oxygen during exertion can use an exercise bike. In this way they can reduce their shortness of breath and the load on their heart, even if their disease is in an advanced stage.



The arm and trunk muscles should also be exercised. This too eases breathing and increases exercise capacity.

What else should I bear in mind?



Remember that your condition is a hereditary disease.

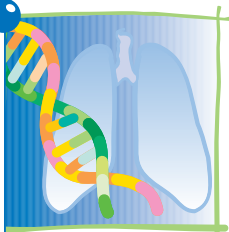
Make sure that your blood relatives of the same generation (brothers and sisters)

and of the following generation (children, nephews and nieces) are examined so that if they have Alpha-1-Antitrypsin Deficiency, it is detected early. Preventive measures can then be taken before any symptoms develop. Chief among these measures is the decision not to smoke. Others relate to the choice of a career and leisure activities that avoid exposure to respiratory irritants.

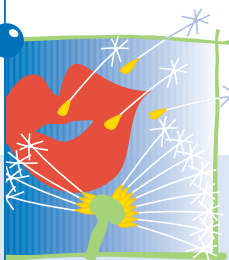
Avail of regular medical checkups, even if you have no complaints. Write down any questions about your condition that occur to you between appointments. You can then discuss them at your leisure with your doctor.

Want to find out more?

The brochures illustrated below can be ordered free of charge on the internet at www.alpha-1-info.com.



*Breathless –
The Whys and
Wherefores*



*How can people with
Alpha-1-Antitrypsin
Deficiency protect
their lungs?*



*Is exercise important
for people with
Alpha-1-Antitrypsin
Deficiency?*



*Why is nutrition
so important
for people with
Alpha-1-Antitrypsin
Deficiency?*



*How can people with
Alpha-1-Antitrypsin
Deficiency manage
stress?*

For further information and useful links see
www.alpha-1-info.com.