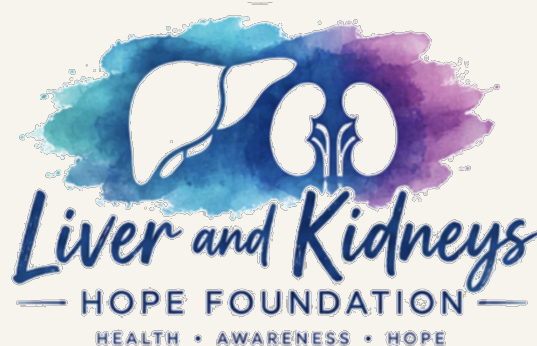




PATIENT & COMMUNITY EDUCATION SERIES

Understanding Alpha-1 Antitrypsin Deficiency

A plain-language, comprehensive guide to alpha-1 antitrypsin deficiency — a genetic condition that can affect both the liver and the lungs, how it's diagnosed, and how each aspect is managed.

Often shortened to AATD or "Alpha-1" — covering liver disease, lung disease, and family screening

Health Education Series · EDU-LIV

A publication of The Liver and Kidneys Hope Foundation · a Nevada 501(c)(3) nonprofit

First Edition

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A NOTE BEFORE YOU BEGIN

Not everyone with alpha-1 antitrypsin deficiency develops both liver and lung disease — some people have only one, or neither, despite carrying the genetic change. This guide covers both halves of the condition so you have the complete picture, but your own situation may involve only part of what's described here.

SECTION 1 Your Liver: A Quiet, Hardworking Organ

Before discussing what can go wrong, it helps to appreciate just how much your liver does every day — usually without you noticing at all.

Your liver is the largest solid organ inside your body, weighing roughly 1.4 kg (about 3 pounds) in an adult. Scientists have identified more than **500 distinct functions** it performs — and one of them, directly relevant to this guide, is manufacturing a wide range of proteins that circulate through the bloodstream to do jobs elsewhere in the body.

The liver as a protein factory

Among the many proteins the liver produces is alpha-1 antitrypsin, a protective protein normally released into the bloodstream and carried to the lungs, where it shields delicate lung tissue from damage. This dual role — the liver as manufacturer, the lungs as destination — is the key to understanding this entire condition.

What happens when the protein is made incorrectly

In alpha-1 antitrypsin deficiency, a genetic change causes the liver to produce a misshapen version of this protein. This creates two separate problems: the misshapen protein tends to get stuck inside liver cells rather than being released (causing liver injury), and less of the protective protein reaches the lungs (leaving lung tissue vulnerable). Sections 3 and 4 explore each of these mechanisms in detail.

DID YOU KNOW?

Alpha-1 antitrypsin deficiency is one of the relatively few genetic conditions that can cause completely different diseases in two different organs from the very same underlying genetic change — a "gain of toxic function" problem in the liver, and a "loss of protective function" problem in the lungs.

KEY POINT

Understanding that this is fundamentally a protein made in the liver, but needed in the lungs, unlocks nearly everything else in this guide — including why the two organs are affected so differently.

SECTION 2 What Is Alpha-1 Antitrypsin Deficiency?

Alpha-1 antitrypsin deficiency (often shortened to AATD, or informally called "Alpha-1") is an inherited condition in which the body produces an abnormal form of a protective protein, potentially causing liver disease, lung disease, or both.

Alpha-1 antitrypsin is normally produced by the liver and released into the blood, where it travels to the lungs and protects delicate lung tissue from an enzyme called neutrophil elastase, produced during the body's normal immune response to everyday irritants and infections. Without adequate alpha-1 antitrypsin to keep it in check, this enzyme can gradually damage lung tissue over years.

Two organs, two very different problems

In AATD, a genetic change causes the liver to produce a misfolded version of this protein. Some of this misfolded protein gets trapped within liver cells instead of being released — this trapped, accumulated protein is directly toxic to the liver cells holding it, which is the basis of AATD-related liver disease (Section 3). Meanwhile, because less properly functioning protein reaches the bloodstream and lungs, lung tissue is left more vulnerable to damage over time — the basis of AATD-related lung disease (Section 4).

KEY POINT

Not everyone with the genetic changes that cause AATD develops both liver and lung disease — some people develop primarily one, some both, and some remain largely unaffected throughout their lives, similar to the variable penetrance seen in some other genetic conditions in this guide series.

DID YOU KNOW?

AATD was first described in 1963 by Swedish researchers who noticed an unusual pattern on blood protein testing in patients with early-onset emphysema — a discovery that eventually led to understanding both the lung and, later, the liver aspects of this condition.

SECTION 3

How AATD Affects the Liver: A Protein-Folding Problem

Understanding exactly how AATD injures the liver — a mechanism quite different from most other liver conditions covered in this guide series — helps explain both the disease course and why certain treatments work while others don't.

A protein that folds incorrectly

Proteins must fold into precise three-dimensional shapes to function correctly and to be properly transported out of the cells that make them. The genetic change most strongly linked to AATD-related liver disease causes the alpha-1 antitrypsin protein to fold abnormally, causing it to clump together and become trapped within liver cells rather than being released into the bloodstream as intended.

Why this trapped protein causes injury

This is fundamentally different from most other causes of liver injury covered in this guide series. Rather than being caused by a virus, toxin, fat and inflammation, or an immune attack, AATD-related liver injury results directly from this misfolded protein accumulating and becoming toxic to the very liver cells producing it — a "gain of toxic function" mechanism, in contrast to the "loss of function" problem this same abnormal protein causes in the lungs.

Why not everyone with the genetic change develops liver disease

Researchers believe individual differences in how efficiently cells can clear this misfolded, trapped protein — through the cell's internal "quality control" and disposal systems — help explain why liver disease severity varies so much between people with the same underlying genetic change, an active area of ongoing research.

KEY POINT

Because AATD-related liver disease is caused by a toxic, accumulated protein rather than an external injury like a virus or toxin, its treatment approach is fundamentally different — there's no equivalent to "stopping the injury" the way there is with, say, alcohol-related or viral liver disease.

DID YOU KNOW?

Under a microscope, liver cells affected by AATD show distinctive globules of the accumulated misfolded protein — a specific, recognizable finding that helps pathologists identify this condition on a liver biopsy.

SECTION 4

How AATD Affects the Lungs: A Different Mechanism

While liver disease in AATD results from a toxic, accumulated protein, lung disease results from the opposite problem — not enough of the protective protein reaching the lungs at all.

The lung's need for protection

Every day, the lungs are exposed to everyday irritants, and the body's immune cells release an enzyme called neutrophil elastase as part of normal immune defense. Left unchecked, this enzyme can break down the delicate, elastic structural tissue of the lungs. Alpha-1 antitrypsin normally neutralizes this enzyme, protecting lung tissue from this ongoing, low-level assault.

What happens without enough protection

Because the misfolded protein gets trapped in the liver rather than reaching the bloodstream (Section 3), people with significant AATD have much lower levels of functional alpha-1 antitrypsin reaching their lungs. Over years, this leaves lung tissue increasingly vulnerable to gradual, cumulative damage, particularly affecting the small air sacs (alveoli) — leading to emphysema, a form of chronic obstructive pulmonary disease (COPD), typically appearing at a notably younger age than emphysema from other causes.

Why smoking matters so enormously here

Cigarette smoke dramatically increases neutrophil elastase activity in the lungs while also directly impairing what little functional alpha-1 antitrypsin is present — a genuinely dangerous combination for someone with this condition, covered in dedicated detail in Section 14.

KEY POINT

This is a genuine "use it or lose it" protective mechanism — without adequate alpha-1 antitrypsin, ordinary immune activity in the lungs, which is harmless in most people, gradually damages lung tissue over years.

DID YOU KNOW?

Because this mechanism doesn't depend on the liver's health, it's possible to have significant AATD-related lung disease with relatively little liver involvement, or vice versa — the two organ systems, while sharing the same genetic root cause, can be affected quite independently of each other.

SECTION 5

The SERPINA1 Gene & Inheritance Pattern

Understanding the genetics of AATD helps explain both your own diagnosis and what it might mean for family members — and this condition's inheritance pattern is somewhat different from the other genetic liver conditions in this guide series.

The SERPINA1 gene and its variants

Alpha-1 antitrypsin is produced according to instructions from the SERPINA1 gene. Different versions (alleles) of this gene are traditionally labeled with letters reflecting how the resulting protein moves on a specific laboratory test. The normal, most common variant is called **M**. The variant most strongly linked to significant disease is called **Z**, and another variant, **S**, is linked to a milder reduction in protein levels.

A "codominant" inheritance pattern

Unlike hemochromatosis and Wilson's disease, which are classically recessive (requiring two affected copies to cause disease), AATD is generally described as **codominant** — meaning a person's specific combination of two gene copies (one inherited from each parent) directly determines their protein levels and risk, with each possible combination carrying its own distinct implications.

Genotype	General significance
MM	Normal — the most common combination, with typical alpha-1 antitrypsin levels.
MZ	Carrier — one normal and one Z variant copy; generally normal or only mildly reduced protein levels, though some data suggests a modestly increased risk of liver disease, particularly with other risk factors present.
SZ	Intermediate deficiency — associated with a moderate reduction in protein levels and some increased disease risk.
ZZ	Severe deficiency — the combination most strongly associated with significant liver and lung disease risk.

KEY POINT

Because AATD risk exists on a spectrum tied to specific genotype combinations, rather than a simple "affected or not," understanding your own specific genetic result — not just a general "positive" or "negative" — is genuinely important for understanding your personal risk.

DID YOU KNOW?

Beyond the common M, S, and Z variants, dozens of rarer variants have been identified, some associated with very low or even completely absent protein production — your genetic counselor or specialist can explain what any less common result means for you specifically.

SECTION 6

Causes & Risk Factors

AATD itself is caused entirely by inherited genetics, but several factors influence whether, and how severely, liver or lung disease actually develops.

The underlying genetic cause

As covered in Section 5, inheriting specific combinations of SERPINA1 gene variants, particularly two copies of the Z variant, is the fundamental cause of clinically significant AATD.

Factors influencing liver disease risk

- **Specific genotype**, with ZZ carrying the highest risk.
- **Other liver conditions**, such as MASLD/MASH, viral hepatitis, or alcohol use, which can compound liver injury alongside AATD.
- **Individual variation** in how efficiently cells clear the accumulated misfolded protein, as discussed in Section 3.

Factors influencing lung disease risk

- **Smoking**, by far the single most significant modifiable risk factor, covered in dedicated detail in Section 14.
- **Occupational or environmental exposure to dust, fumes, or other lung irritants.**
- **Specific genotype**, with ZZ again carrying the highest risk.

KEY POINT

While the underlying genetics can't be changed, several of the factors that influence how severely AATD actually affects you — particularly smoking and managing other liver risk factors — are genuinely modifiable, which is real, actionable information.

DID YOU KNOW?

Because other liver conditions can compound AATD-related liver injury, managing conditions like MASLD or limiting alcohol takes on added importance for someone who also carries AATD risk variants.

SECTION 7 How Common Is It? Who Is Affected

AATD is one of the more common genetic conditions among people of European ancestry, though, similar to other conditions in this guide series, it remains significantly underdiagnosed relative to how many people actually carry the relevant gene variants.

The Z variant is present in a meaningful share of people of European ancestry, particularly those of Northern European descent, making the ZZ genotype (associated with the most significant disease risk) one of the more common single-gene causes of both liver disease and emphysema in these populations, even though it remains relatively rare in absolute terms.

Who tends to be affected

- **People of European, particularly Northern European, ancestry** have the highest prevalence of the Z variant, though AATD can occur in people of any ancestry.

- **Family members of someone diagnosed** have a meaningfully increased likelihood of carrying relevant gene variants themselves.
- **People diagnosed with early-onset emphysema (before age 45) or emphysema without a clear smoking history** are specifically recommended for AATD testing.

DID YOU KNOW?

Multiple studies suggest that the large majority of people with clinically significant AATD remain undiagnosed, often for years, particularly when lung symptoms are attributed to more common causes like typical smoking-related COPD or asthma without specific AATD testing being pursued.

KEY POINT

Because AATD is both common enough to matter and significantly underdiagnosed, many respiratory and liver specialty guidelines now recommend at least one lifetime AATD test for anyone with COPD, unexplained chronic liver disease, or a family history of either.

SECTION 8 Signs & Symptoms in Children

AATD-related liver disease is one of the more common genetic causes of liver disease in infants and children, and can present quite differently than it does in adults.

In infancy

- **Prolonged jaundice** beyond the typical newborn period, sometimes the first clue prompting evaluation.
- **Poor weight gain** or feeding difficulties.
- **Abnormal liver blood tests**, sometimes found incidentally.

In childhood

- **Many children have no symptoms at all** despite carrying the ZZ genotype, with liver involvement, if present, sometimes found only through blood testing.
- **A smaller number develop more significant liver disease**, including, rarely, progression toward cirrhosis in childhood.
- **Lung symptoms are rare in childhood**, since lung disease typically develops gradually over years to decades of exposure to everyday irritants and, especially, smoking.

KEY POINT

Most children with AATD, even with the ZZ genotype, do well throughout childhood, with only a minority developing significant liver problems at this stage — but ongoing monitoring, discussed in Section 19, remains valuable throughout life.

DID YOU KNOW?

AATD is one of the most common identifiable genetic causes of liver transplantation in children, reflecting how, for the minority of children who do develop significant liver disease, it can be a serious condition warranting close pediatric hepatology involvement.

SECTION 9 Signs & Symptoms in Adults

In adults, AATD can present through liver symptoms, lung symptoms, or both — sometimes decades apart from each other.

Liver-related symptoms

- **Often no symptoms at all**, with liver involvement found through abnormal blood tests or incidental imaging.
- **Fatigue** and general symptoms similar to other forms of chronic liver disease.
- **Signs of cirrhosis**, in more advanced, longstanding cases, covered in our companion cirrhosis guide.

Lung-related symptoms

- **Shortness of breath**, often gradually worsening, and notably appearing at a younger age (sometimes 30s to 50s) than typical smoking-related emphysema.
- **A persistent cough**, sometimes with mucus production.
- **Wheezing**, sometimes initially mistaken for asthma.
- **Reduced exercise tolerance**, often noticed gradually over time.

KEY POINT

Early-onset emphysema, or emphysema in someone who has never smoked or smoked only lightly, is one of the clearest, most specific clues that should prompt AATD testing — this single detail has led to many diagnoses that might otherwise have been missed.

DID YOU KNOW?

Because symptoms in one organ system don't predict symptoms in the other, some adults are diagnosed with significant lung disease and have no liver involvement at all, while others have liver disease with completely normal lung function — a pattern worth understanding rather than assuming both will necessarily occur together.

SECTION 10 How AATD Is Diagnosed

Diagnosing AATD combines a blood test measuring protein levels with genetic testing to confirm the specific variant combination — a generally straightforward process once testing is pursued.

Alpha-1 antitrypsin level

A simple blood test measures the amount of alpha-1 antitrypsin protein circulating in the blood. Low levels raise suspicion for AATD and prompt further testing, though levels can occasionally be misleadingly normal in certain situations (such as during acute inflammation, which can temporarily raise levels), so this test alone isn't always fully definitive.

Genetic testing (phenotyping or genotyping)

Testing for specific SERPINA1 variants — either through genotyping (looking for the most common specific variants) or phenotyping (a laboratory technique identifying the specific protein variants present) — confirms the diagnosis and identifies the exact genetic combination involved, which carries specific implications as covered in Section 5.

Liver-specific testing

For those with confirmed AATD, liver blood tests, imaging, and elastography (covered in our companion fibrosis guide) help assess whether, and how much, liver involvement is present. A liver biopsy is sometimes used, particularly to confirm the diagnosis or assess fibrosis more precisely.

Lung-specific testing

Pulmonary function tests measure how well the lungs are working, and imaging (chest X-ray or CT) can assess for emphysema, typically arranged in coordination with a pulmonologist.

KEY POINT

A confirmed AATD diagnosis should prompt evaluation of *both* the liver and the lungs, even if only one organ system is currently causing symptoms, since the other may be quietly affected too.

SECTION 11 Genetic Testing & Family Screening

Because AATD is inherited, a diagnosis carries direct implications for family members, making family screening a valuable, proactive step — though with some distinctive nuances given this condition's variable, dual-organ nature.

Why family screening matters

Because both liver and lung complications are more manageable, and in the case of lung disease, much more preventable, when identified early, testing family members allows for earlier monitoring and, importantly, the chance to strongly encourage never starting smoking, or quitting as early as possible, in anyone found to carry significant risk variants.

Who should generally be offered testing

- **Siblings and children** of someone diagnosed with clinically significant AATD.
- **Parents**, since testing them can sometimes clarify a child's specific genotype and family inheritance pattern.

What screening involves

Family screening typically starts with the same blood level and genetic testing described in Section 10.

KEY POINT

If you've been diagnosed with AATD, sharing this with close relatives is genuinely valuable — particularly because the single most protective step for anyone found to carry significant risk variants (never smoking) is entirely within their control once they know.

DID YOU KNOW?

Genetic counseling can be particularly helpful for AATD given its codominant inheritance pattern and variable disease expression — a genetic counselor can walk through exactly what a specific family member's genotype result means for their own personal risk.

SECTION 12 Possible Liver Complications

Untreated or unrecognized AATD-related liver disease can progress over time — understanding this path helps explain why monitoring matters, even without symptoms.

Fibrosis and cirrhosis

Ongoing accumulation of misfolded protein within liver cells can, over years, lead to fibrosis and, eventually, cirrhosis, with the associated complications covered in our companion cirrhosis guide — though, as discussed in Sections 3 and 8, many people with AATD never progress this far.

Liver cancer

Once cirrhosis develops, AATD-related cirrhosis carries an increased risk of liver cancer, similar to cirrhosis from other causes, making regular surveillance — typically an ultrasound every six months, as covered in our companion liver cancer guide — an important part of care once cirrhosis is present.

A note on the pace of progression

AATD-related liver disease, when it progresses, generally does so gradually over years to decades, similar to many other chronic liver conditions in this guide series — sudden, rapid liver failure directly from AATD alone is uncommon, though it can occur, particularly in infancy in more severe cases.

KEY POINT

Because progression is generally gradual and many people never develop significant liver disease at all, a AATD diagnosis with only mild or no current liver involvement is not a reason for alarm — it's a reason for the ongoing, straightforward monitoring described in Section 19.

DID YOU KNOW?

Unlike some genetic liver conditions covered elsewhere in this guide series, there's currently no medication that directly treats AATD-related liver disease by reducing protein accumulation — management focuses on monitoring, addressing complications as they arise, and, for advanced disease, liver transplantation (Section 18).

SECTION 13

Possible Lung Complications

The primary lung complication in AATD is early-onset emphysema, a form of chronic obstructive pulmonary disease (COPD) — understanding its course helps explain why prevention, covered in Section 14, matters so enormously.

Emphysema

Gradual, progressive damage to the small air sacs (alveoli) in the lungs reduces their ability to exchange oxygen and carbon dioxide efficiently, leading to progressive shortness of breath

and reduced exercise tolerance over years. In AATD, this process typically begins at a notably younger age than emphysema from typical smoking alone.

Increased infection susceptibility

Damaged lung tissue can be more susceptible to respiratory infections, which in turn can cause temporary worsening of breathing (exacerbations) and, over repeated episodes, contribute to further lung damage.

The dramatic impact of smoking

As covered in Section 4, smoking dramatically accelerates lung damage in AATD specifically — people with significant AATD who smoke tend to develop emphysema symptoms considerably earlier, and more severely, than those who never smoke, making this the single most important modifiable factor in the entire lung disease picture.

KEY POINT

Unlike liver disease, where no specific medication currently exists, lung disease in AATD has a specific, targeted treatment — augmentation therapy, covered in Section 17 — making early diagnosis particularly valuable for accessing this treatment before significant lung damage accumulates.

DID YOU KNOW?

Because AATD-related emphysema often has a distinctive pattern on lung imaging (particularly affecting the lower portions of the lungs, unlike the upper-lung pattern more typical of smoking-related emphysema alone), this can sometimes be an additional clue prompting AATD testing.

SECTION 14

The Critical Role of Smoking & Smoke Avoidance

If this guide had to distill down to one single, most important piece of practical advice, it would be this: for anyone with significant AATD, never starting smoking — or quitting as soon as possible — is the single most protective action available.

Why smoking is so specifically dangerous with AATD

As explained in Section 4, smoking both increases the destructive enzyme activity in the lungs and further impairs the already-reduced protective protein reaching lung tissue — a genuinely compounding, "double hit" effect that doesn't apply in the same way to people with normal alpha-1 antitrypsin levels.

The dramatic difference this makes

Research has consistently shown that people with significant AATD who smoke develop emphysema symptoms substantially earlier, and experience faster lung function decline, than those with the same genotype who never smoke. This isn't a modest difference — it's one of the most impactful single lifestyle factors in this entire guide series.

Secondhand smoke and other lung irritants

Given how sensitive AATD-affected lungs appear to be to irritant exposure, avoiding secondhand smoke and minimizing exposure to workplace dust, fumes, and air pollution where possible are also genuinely worthwhile protective steps.

IF YOU SMOKE AND HAVE AATD

Quitting smoking is the single most impactful thing you can do for your long-term lung health. Your care team can connect you with smoking cessation resources and support — this is one of the most genuinely high-value conversations to have if it applies to you.

KEY POINT

If you've just learned you or a family member carries significant AATD risk variants, and that person has never smoked, protecting that fact — by never starting — may be the single most valuable piece of information in this entire guide.

SECTION 15

Treatment & Management: The Big Picture

Because AATD affects two organs through two different mechanisms, treatment is genuinely divided into two distinct tracks — liver management and lung management — often coordinated by different specialists working together.

Liver track

As covered in Section 16, liver management currently focuses on monitoring, managing complications as they arise, and, for advanced disease, transplantation — since no medication currently exists that directly reduces the toxic, accumulated protein within liver cells.

Lung track

As covered in Section 17, lung management can include augmentation therapy (replacing the missing protective protein), alongside standard COPD management approaches such as bronchodilator medications, pulmonary rehabilitation, and vaccination against respiratory infections.

Why coordination between specialists matters

Because these two tracks involve different specialists (hepatology and pulmonology) and different treatment approaches, coordinated communication between your care providers helps ensure both aspects of the condition are being addressed appropriately, even if one is currently more prominent than the other.

A WORD OF CAUTION

Specific treatment decisions depend on which organs are affected and how significantly. **This guide cannot recommend specific treatments for you.** These decisions belong with your treating specialists.

KEY POINT

Even though liver disease currently lacks a targeted medication, this doesn't mean nothing can be done — monitoring, addressing complications early, and transplantation when needed all offer genuine, effective paths forward.

SECTION 16 Managing Liver Disease in AATD

Without a medication that directly targets the underlying protein accumulation, liver disease management in AATD focuses on vigilant monitoring and addressing complications as they arise.

Regular monitoring

Periodic liver blood tests, imaging, and, where relevant, elastography (covered in our companion fibrosis guide) track whether liver disease is present and whether it's progressing over time.

Managing complications

If cirrhosis develops, its complications are managed using the same principles covered in our companion cirrhosis guide — including monitoring for and treating portal hypertension, ascites, and other issues, along with regular liver-cancer surveillance.

General liver health measures

Avoiding additional liver stressors — moderating or avoiding alcohol, being cautious with certain medications, and managing other liver conditions like MASLD if present — takes on particular importance, since these can compound AATD-related liver injury.

Research into future treatments

Active research is exploring treatments aimed specifically at reducing the accumulation of misfolded protein within liver cells, including approaches that would reduce production of the abnormal protein altogether — a genuinely promising area, though not yet part of standard clinical care.

KEY POINT

While liver-specific medication isn't yet available, the monitoring and complication-management approach used for AATD-related liver disease has a strong track record — many people live for decades with stable, well-monitored disease.

DID YOU KNOW?

Because research into liver-specific AATD treatments is active and ongoing, it's worth periodically asking your hepatologist whether any new treatment options or clinical trials have become relevant to your situation.

SECTION 17 Augmentation Therapy for Lung Disease

Unlike the liver side of this condition, lung disease in AATD has a specific, targeted treatment available — replacing the missing protective protein directly.

How augmentation therapy works

Augmentation therapy involves regular intravenous infusions of alpha-1 antitrypsin protein, purified from donated human plasma, directly raising blood levels of the protective protein and, in turn, the amount reaching lung tissue.

Who is typically considered for it

Augmentation therapy is generally considered for people with significant AATD who have evidence of emphysema or reduced lung function, aiming to slow further lung damage — it does not reverse existing damage, which is part of why early diagnosis, before significant lung damage accumulates, is so valuable.

What treatment involves

Treatment typically involves regular infusions, often weekly, usually continuing long-term. Many patients can receive infusions at home or at an infusion center, and the treatment is generally well tolerated.

KEY POINT

Augmentation therapy specifically addresses the lung side of AATD — it does not treat or improve the liver aspect of the condition, since it doesn't address the misfolded protein accumulating within liver cells.

DID YOU KNOW?

Because augmentation therapy is purified from donated human plasma, it depends on an adequate donor supply — plasma donation is a genuinely meaningful way some people choose to support this treatment pathway for the broader AATD community.

A WORD OF CAUTION

Whether augmentation therapy is appropriate for you depends on your specific lung function and clinical picture. **This guide cannot recommend this treatment for you** — this decision belongs with your treating pulmonologist.

SECTION 18

Liver Transplantation: Curing the Liver Disease

For those who progress to advanced, decompensated liver disease, liver transplantation offers something genuinely notable — an actual cure for the liver aspect of this condition.

Why transplantation is curative here

Because AATD-related liver disease results from a misfolded protein produced by liver cells carrying the abnormal gene, replacing those liver cells with a new liver (carrying normal genes, from a donor without AATD) eliminates the source of the toxic, accumulated protein entirely — genuinely curing the liver disease, not just treating its complications.

What transplantation doesn't change

It's important to understand that a liver transplant addresses only the liver aspect of AATD. The rest of the body's cells, including those relevant to lung disease, still carry the original genetic change — meaning a liver transplant does not cure or improve AATD-related lung disease, which continues to require its own, separate management (Sections 13, 17).

The evaluation and waiting process

As with other transplant situations covered in our companion guides, this involves a thorough evaluation process and the standard organ allocation and waiting system, with timing influenced by overall disease severity.

KEY POINT

This is one of the more genuinely hopeful facts in this entire guide — for the liver aspect specifically, transplantation isn't just a treatment, it's a cure, since the underlying genetic problem resides in liver cells themselves.

DID YOU KNOW?

After a liver transplant for AATD, blood alpha-1 antitrypsin levels typically normalize, since the new liver produces the normal version of the protein — though, again, this doesn't affect any existing lung disease, which follows its own separate course.

SECTION 19 Monitoring & Your Care Team

Ongoing monitoring of both the liver and lungs is a lifelong part of AATD care, even when one or both organ systems currently show no signs of disease.

What ongoing monitoring involves

- **Regular liver blood tests and imaging**, tracking for any change over time.
- **Periodic pulmonary function testing**, tracking lung function over time.
- **For those with cirrhosis**, regular liver-cancer surveillance, as covered in our companion liver cancer guide.
- **For those on augmentation therapy**, ongoing assessment of treatment response.

Who might be on your team

Hepatologist

Pulmonologist

Primary care provider

Genetic counselor

Registered dietitian

Respiratory therapist

KEY POINT — YOU ARE THE CONSTANT

Because AATD involves two specialists tracking two different organ systems, keeping your own simple record of results from both sides of your care helps ensure nothing falls through the gaps between appointments.

MAKE THE MOST OF APPOINTMENTS

Worth asking at both your liver and lung appointments: "Has anything changed since my last visit on the other side of my care?" — a simple question that helps keep both specialists genuinely in the loop.

SECTION 20 Living with AATD & Special Situations

With appropriate monitoring, smoke avoidance, and treatment where needed, many people with AATD live full, active lives — this section covers daily life and a few situations worth understanding.

Daily life

For many people, especially those with mild or no current organ involvement, daily life continues largely unaffected beyond regular monitoring appointments and, if applicable, unwavering commitment to never smoking. For those with more significant lung involvement, pacing activity and pulmonary rehabilitation can genuinely help maintain quality of life.

Emotional aspects

Learning of a genetic condition that could affect two different organs can feel like a lot to absorb at once — these feelings are understandable, and it's worth remembering that many people with AATD, particularly those who never smoke, live long, healthy lives with only mild or no significant disease in either organ.

Pregnancy

Most people with AATD have healthy pregnancies; specific considerations depend on the severity of any existing liver or lung involvement, warranting coordination with your specialists before conception where possible.

Occupational considerations

People with significant AATD, particularly with lung involvement, may benefit from avoiding occupations with heavy dust, fume, or chemical exposure — worth discussing with your pulmonologist if relevant to your work.

IF YOU ARE STRUGGLING

If you are experiencing persistent low mood, hopelessness, or thoughts of harming yourself, please reach out to a healthcare professional or a crisis line. The **988 Suicide & Crisis Lifeline** (call or text 988 in the United States) is free and available 24/7. Support is available.

COMMUNITY MATTERS

Dedicated Alpha-1 patient organizations, alongside groups like The Liver and Kidneys Hope Foundation, can connect you with others who understand this specific, dual-organ condition.

SECTION 21 Prevention & Myths vs. Facts

While the underlying genetics of AATD can't be changed, the serious complications it can cause — particularly on the lung side — are often substantially preventable.

Prevention

- **Never smoke**, or quit as soon as possible — the single most impactful protective step available for lung disease.
- **Avoid secondhand smoke and other lung irritants** where possible.
- **Family screening** after any relative's diagnosis, so at-risk family members can be counseled early, particularly about smoking.
- **Manage other liver risk factors**, including alcohol and metabolic health, to avoid compounding liver injury.
- **Stay current on vaccinations**, including respiratory infections, given increased vulnerability with lung involvement.

Myths vs. facts

Myth	Fact
"AATD always causes both liver and lung disease."	Many people develop only one, or neither — the two organ systems can be affected quite independently.
"If I have AATD but don't smoke, my lungs are automatically fine."	Lung disease can still develop without smoking, though the risk and severity are substantially lower — regular monitoring remains valuable.
"There's no point in genetic testing since there's no cure."	Diagnosis enables monitoring, augmentation therapy for lung disease, smoking-avoidance counseling, and family screening — all genuinely valuable even without a cure for the liver side.
"A liver transplant would also fix my lung disease."	A liver transplant cures the liver aspect of AATD but does not affect existing or future lung disease, which requires its own separate management.
"AATD is too rare to bother testing for."	The relevant gene variants are relatively common in people of European ancestry, and AATD is significantly underdiagnosed relative to how many people actually carry them.
"Only people with the ZZ genotype need to worry about AATD."	Intermediate genotypes like SZ, and in some cases even MZ, can carry some increased risk, particularly alongside other liver risk factors — worth discussing with your clinician regardless of your specific result.
"Because there's no liver-specific medication yet, there's nothing to do until a cure arrives."	Monitoring, managing complications early, avoiding smoking, and transplantation for advanced disease all offer genuine, effective paths forward today.

KEY POINT

If you remember one thing from this page: AATD affects the liver and lungs through two different mechanisms, and for the lung side specifically, never smoking is one of the single most protective actions in all of this guide series.

CLOSING

Questions, Glossary, Resources & Disclaimer

Questions you might ask your doctor

- What is my specific SERPINA1 genotype, and what does it mean for my personal risk?

- Do I have any evidence of liver involvement, lung involvement, or both?
- Should my siblings or children be tested?
- Would augmentation therapy be appropriate for me, given my current lung function?
- If I have cirrhosis, am I up to date on liver-cancer surveillance?
- What resources are available if I need help quitting smoking?

Glossary

Term	Plain-language meaning
Alpha-1 antitrypsin	A protective protein, made by the liver, that shields lung tissue from damage.
Augmentation therapy	Regular infusions of donor-derived alpha-1 antitrypsin protein, used to treat lung disease in AATD.
Codominant inheritance	A pattern where each of a person's two gene copies contributes to their overall risk, rather than one fully masking the other.
Emphysema	Progressive damage to the lungs' small air sacs, a form of COPD common in AATD.
Genotype (PiMM, PiZZ, etc.)	The specific combination of SERPINA1 gene variants a person carries.
Neutrophil elastase	An enzyme normally neutralized by alpha-1 antitrypsin; can damage lung tissue if unchecked.
SERPINA1	The gene responsible for producing alpha-1 antitrypsin.

About The Liver and Kidneys Hope Foundation

The Liver and Kidneys Hope Foundation (TLHF) is a Nevada-based 501(c)(3) nonprofit dedicated to liver-health education, community support, and outreach. Through educational materials like this guide, community programming, our chapter network, volunteer efforts, and fundraising initiatives, we work to raise awareness of liver conditions and support the people affected by them, including those living with alpha-1 antitrypsin deficiency. The Foundation is not a medical provider and does not deliver clinical care.

A NOTE ON SOURCES AND CURRENCY

This guide reflects widely accepted, general medical understanding of alpha-1 antitrypsin deficiency intended for patient education. It does not cite individual studies, and research into liver-specific treatments is actively evolving. For the most current, individualized information, your healthcare team is the best resource.



Full disclaimer

PLEASE READ

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The Liver and Kidneys Hope Foundation · Health Education Series (EDU-LIV) · "Understanding Alpha-1 Antitrypsin Deficiency," First Edition

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