



PROFILES OF RARE DISEASES



EFFECT ON PATIENTS AND FAMILIES

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Effect of Rare Diseases on Patients and Families

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Issues Related to Rarity

Following are seven profiles of patients with rare diseases and disorders and the impact of the condition on themselves and their families. Many of these patients are children, and this is appropriate given that up to 80% of rare disorders do affect children. Most of these are genetic disorders, again representative of the fact that more than 50% of rare disorders are inherited. The majority of rare disorders are autosomal recessive, which accounts for their rarity, since symptomatic patients will need to inherit one copy of the defective gene from each parent. However, there are some disorders that are dominant and some that are genetic but the gene defect is “spontaneous”, that is, the mutation happens in the parent and there is no “inheritance” pattern.

Many of these patients will have experienced the frustrating of initially misdiagnosis or no diagnosis (physician diagnoses a more common disease or disorder or simply does not know what is causing the symptoms). In some cases, the patient and family miss the chance for early intervention that might have prevented disease progression or more severe symptoms that may be present by the time an accurate diagnosis is made. For almost all of these families, given the rarity of the disease, even if it is inherited, the diagnosis comes as a surprise since there may be no known relatives.

For genetic disorders, the families will tend to experience “guilt” in realizing they “passed” the disease to the child. They will also experience concerns for other family members, especially if the diagnosis is not made at birth and there is already one or more younger siblings (as in one case here).

Parents are dealing with the shock of a diagnosis as well as little knowledge about the disease, although in some cases, once family members will often volunteer knowledge of an “older relative” who will have manifest or died of similar symptoms without a diagnosis. Thus, a commonality for most families that receive a diagnosis of a rare disorder is lack of information and, more troubling, lack of clear prognosis. While some diseases may manifest with fairly predictable symptoms and follow a relatively predictable course, most will have tremendous variation in symptoms, severity, and course of disease, even within the same family. This makes planning very difficult and increases the stress and anxiety for the family.

Issues Related to Severity and Lack of Treatment

In the case profiles presented here, the disease tends to be overwhelming, that is, the symptoms pervade every aspect of the patient’s and the family’s lives. However, in all of these cases, there

is tremendous resilience and resourcefulness demonstrated. In one case, the family has immigrated to Canada to assure their child will have access to care and treatment. In all cases, the family has had to seek out experts and to develop a personalized care and treatment plan. In most of these cases, the disease is progressive, leading to severe debilitation (loss of mobility, reduced cognitive functioning, or organ damage and failure) and early death.

In all of these cases presented here, there are few treatment options. In most cases, symptom management and/or supportive care have been the standard course of treatment. However, in all of these cases, there is either a new drug treatment available or one that will soon be available. That provides both good news and, of course, new concerns. Is the treatment appropriate for the specific patient? What are the potential risks and benefits? Will it be funded, either through private coverage or the public drug plan?

In most cases, the drug represents either the first effective therapy specifically for that disorder or a significant improvement in therapy. But that carries with it the issues of lack of evidence of effectiveness or long-term effect on clinical outcomes, disease progression, and/or survival. In most cases, the drug therapies are expensive, requiring coverage from private drug insurance or public drug program. In most cases, there is tremendous hope invested in the treatment and therefore significant desire to gain access.



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Case 1: Prader Willi Syndrome)

DJ is a 5-year-old boy with Prader Willi Syndrome. Both parents are professionals; the father is a technical specialist with data systems and the mother is a teacher. They have one other child, a younger daughter, who is unaffected. DJ was diagnosed at about the age of two. Like many children with PWS, DJ demonstrates a “lack of control” over his impulses. He engages in compulsive eating and has an obsession with food, require constant vigilance on the part of the parents. Food has to be out of sight and locked up; otherwise DJ will seek it out and eat until the supply is exhausted. DJ has IQ in the normal range (which is unusual) but does seem to have some learning difficulties. Otherwise, he demonstrates some of the typical symptoms such as lack of attention, temper rages, and lack of short-term memory for oral communications. DJ has a tendency to pick at his skin, sometimes to the point of bleeding and open sores. DJ is a lovely child with big eyes and curly dark hair. However, like most PWS children, he is small in stature.

There is no cure or effective drug treatment for PWS. The parents have been enrolled in behaviour modification training to learn how to manage DJ’s impulses. DJ has been receiving growth hormone therapy, which has not only improved his growth but has also reduced his other symptoms, allowing him to be calmer and more manageable. The GHT is available through the mother’s drug plan but is not funded by the provincial plan (in part because PWS is not a licensed indicator for GHT). The mother is frustrated because she cannot stop working (the father is basically part of a very small consulting group and has no drug insurance). DJ is enrolled in a private school where he can get more personalized attention and support for his learning difficulties.

Family time tends to revolve around DJ; he can rarely be left with a babysitter, although family members do pitch in with support. In the past, children with PWS rarely lived beyond their late teens or early 20’s, primarily as a result of organ failure due to obesity. Today, most children can be managed in “behaviour therapy” programs but these are very stressful and time-consuming. There is a fairly high divorce rate in PWS families.

Since DJ was diagnosed, the parents have set up a very successful fundraising charity for research. The funds are sent to a PWS organization in the US. One of the goals of the charity is to develop standards of care for this population.

Overview of MPS II (Hunter’s)

Prader-Willi syndrome (PWS) is a complex non-hereditary birth defect resulting from an abnormality on the 15th chromosome. It occurs in males and females equally and in all races. Prevalence is about 1:15,000. The genetic cause is loss of yet unidentified genes normally contributed by the father. Approximately 70% of cases have a non-inherited deletion in the paternally contributed chromosome 15; approximately 25% have maternal uniparental disomy

(UPD)—two maternal 15s and no paternal chromosome 15; and 2–5 % have an error in the "imprinting" process that renders the paternal contribution nonfunctional. DNA methylation analysis confirms diagnosis of PWS.

PWS typically causes low muscle tone, short stature if not treated with growth hormone, incomplete sexual development, and a chronic feeling of hunger that, coupled with a metabolism that utilizes drastically fewer calories than normal, can lead to excessive eating and life-threatening obesity. The food compulsion makes constant supervision necessary. Average IQ is circa 70, but even those with normal IQs almost all have cognitive deficits and require special education. Social and motor deficits also exist. At birth the infant typically has low birth weight for gestation, hypotonia (weak muscles), and difficulty sucking due to the hypotonia ("failure to thrive"). The second stage ("thriving too well"), with onset between the ages of two and five throughout lifetime, usually is characterized by increased appetite, weight control issues, and motor development delays along with often severe behavior problems and medical issues.

Treatments for Prader Willi Syndrome

Treatment is mostly behaviour management and psychological counselling and support. Growth Hormone Therapy is recognized as standard of care to treat not only short stature but also to improve cognitive functioning, including focusing, impulse control, and temperament. However, it is unlikely the companies are interested in doing clinical trials with GHT and PWS patients, primarily because this is a very small patient population; it is an older drug that has come off-patent in Europe with generic versions already available; and PWS patients in most countries are already receiving GHT as standard of care. In Canada, the labeling for GHT does not recognize PWS. Most children with PWS would not have low enough levels of endogenous to be recognized as GH deficient in Canada whereas in the USA, it is recognized that all children with PWS automatically have lower levels of GH.

Case 2: MPS II (Hunter's Disease)

AL is an 11-years-old boy diagnosed with MPS II (Hunter's Syndrome) who lives with his family, mother father and younger brother. His father works for a communications firm; his mother has a nursing background but now stays home to take care of AL. AL has the severe form of MPS II with neurological involvement, resulting in cognitive impairment. Until about a year ago, AL was still in regular school but is now confined to home and wheelchair. The family has also had to modify their excursions, and this has placed tremendous stress on AL and the family. The restrictions on AL's activities and school attendance are not cognitively related (he is verbal and engaging) but his physical condition. He has increasing difficulty in sitting in the chair and doing things for himself, such as writing, eating, and playing with hand-held toys. His mother recognizes that his emotional state has declined significantly, in part because of his limited exposure to the outside world.

There is a drug (enzyme replacement therapy) available for MPS II but AL has not been able to qualify because the father's insurance company will not cover it and the provincial drug plan does not extend to AL's form of the disease. AL has never taken part in any of the clinical trials, again because of the neurological involvement. The father, in particular, has been actively advocating for access through all channels, with appeal to the drug company for compassionate or clinical trial access and to the provincial drug plan for "individual coverage." Since August 2008, the child has been receiving treatment through personally raised funds but it is unknown how long this can last, given the cost of treatment and the limited community resources.

Overview of MPS II (Hunter's)

Mucopolysaccharidosis type 2 (MPS 2) is one of the lysosomal storage diseases and affects between 1/72 000 and 1/132 000 males at birth. The clinical symptoms range from severe (the most frequent form) with early psychomotor regression, to mild. Infants are normal at birth, and symptoms appear progressively. Clinical signs of the severe forms include hernias, facial dysmorphism (macroglossia, constantly opened mouth, coarse features), hepatosplenomegaly, limited joint motion, carpal tunnel syndrome, dysostosis multiplex, small size, behavioural disorders and psychomotor regression leading to intellectual deficit, deafness, cardiac and respiratory disorders, and cutaneous signs (skin with an orange peel appearance on the scapula and thighs). Moderate forms are characterised by normal intelligence, milder dysmorphism and dysostoses, and prolonged survival. For patients with the most severe form, death generally occurring before the age of 20, as a result of cardio-respiratory complications. In the moderate forms, patients survive well into adulthood, sometimes even after the age of 60 for those less severely affected. MPS II results from iduronate-2-sulfatase (IDS) deficiency, which leads to lysosomal accumulation of two specific mucopolysaccharides, dermatan sulfate (DS) and heparan sulfate (HS).

Treatments for MPS II (Hunter's)

In addition to symptomatic treatment, which requires a multidisciplinary approach, allogenic bone marrow grafting is not recommended as it does not prevent intellectual degradation. In 2007, enzyme replacement therapy with infusion of the recombinant enzyme idursulfase was approved for long-term treatment of patients. Clinical trials have shown an improvement in walking abilities and in respiratory involvement and significant results on the size of the liver or the spleen and the cardiac involvement. However, improvement of neurological signs has not been confirmed though reports have appeared in the clinical literature.

Case 3: β -Thalassemia Major

AD is a 10-year-old boy with β -thalassemia major. He lives with his parents and younger brother. The family immigrated to Canada when AD was 5 years old. He has been on transfusions since the age of two to replace the “nonfunctional” red blood cells that his body makes. He has also been receiving iron chelation therapy since that time to remove the excess iron that comes with every unit of transfused blood. AD lives a relatively normal life, active in soccer and swimming, except that he spends on day every three weeks at Sick Kids for transfusion. He also is hooked to a small infusion pump every night, with a needle inserted into his belly, to receive his iron chelation drug. AD accepts the transfusions and drugs with a calm acceptance, having received the therapy since he can remember. He accepts the fact that, unlike his brother, he cannot delay getting into his pajamas beyond 8 or 9 pm, since it takes up to eight hours for the medication to be pumped into his body. This means that he cannot go out or do much by way of evening activities.

AD is now able to insert the needle and set up the infusion pump himself, and is very proud of this achievement. He still gets the occasional reaction to the therapy, sometimes a rash and sometimes an upset stomach. He no longer gets tangled in the IV lines which are attached to the pump but will occasionally awake in the middle of the night to the shrill “beep” of the pump when it has accidentally turned off or had some other technical problem.

The long-term prognosis for AD is good, so long as he remains faithful to transfusion and iron chelation. However, there are many teens and young adults that get into serious trouble when they choose not to comply stringently to the chelation routine. The result of iron overload in the liver or heart can lead to organ failure and death. The concern for parents of children with thalassemia is related not so much to the disease but to the consequences of the therapy. Beyond the side effects of hearing or sight problems (often a result of over-chelation), the major problem is that the infusion drug therapy is not conducive to an active young adult life style. Both girls and boys tend to “skip” treatments as they get older. In Toronto, one or two young adults will die every year from complications of iron overload due to noncompliance. They may develop cardiac problems that are not diagnosed until they are admitted into emergency.

AD was placed on a new oral therapy for several months; this is a pill that is dissolved in water or juice and drunk, once a day. For most patients, it can be as effective as the infusion therapy. AD did not respond well to the oral therapy and is now back on infusion therapy. He may try the oral therapy again at some later date.

Overview of Thalassemia

Thalassemia major is an inherited autosomal recessive blood disease. This means that children will have symptomatic thalassemia only if they receive a defective gene from each of their parents. In thalassemia, the genetic defect results in reduced rate of synthesis of one of the globin chains that make up hemoglobin. If patients receive only one defective gene, they will have thalassemia minor and will generally produce sufficient globin and require no additional treatment. Patients with thalassemia tend to come from the Mediterranean region (southern Italy, Greece, Cyprus, Southeast Asia, and China). Whereas the older thalassemia population in Canada were of Italian and Greek heritage, most new cases of thalassemia are immigrants from India, Pakistan, Malaysia, and other Southeast Asian countries.

Treatments for Thalassemia Major

The only effective therapy for thalassemia major is transfusion of donated red blood cells. Patients generally receive two units, every three to four weeks. In most cases, the units are transfused in hospital, where the patient can also be monitored for potential adverse reactions to blood transfusion. The donated red blood cells will eventually die and be destroyed by the body; however, the iron which accompanies each unit of blood cannot be eliminated entirely through the body's normal regulatory mechanisms. Therefore, patients must receive a "drug" that will bind to the iron and pull the iron out with it when the drug is eliminated through urine or feces.

Until recently, the only approved iron chelator was a drug that had to be slowly infused into the body, either through a vein or under the skin (subcutaneously). This meant the patient had to wear a small pump attached to a needle inserted into the belly, for 8 to 10 hours per day, five to seven days a week. The new therapy is an oral medication, a pill dissolved in water or juice that can be taken just once a day. The oral therapy has the added benefits, beyond improving adherence to therapy, to also avoiding some of the side effects of an infusion therapy (swelling, itchiness).

Case 4: Friederich's Ataxia

AJ is a 19-year old girl with Friederich's Ataxia, diagnosed when she was 7 years old. Up to that time she had been a fairly "normal" child, active and engaged. She began to have symptoms that showed "loss of coordination", falling down, walking into doors, and slight slurring in speech. The disease is a recessive inherited disorder and, sadly, because she was not diagnosed until she was 7, she has a sister, SJ, born three years later who has also been diagnosed with the disease. Unfortunately, SJ has even more severe symptoms. Unlike AJ who was able

to walk until 12 years of age, SJ has been in a wheelchair from the age of six. SJ has had numerous operations for scoliosis (curvature of the spine); she has cardiomyopathy, and her speech is more severely affected. Operations are risky because of the heart complications.

Both girls require a great deal of rehabilitation, including physical therapy and speech therapy, as well as assistance with daily living.

Both children have normal intelligence and do well in their studies but are limited because of their speech and physical limitations. Both have realized for years that the disease is progressive but are hopeful that treatment will be available to at least slow down or halt the symptoms.

Overview of Friedreich's Ataxia

Friedreich's Ataxia is a severe autosomal recessive neurodegenerative disorder that results in the degeneration of an individual's nerve and muscle tissue. This disorder causes loss of muscle control, uncoordinated movements, muscle wasting, and thickening of certain heart walls, which frequently leads to a shortened life span. Friedreich's Ataxia affects both males and females equally, with an average onset of the disease between 5 to 15 years of age. Average life expectancy for Friedreich's Ataxia patients is limited to approximately 35 to 50 years.

Treatments for Friedreich's Ataxia

Currently, there are no cures for FA. A promising treatment to manage cardiac symptoms has been idebenone, a synthetic analogue of coenzyme Q, is a powerful antioxidant that was first administered to Friedreich's ataxia patients less than 10 years ago. Several studies using low doses of idebenone have demonstrated reduction in heart enlargement, and an additional study of idebenone in early-stage FA patients found an improvement in neurological function that appeared related to drug levels. A version of the drug (Catena) that has undergone clinical trials for FA has just recently received marketing approval from Health Canada.

Case 5: Hypophosphotasia

Nine-year-old TR was diagnosed at six-months of age with hypophosphotasia, a rare, inherited and often fatal metabolic bone disease. ("soft bone" disease). Patients with the disease have chronic low levels of phosphatase, which cannot be treated with phosphate supplements.

TA has the form of the disease known as "childhood hypophosphotasia." Those with the more severe infantile form almost all die within the first two or three years of life. TA lives with his father, a single parent. TA has typical symptoms, including rickets, short stature, bone pain, muscle weakness, and frequent fractures and broken bones. He has developed scoliosis (curvature of the spine) and is due to have spinal surgery, perhaps as soon as the fall.

TA attends school but needs to limit his participation in some activities. He requires care, constant monitoring, and special programs, including physiotherapy. Despite his fragility, TA is a cheerful boy who loves school and tries to participate in as many activities as possible. He is

bothered by the lack of understanding of his schoolmates and somewhat self-conscious about his stature and slightly bowed legs. He doesn't dwell on his future but realizes that his physical condition may decline.

Overview of Hypophosphatasia

Hypophosphatasia is a rare, inherited metabolic bone disease. Patients have low levels of the tissue non-specific form of alkaline phosphatase, an essential regulator of bone mineralization. The result is rickets in infants and children and osteomalacia (soft bones) in adults. The prognosis is dependent upon the severity of the disease and the age at which the condition is first recognized. Although affected individuals within a family tend to have similar abnormalities, it is possible to see clinical variability even between relatives. Perinatal or infantile forms are the most severe with profound skeletal hypomineralization and respiratory compromise causing death.

The most common clinical feature childhood hypophosphatasia is loss of the primary teeth before the age of five. Rickets is another common feature leading to delayed walking as a toddler, short stature, and a characteristic waddling gait. Other deformities may also be present such as bowed legs or enlargement of the wrists, knees, and ankles.

Treatments for Hypophosphatasia

Current treatments are symptom management, including pain management, nutritional management, and surgeries to correct spinal curvature. Sometimes, even fractures and broken bones cannot be cast because of the possible damage to the rest of the bone.

There is currently no approved treatment for hypophosphatasia. However, there is a drug, a replacement therapy, in Phase I/II clinical trials. The therapy was discovered by a researcher at the University of Montreal, although the headquarters of the company has just moved to Boston.

Parenthetically, TA's father is anxious to know whether the drug may be helpful to his son, prior to his surgery since fusion of the spine will halt further growth.

Case 6: Neonatal Onset Multisystem Inflammatory Disorder (NOMID)

Five-year old MA lives in Brampton, Ontario with his mother and older brother. At about six months of age, he was diagnosed with NOMID, a very rare inherited auto inflammatory syndrome (affecting perhaps 1:1,000,000 persons). Like other NOMID infants, he was born with red and blistered skin and developed blotches as well as swollen knee joints. He has been in and out of hospital since birth. His mother lists these as symptoms: headache and vomiting daily, red rash covering his whole body, transient synovitis in hips, chronic diarrhea, multiple allergies food and environmental, swollen joints (knees, ankles and wrists are worse), mild developmental delay, large head, large open fontanel, flare ups involving bizarre loss of balance,

big forehead, chronic anemia, high white cells, low platelets, increased inflammatory markers, bony dysplasia in neck, delayed bone growth, and irritated bloodshot eyes.

MA has been in and out of hospital and has made numerous trips to the emergency rooms to deal with many of these symptoms. Because the syndrome is so poorly known, trips to ER are usually exercises in frustration with ER staff unwilling to prescribe appropriate therapy, despite the mother's representation and knowledge. Requests to have the child's file in ER so that it can be referenced have been virtually ignored.

Until very recently, there were no treatments specifically for NOMID. Like other patients, MA has had a range of therapies, beginning with IV steroids to control infections. Other medications have included: Gastrochrom, Zantac, Enbrel, Heparin, Claritin and Ferinsol. In 2005, MA enrolled in NIH-sponsored clinical trials for Kinert (anakinra). The response has been noticeable, with less swelling in joints, increased mobility, and fewer flare-ups. With anakinra, MA has been able to discontinue most other medications and now uses only oral steroids, Heparin, aspirin, and Diamox. The downside is that drug has to be injected daily; there are numerous adverse effects, and patients must travel to NIH for regular assessments. Another problem will be continued access once the clinical trials are over.

Overview of NOMID

Neonatal Onset Multisystem Inflammatory Disease (NOMID) is a chronic inflammatory disorder characterized by early onset of urticarial rash, arthropathy, epiphyseal overgrowth, lymphadenopathy, and central nervous anomalies. Recently, researchers have identified a spontaneously occurring genetic mutation in CIAS1, a gene located at chromosome 1q44, that is present in about 50 percent of children with NOMID. In vitro functional studies have suggested that the genetic defect identified may be directly associated with an increase in IL-1 activity. In 2003, NIH initiated a research study to seek to comprehensively evaluate affected children clinically, genetically, immunologically, and endocrinologically to better characterize the abnormalities in these patients. In 2005, NIH initiated a clinical trial of sensitive imaging modalities that will be used to visualize bone and cartilage findings.

Treatments for NOMID

Until very recently, there were no treatments specifically for NOMID. Medications and supplements are directed toward infection control and symptom management. It is not unusual for children to receive multiple medications, both prescription and over-the-counter, including IV steroids, cromolyn sodium, ranitidine, etanercept, heparin, loratadine and iron drops.

In 2005, NIH initiated clinical trial for Kinerat (anakinra), which has been approved for rheumatoid arthritis. (Because the patient population is so small, the company had no interest in conducting clinical trials specifically for NOMID). There has been positive response from the patient community, which comes from around the world.

There is a new treatment (pending review by Health Canada): Canakinumab (anti-IL-1 β) which has been developed for and tested with patients with Cryopyrin Associated Periodic Syndromes (CAPS), of which NOMID is a severe form. The benefit is that the drug needs to be injected only every two weeks and it is better tolerated.

Case 7: Alpha-1 Antitrypsin Deficiency

MM and AM are sisters, ages 55 and 57 years old, respectively. Both have been diagnosed with Alpha-1 Antitrypsin Deficiency (AAT Deficiency). While the disease is inherited, neither were aware they had the disease because they had no specific symptoms for about the first 50 years of their lives. About seven years ago, AM was diagnosed with smoking-related Chronic Obstructive Pulmonary Disease (COPD), and shortly thereafter MM was identified as suffering from allergic-related asthma. They had symptoms of shortness of breath, wheezing, chronic cough, and frequent chest colds. It was not until AM was diagnosed with elevated liver enzymes related to some liver problems (jaundice, swelling) that they were tested for AAT Deficiency and subsequently diagnosed.

Both have been advised to modify their behaviours (stop smoking, avoid infections, and avoid irritants). Both have received vaccination for common inflammatory illnesses, including influenza, hepatitis, and meningitis. Both are very careful in handling of food to avoid food-borne illnesses and equally attentive on food intake, focusing on foods low in carbohydrates and high in proteins, vitamins and minerals.

In addition, AM has received injections of AAT enzymes, covered through her private insurance, which has improved her breathing and reduced her liver symptoms. MM is considering the option of drug therapy but feels her symptoms are still manageable and currently does not have drug coverage.

Overview of AAT Deficiency

Alpha-1 antitrypsin deficiency (A1AD or AAT deficiency) is an inherited condition where a person lacks a protein known as alpha-1 antitrypsin, made by the liver. There may be low levels of the protein but it doesn't work properly. Alpha-1 antitrypsin (AAT) is particularly important in the lungs, where it mops up another enzyme called neutrophil elastase. This enzyme normally digests damaged or ageing lung cells, foreign particles and bacteria, but has the potential to harm healthy lung tissue.

In AAT deficiency, neutrophil elastase cannot be neutralised efficiently, so it's able to destroy healthy tissue. The common result is emphysema of the lungs. It's thought that abnormal AAT also collects in the liver and can contribute to liver cirrhosis, although many people with AAT deficiency don't develop liver disease.

AAT deficiency is an autosomal recessive inherited disorder. However, there are a large number of different variations in the gene for AAT, which means that there are many variations of

the condition. Carrying just one faulty copy of the gene can cause lower levels of AAT to be produced, and in some cases, increase the risk of lung disease later in life.

People with AAD deficiency are especially vulnerable to exposure to chemical and particulate environmental pollutants, which can aggravate both lung and liver disease. For this reason the most important thing someone with AAT deficiency can do for their health is not to smoke and to avoid people who smoke around them. They are also very susceptible to recurrent lung infections, so it's particularly important they receive immunization against pneumococcal and flu infections. Exercise will boost the immune system to protect the body from infection and is also essential. Medicines to improve lung function and oxygen therapy are also regularly used if lung damage and emphysema have developed.

Treatments for AAT Deficiency

For many people with AAT deficiency, there are no clinical symptoms and many others can keep healthy with careful management. However, while progressive liver or lung disease affects only a minority, it can be serious, so regular monitoring of those with the condition is important.

Injections of replacement AAT enzyme may be beneficial for some patients. It is derived from human plasma. The commercially available version is called Prolastin. Prolastin® is a concentrated form of alpha1-antitrypsin (AAT) that is derived from human plasma. It raises the levels of AAT in the blood and lungs, which may help reduce the damage to the lungs. Prolastin "augments" or replaces missing AAT but is not a cure for AAT deficiency. However, it may help to slow the loss in lung function caused by the disease.