CONDITION

Pompe disease

Pompe disease is an inherited condition that causes glycogen to build up and damage muscles, including the heart and breathing muscles.

WHAT IT IS
Inherited condition causing glycogen buildup in muscles

BODY SYSTEM
Muscles, breathing system, and heart

MAIN SYMPTOMS
Muscle weakness, breathing problems, feeding difficulty, enlarged heart

WHAT CAUSES IT
Inherited GAA gene changes causing enzyme deficiency

HOW IT IS DIAGNOSED
Low GAA enzyme activity plus GAA genetic testing

MAIN TREATMENT
Enzyme replacement therapy and supportive rehabilitation

CAN IT BE CURED?
No - current treatments cannot remove the gene changes

IS IT AN EMERGENCY?
Sometimes - severe breathing trouble or choking

LONG-TERM OUTLOOK
Earlier treatment improves outcomes, but lifelong care remains necessary

Overview

Pompe disease is a rare, inherited condition that mainly affects muscles. It is also called glycogen storage disease type II.

The body normally uses an enzyme called acid alpha-glucosidase, or GAA, to break down glycogen. Glycogen is a stored form of sugar used for energy. In Pompe disease, there is not enough working GAA enzyme. Glycogen then collects inside structures in cells called lysosomes.

Over time, this buildup damages muscle cells. The muscles used for movement and breathing may be affected. In babies with the most severe form, the heart muscle can also become enlarged and weak.

Pompe disease is described as infantile-onset or late-onset. These labels are useful, but the condition is a spectrum rather than two completely separate forms.

Infantile-onset Pompe disease usually causes symptoms during the first year of life. Without effective treatment, it can progress quickly. Late-onset Pompe disease can begin in childhood, adolescence, or adulthood and usually progresses more slowly.

Early diagnosis matters because treatment can limit further damage. It cannot reliably reverse all muscle damage that has already occurred.

Symptoms

Symptoms differ according to age, the amount of working GAA enzyme, and which muscles are affected.

Babies with infantile-onset Pompe disease may have:

Children and adults with late-onset Pompe disease often develop weakness around the hips, thighs, shoulders, and trunk. Climbing stairs, rising from a chair, running, or lifting the arms may become harder.

The diaphragm-the main muscle used for breathing-is often affected. Breathing problems may first appear during sleep or when lying flat. Possible signs include morning headaches, restless sleep, daytime sleepiness, shortness of breath, or a weak cough.

Some people develop a curved spine, called scoliosis, or lower-back pain because the trunk muscles are weak. Swallowing difficulty and fatigue can also occur. Significant heart involvement is less common in late-onset Pompe disease than in the infantile form.

Symptoms can resemble other muscle, nerve, heart, or breathing conditions. Having one or more of these symptoms does not by itself mean that you have Pompe disease.

- Severe muscle weakness and poor muscle tone
- Difficulty holding up the head, rolling, or reaching movement milestones
- Feeding problems, weak sucking, or poor weight gain
- Fast or difficult breathing
- Frequent chest infections
- An enlarged heart, abnormal heart rhythm, or signs of heart failure
- A large tongue or enlarged liver

Causes and risk factors

Pompe disease is caused by changes in the GAA gene. This gene provides instructions for making the GAA enzyme.

The condition is inherited in an autosomal recessive pattern. This means a person must inherit a non-working copy of the gene from each biological parent. Parents who carry one altered copy usually do not have Pompe disease.

When both parents carry a GAA gene change, each pregnancy has:

These chances apply separately to every pregnancy. They do not mean that exactly one in every four children in a family will have the condition.

Different gene changes leave different amounts of working enzyme. Very low enzyme activity is often linked with infantile-onset disease, while some remaining activity is more common in later-onset forms. Even relatives with the same gene changes may not have an identical course.

Pompe disease is not caused by diet, exercise, infection, or anything the parents did during pregnancy.

- A 1 in 4 chance of a child having Pompe disease
- A 1 in 2 chance of a child being an unaffected carrier
- A 1 in 4 chance of a child inheriting neither altered copy

Diagnosis

Pompe disease may be identified after symptoms develop, through testing of relatives, or through newborn screening where this is offered.

A blood test can measure GAA enzyme activity. A dried blood spot is often used for initial testing. A low result needs confirmation because screening alone does not establish the diagnosis.

Diagnosis is usually confirmed through:

Genetic results can sometimes be unclear. A genetics or metabolic specialist may need to compare the results with enzyme activity, symptoms, and family history.

Other tests assess how the condition is affecting the body. These may include blood tests for muscle enzymes, breathing tests, sleep studies, heart tracing, heart ultrasound, muscle strength testing, and walking assessments. A muscle biopsy is now needed less often, but it may be considered when other results are uncertain.

After an infant is diagnosed, specialists may also assess the risk of a strong immune response to enzyme replacement therapy. This can influence how treatment is managed.

- Enzyme testing showing reduced GAA activity in blood cells or other tissue
- Genetic testing finding disease-causing changes in both copies of the GAA gene

Treatment and management

There is no current cure that removes the underlying gene changes. Treatment aims to replace the missing enzyme, protect breathing and heart function, support movement and nutrition, and prevent avoidable complications.

Enzyme replacement therapy supplies a manufactured form of the GAA enzyme through regular infusions into a vein. Several products are available, although approval may differ by age and country.

This treatment can improve survival and heart function in babies. It can also stabilise or improve breathing, walking, and strength in some people with later-onset disease. Response is not the same for everyone, and established muscle damage may remain.

Infusions can cause reactions such as rash, fever, flushing, breathing symptoms, or changes in blood pressure. Treatment teams monitor for these reactions and for antibodies that may reduce how well treatment works. Some infants at high risk of a strong antibody response receive additional immune treatment under specialist supervision.

Supportive management may include:

Care is usually coordinated by a metabolic or neuromuscular team. Regular assessments help show whether treatment is working and whether breathing, mobility, swallowing, or heart support should change.

- Physiotherapy and carefully planned activity to maintain mobility
- Stretching, braces, or mobility aids when needed
- Breathing tests, cough-assistance devices, or non-invasive ventilation
- Swallowing and nutrition assessment
- Modified food textures or tube feeding when eating is unsafe or inadequate
- Heart monitoring, particularly in infants
- Speech, occupational, educational, and psychological support

Complications

Weak breathing muscles can lead to shallow breathing, especially during sleep. Carbon dioxide may build up, and chest infections can become harder to clear because the cough is weak. Some people eventually need ventilation support at night or for longer periods.

Swallowing weakness can allow food, drink, or saliva to enter the airway. This is called aspiration. It may cause choking, poor nutrition, or chest infections.

Progressive muscle weakness can affect walking, balance, posture, and independence. Contractures may develop when joints become fixed in a bent position. Scoliosis can further limit breathing or cause discomfort.

In infantile-onset Pompe disease, enlargement and weakness of the heart can cause heart failure or rhythm problems. Early enzyme replacement has greatly improved heart outcomes for many treated infants, but close monitoring remains important.

Falls, fatigue, pain, reduced bone strength, and the emotional effects of living with a long-term condition may also need attention.

Prevention

Pompe disease cannot be prevented through lifestyle changes because it is inherited.

If a disease-causing GAA gene change is known in a family, genetic counselling can explain carrier testing and reproductive options. These may include testing during pregnancy or testing embryos created through in vitro fertilisation. These are personal choices rather than required steps.

Newborn screening does not prevent Pompe disease. It can identify some babies before clear symptoms appear, allowing confirmatory testing and earlier treatment.

Early treatment, vaccination appropriate for the person's age and health, respiratory monitoring, and prompt management of infections may reduce some complications. They do not prevent the underlying condition.

Living with it and what to expect

Pompe disease requires lifelong follow-up. What changes over time is influenced by age at onset, remaining enzyme activity, the muscles involved, and response to treatment.

Babies with infantile-onset disease need rapid assessment and treatment. Enzyme replacement has changed the outlook, and many treated children live longer and gain

important movement skills. Some still have ongoing weakness, feeding difficulty, hearing problems, or breathing needs.

Late-onset Pompe disease usually progresses over years. Hip, trunk, and breathing muscles may gradually weaken, although the pace is unpredictable. Treatment may improve or stabilise function for a time, but it does not always stop progression completely.

Regular follow-up may include strength and walking assessments, breathing tests, sleep studies, nutrition reviews, and heart checks. These appointments are routine even when symptoms seem stable because breathing weakness can develop gradually.

Many people attend school, work, maintain relationships, travel, and take part in adapted physical activity. Some eventually use braces, a wheelchair, breathing support, or help with daily tasks. Planning adjustments early can help preserve independence.

Exercise should be matched to your strength and breathing function. A specialist physiotherapist can help identify activity that supports fitness without excessive fatigue or muscle strain.

When to get medical help

Arrange routine medical review if you notice a gradual change in muscle strength, walking, balance, swallowing, sleep, or stamina. Morning headaches, difficulty breathing when lying flat, increasing daytime sleepiness, or a weaker cough can point to nighttime breathing problems and should be assessed promptly.

Contact the treatment team if infusion reactions occur or if established symptoms are worsening between planned appointments.

Seek urgent medical care for:

Call emergency services for severe breathing difficulty, blue or grey lips, inability to speak or cry because of breathlessness, loss of consciousness, or a complete airway blockage from choking.

- New or rapidly worsening shortness of breath
- Choking or repeated coughing while eating or drinking
- Signs of dehydration or inability to take enough food or fluid
- A chest infection with increasing weakness or difficulty clearing mucus
- Fainting, new palpitations, or significant chest discomfort

Common questions

Is Pompe disease a type of muscular dystrophy?

It is a metabolic muscle condition rather than a muscular dystrophy. Both can cause progressive weakness, but Pompe disease results from GAA enzyme deficiency and glycogen buildup inside cells.

Can Pompe disease start in adulthood?

Yes. Late-onset Pompe disease may first cause noticeable symptoms during childhood, adolescence, or adulthood. Some adults have years of increasing difficulty with stairs, running, or breathing during sleep before the cause is identified.

Is Pompe disease fatal?

Severe untreated infantile-onset Pompe disease can be life-threatening because it affects the heart and breathing muscles. Treatment has improved survival substantially. Later-onset disease usually progresses more slowly, but respiratory complications can still become serious.

Can enzyme replacement therapy cure Pompe disease?

No. It supplies some of the missing enzyme but does not correct the inherited gene changes. Continuing treatment is usually needed, and regular assessments check its benefits and limitations.

Should my relatives be tested?

Biological siblings may have the condition or carry a GAA gene change. Other relatives may also be carriers. A genetics service can use the family's confirmed test results to identify which relatives could benefit from testing.

Can I exercise with Pompe disease?

Many people can take part in moderate, tailored activity. The safest type and intensity are influenced by muscle strength, mobility, heart health, and breathing function. A physiotherapist familiar with neuromuscular conditions can help create an appropriate plan.

Sources

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