



0845 389 9901  
mps@mpssociety.org.uk  
www.mpssociety.org.uk

# Guide to Understanding Fucosidosis

## Contents

What is Fucosidosis?  
What Causes Fucosidosis?  
How Common is Fucosidosis?  
Does Fucosidosis Affect Individuals Differently?  
How is Fucosidosis Inherited?  
Can You Test for Fucosidosis in Pregnancy?  
Genetic Counselling  
Clinical Presentation of Fucosidosis  
General Management of Fucosidosis  
Specific Treatment of Fucosidosis  
About the MPS Society

## What is Fucosidosis?

Fucosidosis is a rare lysosomal storage disorder of the Oligosaccharide family of diseases and is closely related to Mucopolysaccharidoses.

Fucosidosis was first described by Dr Durand in 1966 and the enzyme responsible for the condition was first identified by Van Hoof and Hers in 1968.

Fucosidosis is an enzyme deficiency disorder which results in defective fucosidase activity, the accumulation of lipids (fucose-rich oligosaccharides, sphingolipids and glycopeptides chains) and the absence of glycosaminoglycans (GAGs). This accumulation is responsible for many problems.

Whilst there is no cure for individuals affected by Fucosidosis this fact sheet sets out to demonstrate how Fucosidosis may present itself and how it may be clinically managed. The prospect of new therapies is also addressed.

This fact sheet is produced by the Society for Mucopolysaccharide Diseases (MPS Society) and draws on the experiences of parents and doctors with reference to medical literature.

## What Causes Fucosidosis?

Oligosaccharides are long chains of sugar molecules used in the building of bones, cartilage, skin, tendons and many other tissues in the body. "Oligo" means a small number and "saccharide" is a general term for a sugar molecule.

In the course of normal life there is a continuous recycling process of building new Oligosaccharides and breaking down old ones. This process requires a series of special biochemical tools called enzymes.



Christopher

Children and adults affected with Fucosidosis have a missing or malfunctioning enzyme. This is called alpha-L-fucosidase. Partially broken down fucose-containing chemicals remain stored in the body, build up and cause progressive damage to the cells.

Babies may show little sign of the disease but as more and more cells become damaged by accumulation of Oligosaccharides, symptoms start to appear.

## How Common is Fucosidosis?

The MPS Society, which co-ordinates the European Registry for Mucopolysaccharide and related diseases, has been contacted regarding ten individuals in the United Kingdom. There are fewer than 100 cases that have been reported worldwide. It has been shown that approximately a third of those patients are of Italian origin.

## Does Fucosidosis Affect Individuals Differently?

Fucosidosis, like most MPS and related disorders, is very variable and in the past has been divided up into two types, one of which presents itself in infancy. This is referred to as Type I. When an individual has a later onset of the disease this is known as Type II or 'Juvenile'. This is an oversimplification, however as it is now recognised that these are two ends of the same disease spectrum.

It is important to remember that Fucosidosis is extremely varied in its effects. A whole range of possible symptoms are outlined in this fact sheet, however affected individuals may not experience all of them.

## How is Fucosidosis Inherited?

Genes are inherited from our parents and control how tall we are as well as the colour of our eyes and skin. Some genes we inherit are “recessive” which means we carry that gene but it does not have any effect on our development.

Fucosidosis is caused by a recessive gene. If an adult carrying the abnormal gene has a partner who is also a carrier, there will be a one in four chance (1:4) with every pregnancy that the foetus will inherit the defective gene from each parent and will suffer from the disease. There is a two in three chance (2:3) that unaffected brothers and sisters of those affected by Fucosidosis will be carriers. They can be reassured however that, as the disease is so rare; the chance of having a partner who is another carrier is very slight unless the individuals are of the immediate or extended family.

## Can You Test for Fucosidosis in Pregnancy?

If you have a child with Fucosidosis it is possible to have tests during any subsequent pregnancy to find out whether the foetus is affected. It is important to contact your doctor as soon as you suspect that you may be pregnant if you wish for tests to be arranged. Both amniocentesis and chorionic villus sampling can be used to diagnose Fucosidosis in utero.

## Genetic Counselling

All parents of children with a lysosomal storage disease should consider asking for Genetic Counselling before having other children. The counsellor should be able to provide non-directive advice on the risk to close relatives, the reproductive choices that are available and to suggest whether the wider family should be informed.

## Clinical Presentation of Fucosidosis

### Growth

Babies with Fucosidosis may be larger than average at birth and may grow faster than normal during the first few years of life. As they get older, however individuals with Fucosidosis will be restricted in their growth.

### Physical Appearance

Unlike other storage disorders, the facial appearance of children with Fucosidosis can be normal. In others, however their heads may be large and longer than normal from front to back. They may also have a protruding forehead. The nose may be broad with a flattened bridge. The skull tends to be short and the ears are often large and low set. Hair may be coarse.

### Intellectual Ability

Individuals with Fucosidosis suffer from neurological deterioration, Psychomotor Retardation being the most significant consequence. This is a general reduction in the speed of thought and difficulty or slowness in movement and speech. The accumulation of Oligosaccharides in the brain is primarily responsible for the learning difficulties seen in affected children and adolescents.

Individuals at the less severe end of the spectrum may only have moderate learning difficulties.

## Brain

Deterioration of the brain is one of the main features of Fucosidosis. All individuals are likely to suffer from this but the rate of progression will vary.

The brain and the spinal cord are protected from jolting by the cerebrospinal fluid that circulates around them. In some individuals with Fucosidosis the circulation of the fluid may become blocked over time. The blockage (known as communicating hydrocephalus) causes increased pressure in the head which can press on the brain and cause headaches and delayed development.

### Seizures

Almost half of those affected by Fucosidosis are likely to have seizures or fits. This may take different forms, for example; absence episodes or more generalised tonic-clonic seizures. Fortunately, most individuals will respond favourably to anticonvulsant medication.

## Eyes

Some individuals with Fucosidosis may have minor abnormalities that are not usually associated with severe visual impairment. In some patients the blood vessels on the cornea (the white of the eye) are prominent and have a spiralled appearance.

## Ears

Some individuals suffering from Fucosidosis may have a degree of hearing loss. It may be Conductive or Nerve Deafness or both (Mixed Deafness). This may be made worse by frequent ear infections. It is important that individuals with Fucosidosis have their hearing checked regularly and for problems to be treated early to improve or maintain the ability to communicate.

Correct functioning of the middle ear depends on the pressure behind the eardrum being the same as that in the outer ear canal and the atmosphere. This pressure is equalised by the eustachian tube which runs from the middle ear to the back of the nose. If the tube is blocked, the pressure behind the eardrum will drop and the drum will be drawn in. If this negative pressure persists, fluid from the lining of the middle ear will build up and in time become thick like glue, hence the condition being known as “glue ear”.

### Conductive Deafness (Glue Ear)

Under general anaesthetic a small incision behind the eardrum (called a myringotomy) can be made and the fluid sucked out. A small ventilation tube called a “grommet” may then be inserted to keep the hole open and allow air to enter from the outer ear canal until the eustachian tube starts to work properly again. Grommets will eventually fall out.

If the Conductive Deafness recurs, the surgeon may decide to use T-tubes, a type of grommet which stays in place longer. In view of the anaesthetic risks for individuals with Fucosidosis the surgeon may decide to use T-tubes on the first occasion.

## Sensorineural Deafness (Nerve Deafness)

In most cases the cause of Nerve Deafness is damage to the tiny hair cells in the inner ear. It may accompany Conductive Deafness, in which case it is referred to as Mixed Deafness. Nerve Deafness is managed by the fitting of hearing aids in most individuals with Fucosidosis. More severely affected children may keep pulling out their hearing aids at first but it is important to persevere at wearing them so that communication can be maintained. Individuals with Fucosidosis may find radio aids and the loop system helpful at school and at home.

## Nose & Throat

Frequent coughs, colds and throat infections are common problems for those suffering from Fucosidosis. The tonsils and adenoids often become enlarged and can partly block the airway. For this reason they may be removed.

The neck may be short and this may contribute to the problems in breathing. The windpipe (trachea) becomes narrowed by storage material and is often more floppy, or softer than usual, due to abnormal cartilage rings in the trachea.

Nodules or excess hardening of tissue can further block the airway. Typically the bridge of the nose is flattened and the passage behind the nose is smaller than usual due to poor growth of the bones in the mid-face and thickening of the mucosal lining.

## Mouth & Teeth

Individuals with Fucosidosis may have an enlarged tongue.

## Dental Hygiene

It is important that the teeth are well cared for to avoid the need for extractions. If the water in your area has not been treated with fluoride, individuals with Fucosidosis should have fluoride tablets or drops daily.

Cleaning around the mouth with a small sponge or a stick soaked in mouthwash will help keep the mouth fresh and avoid bad breath. Dribbling is also a common problem and a plastic-backed bib under the clothes may prevent soreness.

Regular checks at the dentist are important as tooth decay could be a source of pain. If your child is severely affected it may be safer for treatment to be carried out in hospital.

It is important that you inform the dentist if your child has a heart problem as you will probably be advised that s/he should be given antibiotics before and after any dental treatment. This is because certain bacteria in the mouth may get into the blood stream and cause an infection on the heart valves.

If teeth need to be removed under anaesthetic, this should be carried out in a hospital under the care of an experienced anaesthetist and never in the dental surgery. It may be possible for the hospital to carry out other treatment or investigations under the same anaesthetic.

## Chest

The shape of the chest may be abnormal and the junction between the ribs and the breastbone (sternum) is not as flexible as it should be. The chest is therefore rigid and unable to move freely to allow the lungs to take in a large volume of air. The muscles at the base of the chest (diaphragm) may be pushed upwards by an enlarged liver and spleen, further reducing the space for the lungs. When the lungs are not fully cleared, there is an increased risk of infection.

## Respiratory Infections

Individuals with Fucosidosis commonly suffer from recurrent respiratory infections, particularly within the first year, which should be treated with antibiotics. Medication may affect individuals with MPS and related diseases differently, so it is essential to consult your doctor rather than using "over-the-counter" medication.

## Heart

In individuals with Fucosidosis the heart is sometimes abnormally large.

## Liver & Spleen

In most individuals with Fucosidosis the liver and spleen become enlarged by storage of Oligosaccharides (hepatosplenomegaly). The enlarged organs do not usually cause problems, but they can interfere with eating and breathing.

## Bones & Joints

Individuals with Fucosidosis tend to have problems with bone formation and growth. This may lead to both bone and neurological problems if nerves are compressed by bone. Over time, bone changes in Fucosidosis tend to be mild. When this does occur bones and cartilage are not only malformed but also form in abnormal places.

Fucosidosis sufferers tend to have shallow hip sockets that are deformed. The heads of the Femur (the highest part of the thigh bones) are porous and the shaft of these long bones are sometimes widened.

Joint stiffness is a common feature of Fucosidosis and the maximum range of movement of all joints may become limited.

Stiffness may cause pain, which may be relieved by warmth and ordinary painkillers. Anti-inflammatory drugs such as Ibuprofen can help with joint pain, but they should be taken with or after food and monitored closely to make sure that irritation and ulcers of the stomach do not occur.

Psychomotor development is affected by this and mobility may deteriorate so much that they will even lose the ability to stand.



Christopher and John

## Spine

The bones of the spine (vertebrae) normally line up from the neck to the buttocks. Individuals with Fucosidosis can have poorly formed vertebrae that may not stably interact with each other. One or two of the vertebrae in the lower back are sometimes smaller than the rest and are set back in line. This mild backward slippage of the vertebrae can cause a slight angular curve to develop. This is known as kyphosis or gibbus. The upper lumbar vertebrae are fragile and could break easily. In addition to this, flattening and irregularities of the vertebral bodies have been observed in some patients.

## Neck

The tooth-like bone at the top of the spine holding the skull (referred to as odontoid peg) is often underdeveloped. The neck is therefore fragile and shorter than usual.

## Shoulders & Arms

Limited movement may be experienced and individuals with a spectrum of Fucosidosis may suffer from reduced tension in muscles. This is referred to as hypotonia and eventually leads to spasticity.

## Legs & Feet

Many individuals with Fucosidosis stand and walk with their knees and hips flexed. This, combined with the tight Achilles Tendon, may cause them to walk on their toes. Sometimes these individuals have knock-knees but this is very unlikely to respond to treatment.

## Hands

Individuals with Fucosidosis often experience pain and loss of feeling in the fingertips caused by Carpal Tunnel Syndrome.

The wrist (or carpus) consists of eight small bones known as the carpals which are joined by fibrous bands of protein called ligaments. Nerves have to pass through the wrist in the space between the carpal bones and the ligaments. The thickening of these ligaments causes pressure on the nerves which can cause irreversible damage.

This nerve damage will cause the muscle at the base of the thumb to waste away.

## Carpal Tunnel Syndrome

Although a child or adolescent with Fucosidosis may not complain of pain they may already have Carpal Tunnel Syndrome. Doctors may advise for this to be monitored by a nerve conduction study which will show whether or not the condition is present. This test is also carried out if there is any weakness or numbness in the hand or if there are signs of decreased muscle mass at the base of the thumb. This disorder can be treated by a minor operation.

## Skin

Individuals diagnosed with Fucosidosis may suffer from hyperhydrosis (excessive sweating). The skin is also generally thicker than normal and is prone to a rash of small red spots which is known as angiokeratoma. This is often found all over the body.

## General Management of Fucosidosis

### Anaesthetic

Giving an anaesthetic to an individual with Fucosidosis requires skill and should always be undertaken by an experienced anaesthetist. Where a child is concerned this should be a paediatric anaesthetist.

The airway can be very small and may require a very small endotracheal tube. Placing the tube may prove difficult and require the use of a flexible bronchoscope.

In addition, the neck may be somewhat lax and repositioning during anaesthesia or intubation could cause injury to the spinal cord.

For some individuals it is difficult to remove the breathing tube after surgery.

There is a more detailed explanation of this complex subject in the booklet on 'Anaesthetic Management in MPS' available from the MPS Society.

### Physiotherapy & Hydrotherapy

Physiotherapy and Hydrotherapy can be useful to help individuals with Fucosidosis to drain mucus from the chest and to achieve specific and realistic goals in daily life.

It is common sense for the individuals to be as active as possible in order to improve their general health and Physiotherapists may be able to suggest ways of achieving this.

For younger individuals the best forms of Physiotherapy are exercises that are introduced through play.

In adults it is important to remember that passive stretching may be painful and should only be used with caution.

### Life Expectancy

Life expectancy depends on the type of the Fucosidosis and its severity. Where the individual has the more severe and acute form of the disease, this may lead to death within the first 10 years.

Degeneration in other patients may be slower but still frequently leads to death by the age of 20 years.

## Specific Treatment of Fucosidosis

### Haematopoietic Stem Cell Transplant (HSCT)

Haematopoietic Stem Cell Transplantation (HSCT), involves taking cells that are normally found in the bone marrow from umbilical cord blood. Cord blood is collected from the afterbirths (placenta) of new born babies with their parent's consent. The baby donors are not normally related to the patient although the cord blood needs to provide a suitable match. In all other aspects of the procedure, the outcomes are the same as having a bone marrow transplant.

For some years Haematopoietic Stem Cell Transplant (HSCT) has been used to treat children with Mucopolysaccharide and related diseases. A few children with Fucosidosis have been treated by HSCT. Unfortunately the results of HSCT have been poor and as a result, this treatment is no longer recommended for patients with Fucosidosis.

### Enzyme Replacement Therapy

Enzyme Replacement Therapy (ERT) is based on the principle that the recombinant form of the enzyme that is missing or malfunctioning in individuals with an MPS or Related Disease is given via repeated intravenous infusion in order to reduce the symptoms and clinical manifestations associated with the disease.

Although there is reason to hope that Enzyme Replacement Therapy will help some of the physical problems, the blood-brain barrier may prevent Enzyme Replacement Therapy from directly helping the brain. However ERT for Fucosidosis may be a possibility in the future.

### Future Treatments

There is a great deal of research being carried out that may lead to possible treatments. Gene therapy (which involves replacing the faulty gene with a copy of a normal gene) may be a realistic possibility in years to come.

It is possible that not all those affected by Fucosidosis will be able to benefit from these advances. Your paediatrician or physician may be able to give you current information on treatment options or you may contact the Society for Mucopolysaccharide Diseases.

### About the MPS Society

The Society for Mucopolysaccharide Diseases was founded in 1982 and represents from throughout the UK, over 1200 children and adults suffering from MPS and related diseases, their families, carers and professionals. It is a registered charity entirely supported by voluntary donations and fundraising and is managed by the members themselves.

Brooke



### Society for Mucopolysaccharide Diseases

MPS House, Repton Place, White Lion Road, Amersham, Buckinghamshire, HP7 9LP, UK  
Registered Charity No. 1143472. Registered as a Charity in Scotland No. SCO41012  
Registered as a Company limited by guarantee in England & Wales No. 7726882