Children's Liver Disease Foundation

fighting childhood liver disease

Wilson's Disease

A Guide

An explanation of what Wilson's disease is, symptoms, diagnosis and treatment

This leaflet has primarily been written for:

- Parents/carers of children with Wilson's disease

Others may also find this information useful:

- Young people with Wilson's disease
- Healthcare professionals who would like to find out more about the condition

It provides information on:

- What Wilson's disease is
- What causes it
- Diagnosis
- Treatment
- Inheritance and screening

You may find it helpful to also read the following CLDF leaflet:

- An Introduction to Liver Disease

What is Wilson's disease?

Wilson's disease is a rare, inherited condition in which the body cannot handle copper correctly. This leads to a toxic build-up of copper in the liver and brain.

It is estimated that around one in 30,000 people has Wilson's disease. It is more common in some areas, for example, Sardinia and some Eastern European countries.

In younger children it is often the liver which is most affected. In teenagers and adults the brain may be more affected. Between half and two-thirds of Wilson's disease patients show symptoms before the age of 15 and most of these will have liver disease.

Why does the body contain copper?

Copper is needed to survive and is found in many foods as well as in drinking water. Not having enough copper can cause a reduction in the number of red blood cells in the blood (anaemia) and poor growth.

Each day we take in approximately 1mg of copper. Foods which contain a lot of copper include liver and shellfish. Other offal, nuts and seeds contain copper but less than liver and shellfish. Large intakes of dark chocolate may increase copper intake but not as much as the other foods listed.

What causes Wilson's disease?

Wilson's disease has a genetic basis which means it is caused by changes in genes which make up our DNA. The gene affected in Wilson's disease is called ATP7B.

Wilson's disease is "autosomal recessive". This means that, in order to develop Wilson's disease, a person must have two Wilson's disease genes, one inherited from each parent.

If the parents of a child with Wilson's disease do not have the disease, they will be carriers for the gene but will not be unwell because of it.

There are over 500 different genetic mutations which can cause Wilson's disease. People from different parts of the world have different mutations.

The gene involved in Wilson's disease is one which instructs liver cells to make a protein which acts as a "copper pump". This copper pump transports copper out of the liver cells into bile. When an individual has two faulty copies of the gene, the copper pump isn't formed properly so can't pump the copper out into the bile.

If two parents have a child with Wilson's disease, but they don't have the condition themselves, the chance of any children they have in the future of having Wilson's disease is one out of every four children (a 25% chance).

Are males and females affected equally?

Yes.

What are the signs and symptoms of Wilson's disease?

Wilson's disease can have a number of different effects within the liver. In mild cases the symptoms may include:

- tiredness
- loss of appetite
- abdominal pain
- joint pain
- vomiting
- weight loss
- nose bleeds
- anaemia

There may be symptoms of chronic (ongoing) liver disease such as:

- jaundice
- a large spleen
- dilated blood vessels in the stomach and oesophagus (varices)

Some children and young people may have acute liver failure.

Patients may have been diagnosed because other members of the family are known to have Wilson's disease.

How can the brain be affected by Wilson's disease?

The effect on the brain is more common in teenagers or adults. There may, however, be a small change in learning ability in children.

A range of problems may occur and can include:

- declining school or college performance
- changes in behaviour or personality
- deterioration of motor skills such as handwriting or balance

As the disease progresses, and without treatment, there may be tremors, rigidity, and further loss of motor skills.

In more serious cases, a child's mood and personality may change for a short period of time.

This can cause children to behave in a way that is different to usual. They may swear, shout and become aggressive. This can be difficult for parents to see but is a temporary change due to the build-up of copper in the brain.

How is Wilson's disease diagnosed?

Wilson's disease may be considered in any child over three years of age who has acute or chronic liver disease.

If it is suspected that a child or a young person may have Wilson's disease then there are a number of tests which can be used to confirm the diagnosis.

Blood tests

Blood is taken to carry out liver function tests. More information on these blood tests can be found in CLDF's leaflet "An Introduction to Liver Disease". Copper levels will also be tested. Often blood tests will show that children with Wilson's disease are anaemic. DNA will be sent for testing of the ATP7B gene.

Urine tests

In Wilson's disease the copper levels in urine are high. The levels of copper are measured in two 24 hour urine collections before and after a test dose of penicillamine is given. Penicillamine is a medication which enables excess copper to be removed from the body.

Liver biopsy

The amount of copper in the liver can be measured from a biopsy sample. A biopsy may also show typical chronic liver disease changes and excess copper.

CLDF's leaflet "An Introduction to Liver Disease" has further details on what a liver biopsy is and how it is carried out.

Imaging

An MRI (magnetic resonance imaging) scan may show a build-up of copper in the areas of the brain which are often affected.

Eye examination

Copper accumulation in the eye may cause a golden-brown ring to form around the edge of the iris, called a Kayser-Fleischer ring. This ring is only visible using a special instrument (a slit-lamp) and is rarely seen before the age of 10 years.

Can Wilson's disease be treated?

The treatment of Wilson's disease depends on how severe the liver disease is.

Acute liver failure (sudden damage to the liver) may require an urgent liver transplant.

Chronic liver disease (damage to the liver over a period of time) can be treated using a number of different medications which help to remove the build-up of excess copper.

Treatment should be started as soon as an individual is diagnosed with Wilson's disease as this can stop further damage happening. It is really important that once an individual is diagnosed they continue to take their medication, even if they feel well. It can take a number of months to begin to feel back to normal and for blood tests to improve. It can take weeks or months before a young person is ready to return to normal activities, such as going to school.

The long term outcomes for patients who take their prescribed medications properly are excellent. If patients don't take their medications properly or stop taking their medication then they can become very unwell.

Individuals who are found to have Wilson's disease when they are tested because a sibling has been diagnosed generally respond very well to treatment. This stops symptoms developing if medication is continued correctly. For those who already have symptoms the possibility and success of treatment will depend on the degree of damage the liver already has. A number of blood tests and scans can be done to see how badly the liver is already damaged.

Sometimes patients will require treatment for the complications of liver disease, such as portal hypertension and ascites (abdominal swelling), as well as a nutritional assessment. CLDF can provide you with further information about these.

In the case of chronic liver disease and portal hypertension medicines such as aspirin and ibuprofen should be avoided as they can make bleeding in the gut more likely. Paracetamol (Calpol) is a safer alternative.

For those with end stage liver disease liver transplantation is a possibility and the outcomes are generally very positive. For more information on liver transplant, CLDF has a leaflet available.

What medicines are available?

The three most commonly used medicines are **penicillamine** (with pyridoxine), **trientine and zinc.**

Penicillamine

This medicine is unrelated to penicillin. Penicillamine binds with copper in the body which means more of it can be removed in urine. It is an effective drug and can be used to find out if someone has Wilson's disease.

It is not often used as a long term treatment due to its side effects which include:

- A reduction in the vitamin B6 which is known as pyridoxine. Patients taking penicillamine must therefore also take pyridoxine
- Skin rashes
- Protein in the urine. This is rarely severe, the urine is tested during the initial phase of treatment.
- Blood disorders. Blood tests are carried out at the first appointment and subsequent check-up appointments

Pyridoxine

Pyridoxine is a supplement of Vitamin B6. It is taken twice a day and should be taken as far away as possible from penicillamine.

The timing of pyridoxine in relation to zinc or food is not important.

Trientine

Trientine acts in the same way as penicillamine. It may be chosen instead of penicillamine. The side effects are similar to those for penicillamine, but seem to occur less frequently.

Zinc

Zinc reduces the amount of copper which is absorbed from the gut. Like penicillamine, it also reduces the toxicity of the copper which stays within the liver.

It may irritate the stomach causing discomfort. If this occurs it may be relieved by eating a slice of meat at the same time and not taking it before breakfast.

Zinc may be used in combination with either penicillamine or trientine but it should not be taken at the same time.

Penicillamine, trientine and zinc are all most effective if taken on an empty stomach, at least one hour before food, or two hours after food. The doses should be spaced as evenly as possible over 24 hours. For example, if taken twice a day, each dose should be approximately 12 hours apart.

How long does treatment continue for?

Treatment is needed for life. The effectiveness and side effects of treatment will be monitored by regular hospital follow-up visits. This will include blood and 24 hour urine collection. If taken the right way all the time, the treatment is very effective. If doses are missed regularly or treatment is stopped for a period of time, the liver and/or brain may be permanently damaged before any problems are noticed.

Are there any restrictions on lifestyle?

For those who are well at the time the disease is diagnosed there are no lifestyle restrictions.

Liver and/or damage to the brain (neurological damage) which has already happened will need to be discussed by your doctor regarding potential complications. The non-specific signs such as lethargy (extreme tiredness), abdominal pain and nausea will settle but may take some weeks or even months to do so.

During this time physical activity, schooling and work may need to be reduced and then gradually increased back to normal as symptoms stop. If you have any queries about this, talk to your medical team who will be able to discuss the best plan for your child with you.

When is a liver transplant necessary?

Not all patients who are diagnosed with Wilson's disease will need a liver transplant. There are four reasons why liver transplantation may be necessary:

- Acute liver failure
- Failure of medication to stop the progression of the liver damage
- Complications of liver damage which occurred before treatment started
- Liver damage which occurred because medication was not taken

Does a liver transplant cure Wilson's disease?

Following successful transplantation copper is removed properly from the body. However, liver transplantation is a major operation which has risks and it is still necessary to take medication and attend hospital for check-ups for the rest of the transplantee's life.

Having a liver transplant doesn't reverse any changes in the brain which may have occurred before the transplant but it will stop further damage to the brain.

If I have Wilson's disease, will my children have it?

Not unless your partner is a carrier of the gene. The risk of this is very low but is higher if your partner is related to you in any way.

After liver transplantation an individual will still pass the Wilson's gene on to any children they have. This does not mean the child will also have Wilson's disease as the child would need to inherit a Wilson's disease gene from both parents.

Should family members be screened for Wilson's disease?

Brothers and sisters definitely should be tested. It can be very helpful to speak to a genetic counsellor before having a test. A genetic counsellor is a qualified professional who will discuss a genetic disease with an affected individual, and their family. They can explain the disease in detail and also help parents to understand the pros and cons of genetic testing.

Can women with Wilson's disease have successful pregnancies?

Many women with well-controlled Wilson's disease have had successful and safe pregnancies whilst being treated with penicillamine, trientine and zinc salts. It is advisable to inform your specialist if you plan to become pregnant as they may want to review the doses of some of your medications.

CLDF produces a wide variety of information resources for children and young people up to the age of 25 with liver disease, their families and the healthcare professionals who look after them. This information can be downloaded or ordered from CLDF's website www.childliverdisease.org. For further enquiries regarding CLDF's information please contact the Information and Research Hub Manager by email at irhm@childliverdisease.org or call 0121 212 6029.

Thanks

The booklet has been written, edited and reviewed with the help of staff at each of the specialist paediatric liver centres: Birmingham Children's Hospital, King's College Hospital and Leeds Children's Hospital. Thank you to all of the staff involved who have made the production of this leaflet possible.

Disclaimer

This leaflet provides general information but does not replace medical advice. It is important to contact your/your child's medical team if you have any worries or concerns.

Feedback and Information Sources

Information within this leaflet has been produced with input from the three specialist paediatric liver centres in the UK. To provide feedback on this leaflet, for more information on the content of this leaflet including references and how it was developed contact Children's Liver Disease Foundation: info@childliverdisease.org

This leaflet has been reviewed in October 2020. It is due to be updated by October 2023.

What is Children's Liver Disease Foundation (CLDF)?

CLDF is the UK's leading organisation dedicated to fighting all childhood liver diseases. CLDF provides information and support services to young people up to the age of 25 with liver conditions and their families, funds vital research into childhood liver disease and is a voice for everyone affected.

Are you a young person up to the age of 25 with a liver condition or a family member? CLDF's Families and Young People's teams are here for you, whether you want to talk about issues affecting you, meet and share with others, or just belong to a group which cares, knows what it's like and is fighting to make a difference. You are not alone.

If you are a parent/carer or family member then get in touch with CLDF's Families Team:
Phone: 0121 212 6023 **Email:** families@childliverdisease.org

If you are a young person and want to find out more about CLDF's services you can contact CLDF's Young People's Team:
Phone: 0121 212 6024 **Email:** youngpeople@childliverdisease.org

CLDF have a social media platform called HIVE for young people with a liver disease/transplant to make new friends, connect and share stories. **childliverdisease.org/young-people/hive**

Would you like to help us support the fight against childhood liver disease? CLDF's work relies on voluntary donations. Please help us to continue to support children, young people and families now and in the future. To find out more about fundraising and how you can join the fight against childhood liver disease you can visit childliverdisease.org/support-us. Alternatively you can email the Fundraising Team at fundraising@childliverdisease.org or call them on **0121 212 6022**

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