Glutaric aciduria type 1 (GA1): detailed information

Public Health England (PHE) created this information on behalf of the NHS. In this information, the word ‘we’ refers to the NHS service that provides screening.

This information is for parents if their baby is suspected of having GA1 or has been diagnosed with GA1 following their newborn blood spot screening test (‘heel prick test’). It will help you and your healthcare professionals to talk through the next stages of your baby’s care.

About GA1

Glutaric aciduria type 1 (pronounced glue-ta-ric acid-ur-ee-a), or GA1, is a rare but treatable inherited metabolic disorder that prevents the normal breakdown of protein. Babies with GA1 inherit 2 faulty copies of the gene for GA1, one from each parent.

When we eat, our body breaks down protein in food into smaller parts called amino acids. Enzymes, which are chemicals found naturally in our body, then break down the amino acids further so they can be used.

In GA1, an enzyme called glutaryl-CoA dehydrogenase is missing, which leads to problems breaking down the amino acids lysine and tryptophan. This causes harmful substances, called glutaric acid and 3-hydroxyglutaric acid, to build up in the brain and body.

Untreated GA1 can cause long-term health problems, including brain damage and physical disabilities, but with newborn screening and early treatment this can be prevented.

Screening and diagnosis of GA1

Newborn blood spot (‘heel prick test’)

When your baby was about 5 days old, your midwife took some blood from your baby’s heel for their newborn blood spot screening test (the ‘heel prick test’). The newborn blood spot screening test measures the amount of a substance called acylcarnitine (C5-DC) in the blood. A high level of acylcarnitine (C5-DC) suggests your baby may have GA1. This is called a screen positive result.

Diagnostic tests

If your baby has a screen positive result, you will be seen by a metabolic doctor, dietitian and nurse specialist (the ‘metabolic team’). The team will provide advice and support. Blood and urine tests will be carried out to confirm if your baby has GA1.

You will need to wait a few days for the test results to be reported. During this time, you can continue to breastfeed or give normal infant formula. You should feed your baby every 3 to 4 hours, day and night, or more often if demanded. If your baby becomes unwell, you should take them to hospital for further assessment.

Treatment

If your baby does have GA1, the metabolic team will:

- explain the condition in detail and answer any questions you might have
- start your baby on medical treatment and a special diet, which includes:
- a medicine called L-carnitine, which helps to reduce glutaric acid in the blood
- a restricted protein feeding plan
- a special feed to use during illnesses (called the emergency regimen)
- provide you with written information and contact details for the metabolic team
- arrange regular follow-up appointments

The metabolic team will see you regularly throughout your child's life and your child will remain under their care.

The restricted protein feeding plan

The aim of the feeding plan is to reduce the build-up of harmful substances (glutaric acid and 3-hydroxyglutaric acid), which are formed from the amino acids lysine and tryptophan.

Your baby will be given 2 different feeds to provide all the nutrition they need for growth and development. These are:

- a limited daily volume of breastmilk feeds or infant formula
- a lysine-free, tryptophan-low infant formula

Your metabolic dietitian will teach you how much of each feed to give based on your baby's weight. Following the dietetic instructions is very important for your baby's health.

Your GP will be asked to prescribe the lysine-free, tryptophan-low infant formula. You will continue to have regular appointments with a metabolic dietitian who will advise on dietary management throughout the various stages of childhood.

What to do if your baby gets ill

If your baby becomes ill, they might have an episode known as a metabolic crisis (also known as metabolic decompensation). This is caused by a rapid build-up of the harmful

substances (glutaric acid and 3-hydroxyglutaric acid) in their body which can make them severely unwell.

Symptoms of a metabolic crisis include:

- irritability
- sleepiness and non-responsiveness
- floppiness and falling over
- poor feeding
- breathing difficulties
- seizures
- coma

A metabolic crisis can lead to serious illness and long-term brain damage, and can be life-threatening.

To help prevent this from happening, you will be taught to give an emergency regimen, which involves specialist feeds and frequent feeding. If your baby becomes very unwell, they might need to be admitted to hospital.

The metabolic team will teach you how to look after your child during illness.

The emergency regimen

The emergency regimen is made up of GA1 specialist infant formula and glucose polymer powder. It is given regularly, day and night, to provide energy and help limit the build-up of harmful substances in the brain and body.

You should start the emergency regimen if your baby becomes unwell or is not tolerating their usual feeds. Your metabolic dietitian will teach you:

- how to prepare the emergency feed
- how much feed to give your baby
- how often you should feed your baby

Your GP will be asked to prescribe the glucose polymer powder.

The emergency regimen guidelines are available from the British Inherited Metabolic Diseases Group (BIMDG) website at bimdg.org.uk/site/guidelines.asp.

You should contact the metabolic team at the start of any illness to let them know your baby is unwell and that you have started the emergency regimen.

Signs of illness may include:

- high temperature
- vomiting
- cough/cold
- sore throat
- chest infection
- diarrhoea
- not being their usual self

A high temperature must be treated quickly.

You should take your baby to hospital immediately for further assessment if:

- they do not tolerate the emergency regimen
- they have an on-going high temperature
- their symptoms are getting worse

You should take with you any information you have been given about GA1, including your:

- emergency regimen instructions
- BIMDG guidelines
- L-carnitine
- lysine-free tryptophan-low infant formula
- glucose polymer powder and scoops

Long-term outlook

With treatment, the outcome is usually very good and most children will avoid any long-term health problems. The risk of severe brain damage is low after the age of 6 years. Dietary treatment may be relaxed in later childhood but the emergency regimen and L-carnitine will need to be continued.

Your other children

At-risk siblings

Children from the same parents have a 1 in 4 chance of having the condition. Your other children might be at risk of GA1 even if they have never shown any symptoms. It is therefore very important to get them tested if they have not been previously screened for GA1. Your metabolic team will be able to arrange this testing.

Future children

A new baby from the same parents will also have a 1 in 4 chance of having GA1. When you find out that you are pregnant, you should tell your midwife and GP there is a family history of GA1. You should also inform your metabolic team early in the pregnancy.

The metabolic team will write a birth plan for you. This will include advice on an early screening test for your new baby which should be taken between 24 and 48 hours after birth. This blood test will be in addition to the routine newborn blood spot screening test. The birth plan will be given to you and shared with your obstetrician and local midwifery team.

You should notify your metabolic team once you have given birth so they can ensure the correct blood tests are taken and sent to the screening laboratory without delay.

Confidentiality

The NHS Screening Programmes use personal information from your NHS records to invite you for screening at the right time. Public Health England also uses your information to ensure you receive high quality care and to improve the screening programmes. Find out more about how your information is used and protected, and your options at www.gov.uk/phe/screening-data.

More information and support

The metabolic team will be happy to discuss any queries you might have.

Further information can be found at www.metabolicsupportuk.org/. The Metabolic Support UK team can be contacted at:

- 0845 241 2173 or 0800 652 3181
- contact@metabolicsupportuk.org

The British Inherited Metabolic Diseases Group (BIMDG) website has the emergency regimen guidelines at bimdg.org.uk/site/guidelines.asp and a TEMPLE booklet about GA1 at bimdg.org.uk/site/temple.asp.

NHS.UK has information about GA1 at www.nhs.uk/conditions/glutaric-aciduria/ and newborn blood spot screening at www.nhs.uk/conditions/baby/newborn-screening/blood-spot-test/.

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