MSUD further information

This information is for parents if their baby is suspected of having MSUD or has been diagnosed with MSUD 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.

1. About MSUD

Maple syrup urine disease, or MSUD, is a rare but treatable inherited metabolic disorder that prevents the normal breakdown of protein. Babies with MSUD inherit 2 faulty copies of the gene for MSUD, 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 MSUD, an enzyme called branched-chain keto-acid dehydrogenase is missing, which leads to problems breaking down three amino acids: leucine, isoleucine and valine. Leucine and other related substances then build up to high and harmful levels in blood and the brain.

Babies with MSUD may present with symptoms of feeding problems, sleepiness and abnormal movements even before the newborn screening result is reported. They can progress to have fits and slip into a coma, which can lead to severe brain damage and can be life-threatening.

If MSUD is not treated promptly, it can lead to long-term health problems including brain damage, severe learning and physical difficulties, and behavioural problems. Newborn screening allows the diagnosis of MSUD to be made early which can improve the long-term outcome.

2. Screening and diagnosis of MSUD

2.1 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 some amino acids in the blood. A high level of the amino acid leucine suggests your baby may have MSUD. This is called a screen positive result, which you can see more about at https://www.gov.uk/government/publications/nhs-population-screening-glossary-of-terms/glossary-of-terms#screen-positive.

2.2 Diagnostic tests

If your baby has a screen positive result, you will be contacted by the metabolic team and instructed to immediately take your baby to the local hospital for admission, even if they are well.

Many babies with MSUD will already be unwell and may be in hospital before the screening result is reported.

The local hospital will start appropriate treatment for MSUD and arrange transfer to the metabolic specialist centre for further management. Blood tests will be carried out to confirm if your baby has MSUD, but treatment will be started based on the screening result as the condition can be life-threatening.

If your baby is very sick, they are likely to need intensive care. It is very important to bring down the high leucine levels in their blood as quickly as possible. To do this, breast feeds and normal infant formula will be stopped temporarily and your baby will be started on a specialised MSUD infant formula which does not contain leucine, isoleucine or valine. Some babies may also need haemodialysis which filters the blood to remove leucine and other harmful substances. These treatments will help your baby recover from the early symptoms.

If you want to breast feed, you will be encouraged to express breast milk as this can be re-started once your baby's leucine levels are much lower.

3. Treatment

Recovery from the initial symptoms is likely to take several days and your baby will remain at the metabolic specialist centre.

During this time, the metabolic team will:

- explain the condition in detail and answer any questions you might have
- explain the special diet, which includes:
- a restricted protein feeding plan
- a special feed to use during illnesses (called the emergency regimen)

- teach you how to do home blood tests (which you will need to post to the metabolic laboratory for them to monitor the levels of leucine, isoleucine and valine)
- 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.

3.1 The restricted protein feeding plan

The aim of the diet is to prevent the build-up of leucine and other harmful substances.

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

- a limited daily volume of breastmilk feeds (breast feeds or expressed breast milk) or infant formula
- a leucine, isoleucine and valine free infant formula
- supplements of isoleucine and valine may also be needed

Your baby will have weekly blood tests during the first year. Your metabolic dietitian will teach you how much of each feed to give based on the blood test results and your baby's weight. Following the dietetic instructions is very important for your baby's health.

Your GP will be asked to prescribe the leucine, isoleucine and valine free infant formula and the isoleucine and valine supplements. You will continue to have regular appointments with a metabolic dietitian who will advise on dietary management throughout the various stages of childhood.

4. 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 leucine and other related substances 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.

4.1 The emergency regimen

The emergency regimen is made up of MSUD specialist infant formula, isoleucine and valine supplements, 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 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 https://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:

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

You should take your baby to hospital immediately for further assessment if they do not tolerate the emergency regimen or their symptoms are getting worse.

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

- emergency regimen instructions
- BIMDG guidelines

- leucine, isoleucine and valine free infant formula
- isoleucine and valine supplements
- glucose polymer powder and scoops

5. Your other children

5.1 At-risk siblings

Children from the same parents have a 1 in 4 chance of having MSUD. Your metabolic team will discuss if testing is necessary for your other children.

5.2 Future children

A new baby from the same parents will also have a 1 in 4 chance of having MSUD. When you find out that you are pregnant, you should tell your midwife and GP there is a family history of MSUD. 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 12 and 24 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.

6. 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.

Find out how to opt out of screening at www.gov.uk/phe/screening-opt-out.

7. More information and support

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

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

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

The British Inherited Metabolic Diseases Group (BIMDG) website has a TEMPLE booklet about MSUD at http://www.bimdg.org.uk/site/temple.asp and emergency regiment guidelines at https://bimdg.org.uk/site/guidelines.asp.

NHS.UK has information about MSUD at https://www.nhs.uk/conditions/maple-syrup-urine-disease/ and about newborn blood spot screening at https://www.nhs.uk/conditions/baby/newborn-screening/blood-spot-test/.

Published July 2021

PHE supports the UN Sustainable Development Goals