Maple Syrup Urine Disease (MSUD) Information for Health Professionals

What is Maple Syrup Urine Disease?
Maple Syrup Urine Disease (MSUD) is a rare inherited disorder that prevents the breakdown of some of the building blocks of protein, the amino acids leucine, isoleucine and valine in the blood. Without treatment MSUD can lead to serious problems including coma and permanent brain damage.

The condition is named maple syrup urine disease because high levels of these amino acids can cause an unusual sweet smell in the urine and sweat.

What causes Maple Syrup Urine Disease?
MSUD occurs when a baby is born with neither copy of their gene to breakdown the amino acids leucine, isoleucine and valine functioning correctly. MSUD is an autosomal recessive disorder because both genes have an alteration (also known as a gene mutation).

Usually people eat more amino acids (building blocks of protein) than they need and the extra amino acids are broken down and removed from the body. People with MSUD are unable to breakdown the amino acids leucine, isoleucine and valine (these are also known as the branched chain amino acids). When the levels of these amino acids get very high, they are harmful.

There are three forms of MSUD: the classical (severe form of the disease), the intermediate form, and the intermittent (mild form of the disease). Most patients have the classical form of the disease.

What are the clinical effects?
People with MSUD are at risk of developing a metabolic crisis. This typically occurs in the first days or weeks of life but can occur later on in the first year of life or even later during childhood.

The symptoms that can develop in the newborn period include poor feeding, irritability, sleepiness, vomiting, breathing difficulties and fast breathing and coldness. If the baby is not treated they may deteriorate, have fits, go into a coma and are at risk of dying.

Sometimes a baby may not develop symptoms of a metabolic crisis until later during childhood and in these cases a crisis may be caused by having an illness such as an infection or upset stomach.

How common is Maple Syrup Urine Disease?
MSUD is a rare disease and affects about 1 in 116,000 babies born in the UK. It is estimated that there are about 500 cases in the UK.
that in Wales one baby will be born every three to four years with MSUD.

What are the benefits of screening for Maple Syrup Urine Disease?
Newborn bloodspot screening means that babies who have MSUD can be identified early and be given treatment, and parents can be made aware of the management of their baby if they become unwell. If babies are not screened for MSUD and they have the condition, the diagnosis may only be made if the baby or child develops symptoms including a metabolic crisis.

What is the treatment for Maple Syrup Urine Disease?
Treatment aims to reduce the build up of the harmful amino acids which can cause a metabolic crisis and learning difficulties. This is mainly dietary management and needs to be undertaken with the advice of a specialist metabolic team including a specialist dietitian. The patient has a low protein diet with regular blood monitoring and supplementation of essential amino acids.

All baby milks (including breast milk) contain more protein than can be tolerated by babies with MSUD. Breast feeding is encouraged but the amount of milk a baby with MSUD is given needs to be measured and controlled. A special baby milk which does not contain leucine, valine and isoleucine is given to meet dietary requirements.

Babies and children with MSUD are at risk of having a metabolic crisis when they have infections or an illness such as diarrhoea or vomiting. The risk of a crisis can be reduced by starting a special feed called the emergency regimen, which is a glucose polymer, and stopping protein-containing milk and food. It is also important to give a special amino acid formula with supplements to help control the levels of the harmful amino acids in the blood. The specialist metabolic dietitian advises the parents on how to give the emergency regimen. Parents are also advised of when they need to seek urgent medical care.

How effective is the treatment?
With early diagnosis and treatment, most children with MSUD develop normally. However patients need to stay on their low protein diet with supplements throughout life and will need to use their emergency regimen during illness.

Patients with the milder form of the disease, under specialists advice, can have a less restricted diet and may only need to avoid high protein foods and use their emergency regimen during illness.

What are the implications for other members of the family?
If parents have a child with MSUD, the risk of them having another affected child is 1 in 4 (25%). If the affected child has older siblings, the parents will be offered testing of those children for MSUD. If parents have other children in the future, the babies should be offered screening earlier than routine screening. This should be undertaken between one and two days after birth.

As MSUD is an inherited condition, parents can be offered and referred to specialist genetic services for further information and advice. Other family members may have concerns about the implications for them and can also be referred to specialist genetic services for advice and information.

Information adapted from the information resource for parents and professionals on the Expanded Newborn Screening Programme and Rare Conditions websites.

Further information available at: www.newbornbloodspotscreening.wales.nhs.uk
Support and information from other patients, parents and carers available from CLIMB (www.climb.org.uk) 0800 652 3181