
MCAD Deficiency – Fatty Acid Oxidation Defect (FAOD)

What are Fatty Acid Oxidation Defects?

FAODs occur when fats (fatty acids) cannot be broken down in the body. Fats are an important source of energy for the body, especially during periods of fasting. Fatty acids are transported into cells and then taken into the mitochondria to be broken down.

What is MCAD deficiency?

Fatty acids are made up of carbon chains. As these carbon chains are broken down, energy is released and the products of this process are used to make ketone bodies, another source of energy. MCAD (Medium Chain Acyl-Co-A dehydrogenase) is an enzyme responsible for breaking down carbon chains that are between four and 12 carbons long. Individuals who are missing this enzyme have an accumulation of these “medium-chain” fatty acids.

What is its incidence?

MCAD deficiency affects about 1 in every 10,000 babies born in Ontario.

What causes the disease?

Mutations in the gene for MCAD enzyme (ACADM) results in a deficient amount of enzyme or a defective enzyme.

What are the clinical features of the disease?

Although children with MCAD deficiency are normal at birth, during a period of fasting (such as during an illness), a child who was previously healthy may present with hypoketotic hypoglycemia, vomiting, lethargy, and seizures. This can progress quickly to coma and death. These children may also have acute liver disease and an enlarged liver. The first episode usually occurs between 3 months and two years of age. However, presentation is possible at all ages.

How is the diagnosis confirmed?

The diagnosis of MCAD deficiency can be made by measuring the level of medium chain acylcarnitines on Tandem Mass Spectrometry (MS/MS) analysis of a blood sample; individuals with MCAD deficiency have elevated levels. A specific urine organic acid profile, enzyme testing, or mutation analysis of the ACADM gene may also assist in confirming the diagnosis. Diagnostic testing is arranged by specialists at your regional treatment centre.

What is the treatment of the disease?

Frequent feedings ensure that a child with MCAD deficiency does not undergo any prolonged period of fasting. This is very effective in preventing metabolic crises and their sequelae. In an acute symptomatic episode, IV glucose should be given as soon as possible. Supplementation with carnitine and/or uncooked cornstarch as a source of glucose may also be considered. Treatment is coordinated by specialists at your regional treatment centre.

What is the outcome of treatment?

Twenty-five percent of untreated individuals with MCAD deficiency will die during their first episode and, of the remainder, half will have neurological impairment. If treatment is able to prevent this first metabolic crisis, children with MCAD deficiency have a good prognosis.

Can a family have more than one child with MCAD deficiency?

MCAD deficiency is inherited as an autosomal recessive disease. Parents of a child with MCAD deficiency are assumed to be carriers for the disease and have a 1 in 4 (25%) chance, in each pregnancy, of having another child with this condition. Prenatal testing for MCAD deficiency can be done as early

as 10-12 weeks of pregnancy. Genetic counselling to discuss the benefits of prenatal testing options in more detail is recommended.

Unaffected siblings of a child with MCAD deficiency have a 2/3 chance of being carriers. MCAD carriers are healthy and do not have symptoms of the disease.

Resources

<http://www.fodsupport.org/>

<http://www.geneclinics.org>