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My46 Trait Profile

Medium-chain acyl-CoA dehydrogenase deficiency

Medium-chain acyl-coA dehydrogenase deficiency is a metabolic disorder caused by an inability to break down certain fats. It is caused by mutations in the ACADM gene that makes the medium-chain acyl-coenzyme A dehydrogenase enzyme.

Characteristics of Medium-chain acyl-CoA dehydrogenase deficiency

Medium-chain acyl-coA dehydrogenase (MCAD) deficiency is a metabolic disorder that is characterized by the body's inability to break down certain fats as a source of energy for the brain and other organs. Symptoms of MCAD deficiency often present when a child is in a "fasting state," meaning when they are not eating. If a child with MCAD deficiency goes too long without eating, he/she often develop symptoms such as lethargy (tired and weak), vomiting, and sometimes seizures. Blood tests performed when a child has these symptoms often show low sugar levels (i.e., hypoglycemia). If the fasting state continues, stress is put on the liver and the heart, and they may stop functioning properly. In rare cases, symptoms can progress to coma and death. These episodes of acute symptoms are called "crises." A crisis can also occur when a child is sick, because the body requires more energy to function normally during illness.

These symptoms are due to the body's inability to use fat for energy. All organs require energy to function properly. Food provides this necessary energy. When a person eats, they use sugar from the food for energy, and they store fat from the food to use for energy later. Once the sugar is used up, the stored fat is broken down to provide energy for the organs. However, a person with MCAD deficiency cannot effectively use this stored fat. For this reason, they must maintain a regular eating schedule to ensure a constant supply of energy in the form of sugar.

If a person with MCAD deficiency has many "crises" early in life, they may develop lasting symptoms, such as delayed development, attention deficit disorder, and chronic muscle weakness. If crises are avoided in childhood, development will not be impacted, and no chronic symptoms will arise from MCAD deficiency. Though rare, adolescents and adults with MCAD deficiency can have life-threatening crises, and therefore, awareness and management is required throughout life.

Diagnosis/Testing

Individuals with MCAD deficiency have changes or mutations in a gene called ACADM. This gene makes an enzyme called medium chain acyl-coA dehydrogenase. This enzyme is responsible for breaking down fats of medium chain-length to use for energy. Mutations in the ACADM gene decrease the amount of the enzyme in the body, and impair the breakdown of medium-chain fats for energy.

In the United States and in many other countries, babies are tested for MCAD deficiency at birth as part of mandatory newborn screening. This allows the diagnosis to be made in infancy so that crises and chronic symptoms can be prevented. Since the addition of MCAD deficiency to the newborn screen, health outcomes for children with this condition have improved drastically. MCAD deficiency can also be diagnosed by a blood test called an acylcarnitine profile. This test looks at the levels of fat in the blood. High levels of fats of medium chain-length are highly suggestive of MCAD deficiency.

Management/Surveillance

The primary management for MCAD deficiency is to avoid fasting. During infancy, regular feedings are critical.

During childhood, attention is paid to the child's eating patterns. If the infant or child is ill or is not eating, he/she should go to the emergency room, regardless of the presence or absence of symptoms of crisis. In the emergency room, fluids with glucose will be given by IV. All individuals with MCAD deficiency, regardless of age, should have an "ER Letter" that describes MCAD deficiency and explains to what treatment the individual requires.

Carnitine supplementation is often prescribed for individuals with MCAD deficiency. Carnitine is a chemical produced by the body that helps it to break down fats to make energy.

Mode of inheritance

MCAD deficiency is inherited in an autosomal recessive pattern. This means that an individual has to inherit two ACADM mutations (i.e., one from each parent) to be affected with MCAD deficiency. If both parents are carriers of a ACADM mutation, they have a 1 in 4 (25%) chance with each pregnancy of having a child with MCAD deficiency. Babies born in the United States are screened for MCAD deficiency by newborn screening.

Risk to family members

Parents of a child with MCAD deficiency are carriers of MCAD deficiency. If a sibling of a child with MCAD deficiency is unaffected, he/she has a 2 in 3 (or 66%) chance of being a carrier of MCAD deficiency.

Special considerations

None

Resources

Fatty Acid Oxidation Family Support Group
http://www.fodsupport.org
Genetics Home Reference: Medium-chain acyl-CoA dehydrogenase deficiency
http://ghr.nlm.nih.gov/condition/medium-chain-acyl-coa-dehydrogenase-deficiency
Medical Home Portal: MCADD
http://www.medicalhomeportal.org/diagnoses-and-conditions/mcadd/description

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