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My46 Trait Profile

Muscle phosphorylase kinase deficiency

Other Names: Muscle phosphorylase b kinase deficiency

Muscle phosphorylase kinase deficiency is a rare condition characterized by the body's inability to fully break down stored glucose called glycogen. It is caused by mutations in the PHKA1 gene that makes a subunit of the phosphorylase b kinase enzyme.

Characteristics of Muscle phosphorylase kinase deficiency

Muscle phosphorylase kinase deficiency (muscle PhK deficiency) is caused by a deficiency of an enzyme called phosphorylase b kinase (PhK). PhK helps to break down glycogen, the storage form of glucose, into glucose. Glucose is a sugar that the body uses for energy. In people with muscle PhK deficiency, glycogen builds up in the muscles. In some people, deficiency of muscle PhK has no obvious effect or causes very few symptoms. However, in others, muscle fatigue, pain, cramping, and muscle breakdown especially during exercise are commonly seen. Muscle breakdown (rhabdomyolysis) can cause a muscle protein called myoglobin to be excreted in urine (myoglobinuria) in some affected individuals. This makes the urine a dark color and can cause kidney problems. Symptoms can appear at any time from childhood to adulthood.

Diagnosis/Testing

Muscle PhK deficiency is caused by a lack of the PhK enzyme. How well the PhK enzyme works (i.e. its activity) can be measured in a muscle biopsy sample. The amount of glycogen in a muscle sample can also be measured and may be elevated.

Genetic testing is also available. Changes or mutations in the PHKA1 gene have been found in some, but not all, people with muscle PhK deficiency. This gene makes a part or subunit of the PhK enzyme. Mutations in this gene may result in the enzyme not working properly.

Management/Surveillance

Management of muscle PhK deficiency often involves regular physical therapy. Intense exercise is typically avoided as it may cause rhabdomyolysis and muscle cramping. Lipid-lowering drugs (e.g. statins) should be used cautiously as they may worsen symptoms. Precautions for malignant hyperthermia (adverse reaction to specific anesthetics) should be taken if general anesthesia is required.

Mode of inheritance

Muscle PhK deficiency is inherited in an X-linked recessive pattern. The gene mutations causing this type of inheritance are found on the X chromosome. An X-linked recessive pattern means that in females, both copies of the gene (i.e., one on each X chromosome) must have a change or mutation, whereas in males, only one copy of the gene must have a mutation to be affected. A female with a mutation in one copy of the PHKA1 gene on the X chromosome is said to be a carrier of muscle PhK deficiency.

Risk to family members

If a father is affected with muscle PhK deficiency, his daughters will be carriers of muscle PhK deficiency and his sons will be unaffected. If a mother is a carrier of muscle PhK deficiency, each daughter has a 1 in 2 chance (50%) of being a carrier and each son has a 1 in 2 chance (50%) of being affected with muscle PhK deficiency. Some carrier females have symptoms of muscle PhK deficiency although they are usually milder than the symptoms seen in males.

Special considerations

None

Resources

Association of Glycogen Storage Disease
http://www.agsdus.org/
Genetics Home Reference: Glycogen storage disease type IX
http://ghr.nlm.nih.gov/condition/glycogen-storage-disease-type-ix

References

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