Lesch-Nyhan Syndrome

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Lesch-Nyhan syndrome is a condition that occurs almost exclusively in males. It is characterized by neurological and behavioral abnormalities and the overproduction of uric acid. Uric acid is a waste product of normal chemical processes and is found in blood and urine.

Keywords: genetic conditions

1. Introduction

Excess uric acid can be released from the blood and build up under the skin and cause gouty arthritis (arthritis caused by an accumulation of uric acid in the joints). Uric acid accumulation can also cause kidney and bladder stones.

The nervous system and behavioral disturbances experienced by people with Lesch-Nyhan syndrome include abnormal involuntary muscle movements, such as tensing of various muscles (dystonia), jerking movements (chorea), and flailing of the limbs (ballismus). People with Lesch-Nyhan syndrome usually cannot walk, require assistance sitting, and generally use a wheelchair. Self-injury (including biting and head banging) is the most common and distinctive behavioral problem in individuals with Lesch-Nyhan syndrome.

2. Frequency

The prevalence of Lesch-Nyhan syndrome is approximately 1 in 380,000 individuals. This condition occurs with a similar frequency in all populations.

3. Causes

Mutations in the *HPRT1* gene cause Lesch-Nyhan syndrome. The *HPRT1* gene provides instructions for making an enzyme called hypoxanthine phosphoribosyltransferase 1. This enzyme is responsible for recycling purines, a type of building block of DNA and its chemical cousin RNA. Recycling purines ensures that cells have a plentiful supply of building blocks for the production of DNA and RNA.

HPRT1 gene mutations that cause Lesch-Nyhan syndrome result in a severe shortage (deficiency) or complete absence of hypoxanthine phosphoribosyltransferase 1. When this enzyme is lacking, purines are broken down but not recycled, producing abnormally high levels of uric acid. For unknown reasons, a deficiency of hypoxanthine phosphoribosyltransferase 1 is associated with low levels of a chemical messenger in the brain called dopamine. Dopamine transmits messages that help the brain control physical movement and emotional behavior, and its shortage may play a role in the movement problems and other features of this disorder. However, it is unclear how a shortage of hypoxanthine phosphoribosyltransferase 1 causes the neurological and behavioral problems characteristic of Lesch-Nyhan syndrome.

Some people with *HPRT1* gene mutations produce some functional enzyme. These individuals are said to have Lesch-Nyhan variant. The signs and symptoms of Lesch-Nyhan variant are often milder than those of Lesch-Nyhan syndrome and do not include self-injury.

3.1. The gene associated with Lesch-Nyhan syndrome

- HPRT1

4. Inheritance

This condition is inherited in an X-linked recessive pattern. The gene associated with this condition is located on the X chromosome, which is one of the two sex chromosomes. In males (who have only one X chromosome), one altered copy of the gene in each cell is sufficient to cause the condition. In females (who have two X chromosomes), a mutation would have to occur in both copies of the gene to cause the disorder. Because it is unlikely that females will have two altered copies of this gene, males are affected by X-linked recessive disorders much more frequently than females. A characteristic of X-linked inheritance is that fathers cannot pass X-linked traits to their sons.

5. Other Names for This Condition

- choreoathetosis self-mutilation syndrome
- complete HPRT deficiency
- complete hypoxanthine-guanine phosphoribosyltransferase deficiency
- deficiency of guanine phosphoribosyltransferase
- deficiency of hypoxanthine phosphoribosyltransferase
- HGPRT deficiency
- hypoxanthine guanine phosphoribosyltransferase deficiency
- hypoxanthine phosphoribosyltransferase deficiency
- juvenile gout, choreoathetosis, mental retardation syndrome
- juvenile hyperuricemia syndrome
- Lesch-Nyhan disease
- LND
- LNS
- primary hyperuricemia syndrome
- total HPRT deficiency
- total hypoxanthine-guanine phosphoribosyl transferase deficiency
- X-linked hyperuricemia
- X-linked primary hyperuricemia
- X-linked uric aciduria enzyme defect

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