GPC3 Gene

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Glypican 3

genes

1. Introduction

The *GPC3* gene provides instructions for making a protein called glypican 3. This protein is one of several glypicans in humans, each of which consists of a core protein attached to long sugar molecules called heparan sulfate chains. Glypicans are anchored to the outer cell membrane, where they interact with a variety of other proteins outside the cell. Glypicans appear to play important roles in development before birth. These proteins are involved in numerous cell functions, including regulating cell growth and division (cell proliferation) and cell survival.

Several studies have found that glypican 3 interacts with other proteins at the surface of cells to restrain cell proliferation. Specifically, glypican 3 blocks (inhibits) a developmental pathway called the hedgehog signaling pathway. This pathway is critical for cell proliferation, cell specialization, and the normal shaping (patterning) of many parts of the body during embryonic development.

Researchers believe that in some cell types, glypican 3 may act as a tumor suppressor, which is a protein that prevents cells from growing and dividing in an uncontrolled way to form a cancerous tumor. Glypican 3 may also cause some types of cells to self-destruct (undergo apoptosis) when they are no longer needed, which can help keep growth in check.

Although glypican 3 is known primarily as an inhibitor of cell growth and cell division, in some tissues it appears to have the opposite effect. Research suggests that in certain types of cells, such as cells in the liver, glypican 3 may interact with proteins called growth factors to promote cell growth and cell division.

2. Health Conditions Related to Genetic Changes

2.1. Simpson-Golabi-Behmel syndrome

More than 50 mutations in the *GPC3* gene have been identified in people with Simpson-Golabi-Behmel syndrome. This condition is classified as an overgrowth syndrome, which means that affected infants are considerably larger

than normal at birth (macrosomia) and continue to grow and gain weight at an unusual rate. The condition can also be associated with a variety of other birth defects and health problems.

Most of the mutations that cause Simpson-Golabi-Behmel syndrome delete part or all of the *GPC3* gene, which prevents cells from producing functional glypican 3. Other mutations insert or delete a small amount of genetic material in the gene, or change one or a few protein building blocks (amino acids) in glypican 3. These mutations change the structure of the protein.

Mutations in the *GPC3* gene prevent glypican 3 from inhibiting the hedgehog signaling pathway. The resulting overactivity of this pathway leads to an increased rate of cell growth and division starting before birth. This increased cell proliferation accounts, at least in part, for the overgrowth that occurs in Simpson-Golabi-Behmel syndrome. It is unclear how changes in hedgehog signaling contribute to the other abnormalities that can occur with this disorder.

3. Other Names for This Gene

- DGSX
- glypican proteoglycan 3
- glypican-3
- GPC3_HUMAN
- GTR2-2
- Intestinal protein OCI-5
- MXR7
- OCI-5
- SGBS1

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