H19 gene

H19 imprinted maternally expressed transcript

Normal Function

The *H19* gene provides instructions for making a molecule of RNA, a chemical cousin of DNA. This RNA molecule is noncoding, which means that it does not contain instructions for making a protein. Researchers believe that this noncoding RNA acts as a tumor suppressor, keeping cells from growing and dividing too fast or in an uncontrolled way. The *H19* gene is highly active in various tissues before birth and appears to play an important role in early development.

In most cases, people receive one copy of each gene from the egg cell and one copy from the sperm cell. Both copies are typically active, or "turned on," in cells. However, the activity of the *H19* gene depends on whether the gene comes from the egg cell or the sperm cell. Typically, only the *H19* gene inherited from the egg cell is active. This parent-specific difference in gene activation is called genomic imprinting.

A nearby region of DNA regulates the genomic imprinting of the *H19* gene and another gene, called *IGF2,* that is important for growth and development. This region is known as an imprinting center or imprinting control region. In a process known as methylation, small molecules called methyl groups are added to the imprinting center to regulate the activity of the *H19* and *IGF2* genes. Typically, only the *H19* imprinting center that is derived from the sperm cell is methylated.

Health Conditions Related to Genetic Changes

Beckwith-Wiedemann syndrome

Beckwith-Wiedemann syndrome, a growth disorder that affects many parts of the body, can be caused by changes that affect the imprinting centers. In some people with this condition, both copies of the *H19* imprinting center are methylated. Because this imprinting center controls the genomic imprinting of the *H19* and *IGF2* genes, this abnormality disrupts the regulation of both genes. Specifically, abnormal methylation of this imprinting center decreases *H19* gene activity and increases *IGF2* gene activity in many tissues. These changes lead to the overgrowth seen in people with Beckwith-Wiedemann syndrome.

In a few cases, Beckwith-Wiedemann syndrome has been caused by deletions of a

small amount of DNA from the *H19* imprinting center. These deletions impair the imprinting center's ability to regulate the activity of the *H19* and *IGF2* genes.

Breast cancer

MedlinePlus Genetics provides information about Breast cancer

Silver-Russell syndrome

Changes in methylation are responsible for most cases of Silver-Russell syndrome, a disorder that is characterized by slow growth before and after birth.

In people with Silver-Russell syndrome, the *H19* imprinting center derived from the sperm cell often has fewer methyl groups than it should (hypomethylation). Hypomethylation of the imprinting center impairs its ability to regulate genes and leads to increased activity of the *H19* gene and decreased activity of the *IGF2* gene, which causes the slow growth seen in people with Silver-Russell syndrome.

Wilms tumor

Methylation changes have also been found in some cases of Wilms tumor, a rare form of kidney cancer that occurs almost exclusively in children.

In some people with Wilms tumor, both copies of the *H19* imprinting center are methylated. This change leads to decreased *H19* gene activity and increased *IGF2* gene activity in kidney cells, which can cause the uncontrolled cell growth and tumor development seen in people with Wilms tumor. As this mechanism is similar to the one that causes Beckwith-Wiedemann syndrome, some individuals with Beckwith-Wiedemann syndrome will also develop Wilm's tumor.

In most cases, the abnormal methylation and subsequent changes in *H19* and *IGF2* gene activity are acquired during a person's lifetime (somatic) and are present only in the kidneys.

Other Names for This Gene

- ASM
- D11S813E
- H19, imprinted maternally expressed transcript (non-protein coding)
- LINC00008
- MIR675HG
- NCRNA00008

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of H19 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=283120[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28H19%5BTI%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1080+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- H19, IMPRINTED MATERNALLY EXPRESSED NONCODING TRANSCRIPT; H19 (https://omim.org/entry/103280)
- H19/IGF2-IMPRINTING CONTROL REGION (https://omim.org/entry/616186)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/283120)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=H19[gene])

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Genomic Location

The *H19* gene is found on chromosome 11 (https://medlineplus.gov/genetics/chromosome/11/).

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