EP300 gene

E1A binding protein p300

Normal Function

The *EP300* gene provides instructions for making a protein called p300, which regulates the activity of many genes in tissues throughout the body. This protein plays an essential role in controlling cell growth and division and prompting cells to mature and take on specialized functions (differentiate). The p300 protein appears to be critical for normal development before and after birth.

The p300 protein carries out its functions by turning on (activating) transcription, which is the first step in the production of protein from the instructions stored in DNA. The p300 protein ensures the DNA is ready for transcription by attaching a small molecule called an acetyl group (a process called acetylation) to proteins called histones. Histones are structural proteins that bind DNA and give chromosomes their shape. Acetylation of the histone changes the shape of the chromosome, making genes available for transcription. On the basis of this function, the p300 protein is called a histone acetyltransferase.

In addition, the p300 protein connects other proteins that start the transcription process (known as transcription factors) with the group of proteins that carries out transcription. On the basis of this function, the p300 protein is called a transcriptional coactivator.

Health Conditions Related to Genetic Changes

Rubinstein-Taybi syndrome

More than 80 mutations in the *EP300* gene have been identified in people with Rubinstein-Taybi syndrome, a condition characterized by short stature, moderate to severe intellectual disability, distinctive facial features, and broad thumbs and first toes. Genetic changes in the *EP300* gene cause a small percentage of cases of this condition. Some mutations lead to the production of an abnormally small, nonfunctional version of the p300 protein, while other mutations prevent one copy of the gene from making any protein at all. These genetic changes all result in the loss of one functional copy of the *EP300* gene in each cell, which reduces the amount of p300 protein by half. Although researchers are uncertain how a reduction in the amount of this protein leads to the specific features of Rubinstein-Taybi syndrome, it is clear that changes in the *EP300* gene disrupt normal development before and after birth. Problems with development of

multiple systems are thought to underlie the features of Rubinstein-Taybi syndrome.

Bladder cancer

MedlinePlus Genetics provides information about Bladder cancer

Prostate cancer

MedlinePlus Genetics provides information about Prostate cancer

Other disorders

Mutations in the *EP300* gene are a very rare cause of a condition called Menke-Hennekam syndrome. While this condition shares some features with Rubinstein-Taybi syndrome (described above), such as intellectual disability and growth delays, individuals with Menke-Hennekam syndrome do not have the facial features and thumb and toe abnormalities characteristic of Rubinstein-Taybi syndrome. Other features of Menke-Hennekam syndrome are variable and can include vision or hearing impairment, recurrent seizures (epilepsy), frequent airway infections, and autistic behaviors that affect communication.

The *EP300* gene mutations that cause Menke-Hennekam syndrome occur in regions of the gene known as exon 30 or exon 31. They result in changes to single protein building blocks (amino acids) in the p300 protein. Researchers suggest that these changes give the altered protein a new function, which disrupts development and causes the signs and symptoms of Menke-Hennekam syndrome.

Cancers

Rarely, chromosomal rearrangements (translocations) involving chromosome 22 have been associated with certain types of cancer. These genetic changes are somatic, which means they are acquired during a person's lifetime and are present only in certain cells. In cancer cells, translocations can disrupt the region of chromosome 22 that contains the *EP300* gene. For example, researchers have found a translocation between chromosome 8 and chromosome 22 in several people with a cancer of blood-forming cells called acute myeloid leukemia (AML). Another translocation, involving chromosomes 11 and 22, has been found in a small number of people who have undergone cancer treatment. This chromosomal change is associated with the development of AML following chemotherapy for other forms of cancer.

Somatic mutations in the *EP300* gene have been identified in several other types of cancer. These mutations prevent the gene from producing any functional protein. Cells without the p300 protein cannot effectively restrain growth and division, allowing cancerous tumors to develop and grow. Somatic mutations in the *EP300* gene have been found in a small number of solid tumors, including cancers of the colon and rectum, stomach, breast, and pancreas. Studies suggest that *EP300* mutations may also play a role in the development of some prostate cancers. These genetic changes could help predict whether prostate tumors will increase in size or spread to other parts of the body.

Other Names for This Gene

- E1A-associated protein p300
- E1A-binding protein, 300kD
- EP300_HUMAN
- p300
- p300 E1A-Associated Coactivator

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of EP300 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=2033[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28EP300%5BTI%5D%29+OR+%28E1A+binding+protein+p300%5BTI%5D%29%29+OR+%28%28E1A-binding+protein,+300kD%5BTI%5D%29+OR+%28p300%5BTI%5D%29+OR+%28p300+E1A-Associated+Coactivator%5BTI%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+720+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- COLORECTAL CANCER; CRC (https://omim.org/entry/114500)
- PROSTATE CANCER (https://omim.org/entry/176807)
- LEUKEMIA, ACUTE MYELOID; AML (https://omim.org/entry/601626)
- E1A-BINDING PROTEIN, 300-KD; EP300 (https://omim.org/entry/602700)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/2033)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=EP300[gene])

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Genomic Location

The *EP300* gene is found on chromosome 22 (https://medlineplus.gov/genetics/chromosome/22/).

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