MBD5 gene

methyl-CpG binding domain protein 5

Normal Function

The *MBD5* gene is one of a family of genes called the methyl-CpG-binding domain (MBD) genes. These genes provide instructions for making proteins that help regulate gene activity (expression) by modifying chromatin, the complex of DNA and protein that packages DNA into chromosomes. The MBD5 protein is likely involved in regulating gene expression and controlling the production of proteins that are involved in neurological functions such as learning, memory, and behavior. The MBD5 protein also seems to play a role in the growth and division (proliferation) and maturation (differentiation) of various types of cells.

Health Conditions Related to Genetic Changes

MBD5-associated neurodevelopmental disorder

Mutations in the *MBD5* gene have been found to cause *MBD5*-associated neurodevelopmental disorder (MAND). MAND is a condition that affects neurological and physical development from birth. Affected individuals often have intellectual disability, developmental delay, impaired speech, sleep problems, distinctive facial features, and mild hand and foot abnormalities. Most people with MAND also have features similar to autism spectrum disorder, a developmental condition that affects communication and social interaction.

Some *MBD5* gene mutations that cause MAND delete large segments of the *MBD5* gene or result in the production of an altered protein with no function. These mutations affect one copy of the gene in each cell. As a result, there is less MBD5 protein available to regulate the expression of certain genes, leading to uncontrolled protein production. Proteins that play a role in neurological functions are particularly affected, which helps explain why MAND impacts brain development and behavior.

Additionally, an extra copy of the *MBD5* gene or a loss of the whole gene in each cell can cause MAND. In these cases, MAND results from abnormal copying (duplication) or removal (deletion) of a small piece of the long (q) arm of chromosome 2 at position 2q23.1. The duplicated or deleted segments can vary in size but always include the *MBD5* gene, and often additional genes. Researchers believe that *MBD5* gene changes underlie most of the signs and symptoms of MAND. Features of the condition generally

do not differ based on the genetic cause, although they can vary between individuals.

Other Names for This Gene

- methyl-CpG-binding domain protein 5
- methyl-CpG-binding protein MBD5

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of MBD5 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=55777[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28MBD5%5BTIAB%5D%29+OR+%28methyl-CpG+binding+domain+protein+5%5BTIAB%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+3600+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- METHYL-CpG-BINDING DOMAIN PROTEIN 5; MBD5 (https://omim.org/entry/611472)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/55777)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=MBD5[gene])

References

- Mullegama SV, Rosenfeld JA, Orellana C, van Bon BW, Halbach S, Repnikova EA, Brick L, Li C, Dupuis L, Rosello M, Aradhya S, Stavropoulos DJ, Manickam K, Mitchell E, Hodge JC, Talkowski ME, Gusella JF, Keller K, Zonana J, Schwartz S, Pyatt RE, Waggoner DJ, Shaffer LG, Lin AE, de Vries BB, Mendoza-Londono R, ElseaSH. Reciprocal deletion and duplication at 2q23.1 indicates a role for MBD5 inautism spectrum disorder. Eur J Hum Genet. 2014 Jan;22(1):57-63. doi:10.1038/ejhg.2013.67. Epub 2013 May 1. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/23632792) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3865402/)
- Tadros S, Wang R, Waters JJ, Waterman C, Collins AL, Collinson MN, Ahn JW,

Josifova D, Chetan R, Kumar A. Inherited 2q23.1 microdeletions involving theMBD5 locus. Mol Genet Genomic Med. 2017 Aug 8;5(5):608-613. doi:10.1002/mgg3.316. eCollection 2017 Sep. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/28944244) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5606852/)

- Talkowski ME, Mullegama SV, Rosenfeld JA, van Bon BW, Shen Y, Repnikova EA, Gastier-Foster J, Thrush DL, Kathiresan S, Ruderfer DM, Chiang C, Hanscom C, Ernst C, Lindgren AM, Morton CC, An Y, Astbury C, Brueton LA, Lichtenbelt KD, Ades LC, Fichera M, Romano C, Innis JW, Williams CA, Bartholomew D, Van Allen MI,Parikh A, Zhang L, Wu BL, Pyatt RE, Schwartz S, Shaffer LG, de Vries BB, GusellaJF, Elsea SH. Assessment of 2q23.1 microdeletion syndrome implicates MBD5 as asingle causal locus of intellectual disability, epilepsy, and autism spectrumdisorder. Am J Hum Genet. 2011 Oct 7;89(4):551-63. doi:10.1016/j.ajhg.2011.09.011. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/21981781) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3188839/)
- Walz K, Young JI. The methyl binding domain containing protein MBD5 is atranscriptional regulator responsible for 2q23.1 deletion syndrome. Rare Dis.2014 Nov 3;2(1):e967151. doi: 10.4161/2167549X.2014.967151. eCollection 2014. Erratum In: doi: 10.15252/emmm.201404044. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/26942102) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4755234/)

Genomic Location

The *MBD5* gene is found on chromosome 2 (https://medlineplus.gov/genetics/chromosome/2/).

Last updated September 1, 2018