ITM2B Gene

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Contributor: Dean Liu

Integral membrane protein 2B

genes

1. Introduction

The *ITM2B* gene provides instructions for producing a protein called the integral membrane protein 2B (ITM2B), which is found in all tissues. The function of the ITM2B protein is unclear. It is thought to play a role in triggering the self-destruction of cells (apoptosis) and in keeping cells from growing and dividing too fast or in an uncontrolled way (suppressing tumor formation). Additionally, the ITM2B protein may be involved in processing the amyloid precursor protein, which is produced by the *APP* gene. Not much is known about amyloid precursor protein function, but it is thought to be involved in nerve cell function in the brain in early development. Processing this protein creates different forms of the protein that can carry out various functions. Research suggests that the ITM2B protein is also involved in preventing (inhibiting) a form of the amyloid precursor protein from accumulating in the body's cells and tissues.

2. Health Conditions Related to Genetic Changes

2.1. Hereditary Cerebral Amyloid Angiopathy

Two mutations in the *ITM2B* gene have been found to cause a condition called hereditary cerebral amyloid angiopathy. When this condition is caused by mutations in the *ITM2B* gene, it is characterized by movement problems and a decline in intellectual function (dementia). *ITM2B* gene mutations cause two forms of the condition called familial British dementia and familial Danish dementia, named for the regions where the conditions were first diagnosed. The *ITM2B* gene mutation that causes the British type results in the production of a protein that is longer than normal. The ITM2B protein normally has a stop signal that indicates where to stop the protein sequence so that all the ITM2B proteins that are made are the same. The mutation that causes the British type changes the stop signal so that more length is added to the protein. This mutation is written as Ter267Arg or X267R. The mutation that causes the Danish type is similar, but instead of changing the stop signal, extra pieces of DNA are added to the gene, which means that the protein is longer. This mutation is written as 795-796insTTTAATTTGT.

The *ITM2B* gene mutations that cause the British type or the Danish type produce elongated proteins, known as ABri or ADan respectively, with altered 3-dimensional shapes that tend to cluster together (aggregate). These aggregated proteins form clumps called amyloid deposits, which accumulate in specific areas of the brain and in its blood vessels. The amyloid deposits, known as plaques, trigger activation of the complement system, which is a group of immune system proteins that work together to destroy pathogens, trigger inflammation, and remove debris from cells and tissues. Other immune system reactions are also activated, which all attack the area surrounding the deposit. The complement system and other reactions lead to cell death and tissue damage in various parts of the brain. These abnormalities underlie the signs and symptoms of the familial British dementia and familial Danish dementia types of hereditary cerebral amyloid angiopathy.

3. Other Names for This Gene

- ABRI
- BRI2
- BRICD2B
- E25B
- ITM2B_HUMAN

References

1. Fotinopoulou A, Tsachaki M, Vlavaki M, Poulopoulos A, Rostagno A, Frangione B,Ghiso J, Efthimiopoulos S. BRI2 interacts with amyloid precursor protein (APP)and regulates amyloid beta (Abeta) production. J Biol Chem. 2005 Sep2;280(35):30768-72.
2. Ghiso J, Rostagno A, Tomidokoro Y, Lashley T, Bojsen-Møller M, Braendgaard H, Plant G, Holton J, Lal R, Revesz T, Frangione B. Genetic alterations of the BRI2 gene: familial British and Danish dementias. Brain Pathol. 2006 Jan;16(1):71-9.
3. Kim J, Miller VM, Levites Y, West KJ, Zwizinski CW, Moore BD, Troendle FJ,Bann M, Verbeeck C, Price RW, Smithson L, Sonoda L, Wagg K, Rangachari V, Zou F, Younkin SG, Graff-Radford N, Dickson D, Rosenberry T, Golde TE. BRI2 (ITM2b)inhibits Abeta deposition in vivo. J Neurosci. 2008 Jun 4;28(23):6030-6. doi:10.1523/JNEUROSCI.0891-08.2008.
4. Revesz T, Ghiso J, Lashley T, Plant G, Rostagno A, Frangione B, Holton JL.Cerebral amyloid angiopathies: a pathologic, biochemical, and genetic view. JNeuropathol Exp Neurol. 2003 Sep;62(9):885-98. Review.

5. Revesz T, Holton JL, Lashley T, Plant G, Frangione B, Rostagno A, Ghiso J.Genetics and molecular pathogenesis of sporadic and hereditary cerebral amyloidangiopathies. Acta Neuropathol. 2009 Jul;118(1):115-30. doi:10.1007/s00401-009-0501-8.Neuropathol. 2009 Aug;118(2):321.