GRIN2B-related neurodevelopmental disorder

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Description

GRIN2B-related neurodevelopmental disorder is a condition that affects the nervous system. Neurodevelopmental disorders result from impaired growth and development of the central nervous system, which includes the brain and spinal cord, and the nerves connecting them. These disorders often affect learning ability, memory, and behavior and can be associated with other neurological problems.Individuals with GRIN2B-related neurodevelopmental disorder have mild to profound intellectual disability and delayed development of speech and motor skills, such as sitting and walking. Some affected individuals never develop speech or the ability to walk on their own. Many people with this condition have weak muscle tone (hypotonia), which can contribute to the problems developing motor skills and lead to difficulty eating. Some affected individuals have abnormal muscle stiffness (spasticity), which can also cause problems with movement.Recurrent seizures (epilepsy) occur in about half of people with GRIN2B-related neurodevelopmental disorder. About one-quarter of affected individuals have features of autism spectrum disorder, which is characterized

by impaired communication and social interaction. Affected individuals may also be hyperactive, impulsive, or easily distractible, and some are described as being overly friendly. Sleeping difficulties can also occur in this condition.Less common features of GRIN2B-related neurodevelopmental disorder include structural brain abnormalities, an unusually small head size (microcephaly), impaired vision, and involuntary muscle movements.

Frequency

The prevalence of GRIN2B-related neurodevelopmental disorder is unknown. Fewer than 100 cases have been reported in the medical literature.

Causes

GRIN2B-related neurodevelopmental disorder is caused by mutations in a gene called GRIN2B. This gene provides instructions for making a protein called GluN2B, which is found in nerve cells (neurons) in the brain primarily during development before birth. This protein is a part of specialized protein structures called NMDA receptors, which are involved in normal brain development, changes in the brain in response to experience (synaptic plasticity), learning, and memory.Some GRIN2B gene mutations lead to production of a nonfunctional GluN2B protein or prevent the production of any GluN2B protein from one copy of the gene in each cell. A shortage of this protein may reduce the number of functional NMDA receptors, which would decrease receptor activity in cells. Other mutations lead to production of abnormal GluN2B proteins that likely alter how the NMDA receptors function; some mutations reduce NMDA receptor signaling while others increase it. Researchers are unsure how abnormal activity of NMDA receptors prevents normal growth and development of the brain or why too much or too little activity lead to similar neurological problems in people with

GRIN2B-related neurodevelopmental disorder.

Learn more about the gene associated with GRIN2B-related neurodevelopmental disorder

GRIN2B

Inheritance

This condition is inherited in an autosomal dominant pattern, which means one copy of the altered gene in each cell is sufficient to cause the disorder.Most cases of this condition result from new (de novo) mutations in the gene that occur during the formation of reproductive cells (eggs or sperm) in an affected individual's parent or in early embryonic development. These cases occur in people with no history of the disorder in their family.

Other Names for This Condition

EIEE27 Epileptic encephalopathy, early infantile, 27 GRIN2B encephalopathy GRIN2B related syndrome

Additional Information & Resources

Genetic Testing Information

Genetic Testing Registry: Developmental and epileptic encephalopathy, 27

Genetic Testing Registry: Intellectual disability, autosomal dominant 6

Patient Support and Advocacy Resources

National Organization for Rare Disorders (NORD)

Catalog of Genes and Diseases from OMIM

DEVELOPMENTAL AND EPILEPTIC ENCEPHALOPATHY 27; DEE27

INTELLECTUAL DEVELOPMENTAL DISORDER, AUTOSOMAL DOMINANT 6, WITH OR

WITHOUT SEIZURES; MRD6

Scientific Articles on PubMed

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References

Bell S, Maussion G, Jefri M, Peng H, Theroux JF, Silveira H, Soubannier V, Wu H, Hu P, Galat E, Torres-Platas SG, Boudreau-Pinsonneault C, O'Leary LA, Galat V, Turecki G, Durcan TM, Fon EA, Mechawar N, Ernst C. Disruption of GRIN2B Impairs Differentiation in Human Neurons. Stem Cell Reports. 2018 Jul 10;11(1):183-196. doi: 10.1016/j.stemcr.2018.05.018. Epub 2018 Jun 21. Citation on PubMed or Free article on PubMed Central

Fedele L, Newcombe J, Topf M, Gibb A, Harvey RJ, Smart TG. Disease-associated missense mutations in GluN2B subunit alter NMDA receptor ligand binding and ion channel properties. Nat Commun. 2018 Mar 6;9(1):957. doi:

10.1038/s41467-018-02927-4. Citation on PubMed or Free article on PubMed Central

Freunscht I, Popp B, Blank R, Endele S, Moog U, Petri H, Prott EC, Reis A, Rubo J, Zabel B, Zenker M, Hebebrand J, Wieczorek D. Behavioral phenotype in five individuals with de novo mutations within the GRIN2B gene. Behav Brain Funct. 2013 May 29;9:20. doi: 10.1186/1744-9081-9-20. Citation on PubMed or Free article on PubMed Central

Hu C, Chen W, Myers SJ, Yuan H, Traynelis SF. Human GRIN2B variants in neurodevelopmental disorders. J Pharmacol Sci. 2016 Oct;132(2):115-121. doi: 10.1016/j.jphs.2016.10.002. Epub 2016 Oct 19. Erratum In: J Pharmacol Sci. 2017 Apr;133(4):280. Citation on PubMed or Free article on PubMed Central

Platzer K, Lemke JR. GRIN2B-Related Neurodevelopmental Disorder. 2018 May 31 [updated 2021 Mar 25]. In: Adam MP, Feldman J, Mirzaa GM, Pagon RA, Wallace SE, Bean LJH, Gripp KW, Amemiya A, editors. GeneReviews(R) [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2024. Available from http://www.ncbi.nlm.nih.gov/books/NBK501979/

Citation on PubMed

Platzer K, Yuan H, Schutz H, Winschel A, Chen W, Hu C, Kusumoto H, Heyne HO, Helbig KL, Tang S, Willing MC, Tinkle BT, Adams DJ, Depienne C, Keren B, Mignot C, Frengen E, Stromme P, Biskup S, Docker D, Strom TM, Mefford HC, Myers CT, Muir AM, LaCroix A, Sadleir L, Scheffer IE, Brilstra E, van Haelst MM, van der Smagt JJ, Bok LA, Moller RS, Jensen UB, Millichap JJ, Berg AT, Goldberg EM, De Bie I, Fox S, Major P, Jones JR, Zackai EH, Abou Jamra R, Rolfs A, Leventer RJ, Lawson JA, Roscioli T, Jansen FE, Ranza E, Korff CM, Lehesjoki AE, Courage C, Linnankivi T, Smith DR, Stanley C, Mintz M, McKnight D, Decker A, Tan WH, Tarnopolsky MA, Brady LI, Wolff M, Dondit L, Pedro HF, Parisotto SE, Jones KL, Patel AD, Franz DN, Vanzo R, Marco E, Ranells JD, Di Donato N, Dobyns WB, Laube B, Traynelis SF, Lemke JR. GRIN2B encephalopathy: novel findings on phenotype, variant

clustering, functional consequences and treatment aspects. J Med Genet. 2017 Jul;54(7):460-470. doi: 10.1136/jmedgenet-2016-104509. Epub 2017 Apr 4. Citation on PubMed or Free article on PubMed Central

Swanger SA, Chen W, Wells G, Burger PB, Tankovic A, Bhattacharya S, Strong KL, Hu C, Kusumoto H, Zhang J, Adams DR, Millichap JJ, Petrovski S, Traynelis SF, Yuan H. Mechanistic Insight into NMDA Receptor Dysregulation by Rare Variants in the GluN2A and GluN2B Agonist Binding Domains. Am J Hum Genet. 2016 Dec 1;99(6):1261-1280. doi: 10.1016/j.ajhg.2016.10.002. Epub 2016 Nov 10. Citation on PubMed or Free article on PubMed Central

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