

3q29 Microdeletion Syndrome

Subjects: Genetics & Heredity

Contributor: Catherine Yang

3q29 microdeletion syndrome (also known as 3q29 deletion syndrome) is a condition that results from the deletion of a small piece of chromosome 3 in each cell. The deletion occurs on the long (q) arm of the chromosome at a position designated q29.

Keywords: genetic conditions

1. Introduction

The features associated with 3q29 microdeletion syndrome vary widely. Some individuals with this chromosomal change have very mild or no related signs and symptoms, and the deletion is discovered through genetic testing only after a family member is diagnosed. However, most people with a 3q29 microdeletion have delayed development (particularly speech delay) and mild or moderate intellectual disability. They also have an increased risk of behavioral or psychiatric disorders, including autism spectrum disorder (which affects social interaction and communication), anxiety, bipolar disorder, and schizophrenia.

Infants with 3q29 microdeletion syndrome often have feeding difficulties and do not grow and gain weight at the expected rate (which is described as failure to thrive). Weak muscle tone (hypotonia), recurrent ear infections, an unusually small head (microcephaly), and yellowing of the skin and whites of the eyes (jaundice) can also occur. Some affected babies are born with a heart defect, most commonly an abnormal connection between two major arteries called patent ductus arteriosus (PDA).

Other possible features of 3q29 microdeletion syndrome include gastrointestinal disorders, such as a backflow of acidic stomach contents into the esophagus (gastroesophageal reflux), and abnormalities of the teeth. There may also be a subtle pattern of characteristic facial features, including a long, narrow face; a narrow space between the nose and upper lip (short philtrum); a high bridge of the nose; and large ears.

2. Frequency

3q29 microdeletion syndrome appears to be very rare. Based on a study from Iceland, the condition has an estimated incidence of 1 in 30,000 to 40,000 people in that population. About 75 affected individuals have been described in the medical literature.

3. Causes

Most people with 3q29 microdeletion syndrome are missing about 1.6 million DNA building blocks (base pairs), also written as 1.6 megabases (Mb), at position q29 on chromosome 3. This deletion affects one of the two copies of chromosome 3 in each cell.

The segment that gets deleted is surrounded by short, repeated sequences of DNA that make it prone to rearrangement during cell division. The rearrangement can lead to missing or extra copies of DNA at 3q29. (An extra copy of this segment causes another condition called 3q29 microduplication syndrome.)

The chromosome segment most commonly deleted in people with 3q29 microdeletion syndrome contains about 20 genes. Some of these genes are thought to be involved in brain development. However, it is unknown which specific genes, when deleted, are related to the signs and symptoms of 3q29 microdeletion syndrome. It is also unclear why some people with a deletion at 3q29 have no associated health problems. It is possible that genetic changes outside the 3q29 region can influence the features of this condition.

3.1 The chromosome associated with 3q29 microdeletion syndrome

- chromosome 3

4. Inheritance

This condition has an autosomal dominant pattern of inheritance, which means the deletion occurs on one copy of chromosome 3 in each cell.

Most cases of 3q29 microdeletion syndrome result from a new (de novo) chromosomal change and occur in people with no history of the deletion in their family. Less commonly, an affected person inherits the deletion from a parent. The parent may have no signs and symptoms related to the deletion, or the features may be mild.

5. Other Names for This Condition

- 3q subtelomere deletion syndrome
- 3q29 deletion syndrome
- 3q29 recurrent deletion
- chromosome 3q29 deletion syndrome
- microdeletion 3q29 syndrome
- monosomy 3q29

References

1. Ballif BC, Theisen A, Coppinger J, Gowans GC, Hersh JH, Madan-Khetarpal S, Schmidt KR, Tervo R, Escobar LF, Friedrich CA, McDonald M, Campbell L, Ming JE, Zackai EH, Bejjani BA, Shaffer LG. Expanding the clinical phenotype of the 3q29 microdeletion syndrome and characterization of the reciprocal microduplication. *Mol Cytogenet*. 2008 Apr 28;1:8. doi: 10.1186/1755-8166-1-8.
2. Biamino E, Di Gregorio E, Belligni EF, Keller R, Riberi E, Gandione M, Calcia A, Mancini C, Giorgio E, Cavalieri S, Papi P, Talarico F, Fea AM, De Rubeis S, Cirillo Silengo M, Ferrero GB, Brusco A. A novel 3q29 deletion associated with autism, intellectual disability, psychiatric disorders, and obesity. *Am J Med Genet B Neuropsychiatr Genet*. 2016 Mar;171B(2):290-9. doi: 10.1002/ajmg.b.32406.
3. Cox DM, Butler MG. A clinical case report and literature review of the 3q29 microdeletion syndrome. *Clin Dysmorphol*. 2015 Jul;24(3):89-94. doi:10.1097/MCD.000000000000077. Review.
4. Glassford MR, Rosenfeld JA, Freedman AA, Zwick ME, Mulle JG; Unique Rare Chromosome Disorder Support Group. Novel features of 3q29 deletion syndrome: Results from the 3q29 registry. *Am J Med Genet A*. 2016 Apr;170A(4):999-1006. doi:10.1002/ajmg.a.37537.
5. Mulle JG, Dodd AF, McGrath JA, Wolyniec PS, Mitchell AA, Shetty AC, Sobreira NL, Valle D, Rudd MK, Satten G, Cutler DJ, Pulver AE, Warren ST. Microdeletions of 3q29 confer high risk for schizophrenia. *Am J Hum Genet*. 2010 Aug 13;87(2):229-36. doi: 10.1016/j.ajhg.2010.07.013.
6. Mulle JG. The 3q29 deletion confers >40-fold increase in risk for schizophrenia. *Mol Psychiatry*. 2015 Sep;20(9):1028-9. doi: 10.1038/mp.2015.76.
7. Murphy MM, Lindsey Burrell T, Cubells JF, España RA, Gambello MJ, Goines KCB, Klaiman C, Li L, Novacek DM, Papetti A, Sanchez Russo RL, Saulnier CA, Shultz S, Walker E, Mulle JG. Study protocol for The Emory 3q29 Project: evaluation of neurodevelopmental, psychiatric, and medical symptoms in 3q29 deletion syndrome. *BMC Psychiatry*. 2018 Jun 8;18(1):183. doi: 10.1186/s12888-018-1760-5.
8. Willatt L, Cox J, Barber J, Cabanas ED, Collins A, Donnai D, FitzPatrick DR, Maher E, Martin H, Parnau J, Pindar L, Ramsay J, Shaw-Smith C, Sistermans EA, Tettenborn M, Trump D, de Vries BB, Walker K, Raymond FL. 3q29 microdeletion syndrome: clinical and molecular characterization of a new syndrome. *Am J Hum Genet*. 2005 Jul;77(1):154-60.

