

Williams Syndrome

Subjects: **Genetics & Heredity**

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Williams syndrome is a developmental disorder that affects many parts of the body. This condition is characterized by mild to moderate intellectual disability or learning problems, unique personality characteristics, distinctive facial features, and heart and blood vessel (cardiovascular) problems.

genetic conditions

1. Introduction

People with Williams syndrome typically have difficulty with visual-spatial tasks such as drawing and assembling puzzles, but they tend to do well on tasks that involve spoken language, music, and learning by repetition (rote memorization). Affected individuals have outgoing, engaging personalities and tend to take an extreme interest in other people. Attention deficit disorder (ADD), problems with anxiety, and phobias are common among people with this disorder.

Young children with Williams syndrome have distinctive facial features including a broad forehead, a short nose with a broad tip, full cheeks, and a wide mouth with full lips. Many affected people have dental problems such as teeth that are small, widely spaced, crooked, or missing. In older children and adults, the face appears longer and more gaunt.

A form of cardiovascular disease called supraventricular aortic stenosis (SVAS) occurs frequently in people with Williams syndrome. Supraventricular aortic stenosis is a narrowing of the large blood vessel that carries blood from the heart to the rest of the body (the aorta). If this condition is not treated, the aortic narrowing can lead to shortness of breath, chest pain, and heart failure. Other problems with the heart and blood vessels, including high blood pressure (hypertension), have also been reported in people with Williams syndrome.

Additional signs and symptoms of Williams syndrome include abnormalities of connective tissue (tissue that supports the body's joints and organs) such as joint problems and soft, loose skin. Affected people may also have increased calcium levels in the blood (hypercalcemia) in infancy, developmental delays, problems with coordination, and short stature. Medical problems involving the eyes and vision, the digestive tract, and the urinary system are also possible.

2. Frequency

Williams syndrome affects an estimated 1 in 7,500 to 10,000 people.

3. Causes

Williams syndrome is caused by the deletion of genetic material from a specific region of chromosome 7. The deleted region includes 26 to 28 genes, and researchers believe that a loss of several of these genes probably contributes to the characteristic features of this disorder.

CLIP2, *ELN*, *GTF2I*, *GTF2IRD1*, and *LIMK1* are among the genes that are typically deleted in people with Williams syndrome. Researchers have found that loss of the *ELN* gene is associated with the connective tissue abnormalities and cardiovascular disease (specifically supraaortic stenosis) found in many people with this disease. Studies suggest that deletion of *CLIP2*, *GTF2I*, *GTF2IRD1*, *LIMK1*, and perhaps other genes may help explain the characteristic difficulties with visual-spatial tasks, unique behavioral characteristics, and other cognitive difficulties seen in people with Williams syndrome. Loss of the *GTF2IRD1* gene may also contribute to the distinctive facial features often associated with this condition.

Researchers believe that the presence or absence of the *NCF1* gene on chromosome 7 is related to the risk of developing hypertension in people with Williams syndrome. When the *NCF1* gene is included in the part of the chromosome that is deleted, affected individuals are less likely to develop hypertension. Therefore, the loss of this gene appears to be a protective factor. People with Williams syndrome whose *NCF1* gene is not deleted have a higher risk of developing hypertension.

The relationship between other genes in the deleted region of chromosome 7 and the signs and symptoms of Williams syndrome is under investigation or unknown.

3.1 The genes and chromosome associated with Williams syndrome

- *CLIP2*
- *ELN*
- *GTF2I*
- *GTF2IRD1*
- *LIMK1*
- *NCF1*
- chromosome 7

4. Inheritance

Most cases of Williams syndrome are not inherited but occur as random events during the formation of reproductive cells (eggs or sperm) in a parent of an affected individual. These cases occur in people with no history of the disorder in their family.

Williams syndrome is considered an autosomal dominant condition because one copy of the altered chromosome 7 in each cell is sufficient to cause the disorder. In a small percentage of cases, people with Williams syndrome inherit the chromosomal deletion from a parent with the condition.

5. Other Names for This Condition

- Beuren syndrome
- elfin facies syndrome
- elfin facies with hypercalcemia
- hypercalcemia-supravalvar aortic stenosis
- infantile hypercalcemia
- supravalvar aortic stenosis syndrome
- WBS
- Williams-Beuren syndrome
- WMS
- WS

References

1. Bhattacharjee Y. Friendly faces and unusual minds. *Science*. 2005 Nov4;310(5749):802-4.
2. Carrasco X, Castillo S, Aravena T, Rothhammer P, Aboitiz F. Williams syndrome: pediatric, neurologic, and cognitive development. *Pediatr Neurol*. 2005Mar;32(3):166-72.
3. Del Campo M, Antonell A, Magano LF, Muñoz FJ, Flores R, Bayés M, Pérez Jurado LA. Hemizygoty at the NCF1 gene in patients with Williams-Beuren syndrome decreases their risk of hypertension. *Am J Hum Genet*. 2006 Apr;78(4):533-42.
4. Eckert MA, Galaburda AM, Mills DL, Bellugi U, Korenberg JR, Reiss AL. The neurobiology of Williams syndrome: cascading influences of visual system impairment? *Cell Mol Life Sci*. 2006 Aug;63(16):1867-75. Review.
5. Mervis CB, Becerra AM. Language and communicative development in Williams syndrome. *Ment Retard Dev Disabil Res Rev*. 2007;13(1):3-15. Review.
6. Meyer-Lindenberg A, Hariri AR, Munoz KE, Mervis CB, Mattay VS, Morris CA, Berman KF. Neural correlates of genetically abnormal social cognition in Williams syndrome. *Nat Neurosci*. 2005 Aug;8(8):991-3.
7. Meyer-Lindenberg A, Mervis CB, Berman KF. Neural mechanisms in Williams syndrome: a unique window to genetic influences on cognition and behaviour. *Nat Rev Neurosci*. 2006 May;7(5):380-93. Review.

8. Morris CA. Williams Syndrome. 1999 Apr 9 [updated 2017 Mar 23]. In: Adam MP, Ardinger HH, Pagon RA, Wallace SE, Bean LJH, Stephens K, Amemiya A, editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2020. Available from <http://www.ncbi.nlm.nih.gov/books/NBK1249/>
9. Pober BR, Morris CA. Diagnosis and management of medical problems in adults with Williams-Beuren syndrome. *Am J Med Genet C Semin Med Genet*. 2007 Aug 15; 145C(3):280-90. Review.
10. Pober BR. Williams-Beuren syndrome. *N Engl J Med*. 2010 Jan 21; 362(3):239-52. doi: 10.1056/NEJMr0903074. Review. Erratum in: *N Engl J Med*. 2010 Jun 3; 362(22):2142.
11. Schubert C. The genomic basis of the Williams-Beuren syndrome. *Cell Mol Life Sci*. 2009 Apr; 66(7):1178-97. doi: 10.1007/s00018-008-8401-y. Review.
12. Tassabehji M, Hammond P, Karmiloff-Smith A, Thompson P, Thorgeirsson SS, Durkin ME, Popescu NC, Hutton T, Metcalfe K, Rucka A, Stewart H, Read AP, Maconochie M, Donnai D. GTF2IRD1 in craniofacial development of humans and mice. *Science*. 2005 Nov 18; 310(5751):1184-7.

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