



Cone-rod dystrophy

Cone-rod dystrophy is a group of related eye disorders that causes vision loss, which becomes more severe over time. These disorders affect the retina, which is the layer of light-sensitive tissue at the back of the eye. In people with cone-rod dystrophy, vision loss occurs as the light-sensing cells of the retina gradually deteriorate.

The first signs and symptoms of cone-rod dystrophy, which often occur in childhood, are usually decreased sharpness of vision (visual acuity) and increased sensitivity to light (photophobia). These features are typically followed by impaired color vision (dyschromatopsia), blind spots (scotomas) in the center of the visual field, and partial side (peripheral) vision loss. Over time, affected individuals develop night blindness and a worsening of their peripheral vision, which can limit independent mobility. Decreasing visual acuity makes reading increasingly difficult and most affected individuals are legally blind by mid-adulthood. As the condition progresses, individuals may develop involuntary eye movements (nystagmus).

There are more than 30 types of cone-rod dystrophy, which are distinguished by their genetic cause and their pattern of inheritance: autosomal recessive, autosomal dominant, and X-linked. Additionally, cone-rod dystrophy can occur alone without any other signs and symptoms or it can occur as part of a syndrome that affects multiple parts of the body.

Frequency

Cone-rod dystrophy is estimated to affect 1 in 30,000 to 40,000 individuals.

Causes

Mutations in more than 30 genes are known to cause cone-rod dystrophy. Approximately 20 of these genes are associated with the form of cone-rod dystrophy that is inherited in an autosomal recessive pattern. Mutations in the *ABCA4* gene are the most common cause of autosomal recessive cone-rod dystrophy, accounting for 30 to 60 percent of cases. At least 10 genes have been associated with cone-rod dystrophy that is inherited in an autosomal dominant pattern. Mutations in the *GUCY2D* and *CRX* genes account for about half of these cases. Changes in at least two genes cause the X-linked form of the disorder, which is rare.

The genes associated with cone-rod dystrophy play essential roles in the structure and function of specialized light receptor cells (photoreceptors) in the retina. The retina contains two types of photoreceptors, rods and cones. Rods are needed for vision in low light, while cones provide vision in bright light, including color vision.

Mutations in any of the genes associated with cone-rod dystrophy lead to a gradual loss of rods and cones in the retina. The progressive degeneration of these cells causes the characteristic pattern of vision loss that occurs in people with cone-rod dystrophy. Cones typically break down before rods, which is why sensitivity to light and impaired color vision are usually the first signs of the disorder. (The order of cell breakdown is also reflected in the condition name.) Night vision is disrupted later, as rods are lost.

Some of the genes associated with cone-rod dystrophy are also associated with other eye diseases, including a group of related eye disorders called rod-cone dystrophy. Rod-cone dystrophy has signs and symptoms similar to those of cone-rod dystrophy. However, rod-cone dystrophy is characterized by deterioration of the rods first, followed by the cones, so night vision is affected before daylight and color vision. The most common form of rod-cone dystrophy is a condition called retinitis pigmentosa.

Inheritance Pattern

Cone-rod dystrophy is usually inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

Less frequently, 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. In most of these cases, an affected person has one parent with the condition.

Rarely, cone-rod dystrophy is inherited in an X-linked recessive pattern. The genes associated with this form of the condition are located on the X chromosome, which is one of the two sex chromosomes. In males (who have only one X chromosome), one altered copy of the gene in each cell is sufficient to cause the condition. In females (who have two X chromosomes), a mutation would have to occur in both copies of the gene to cause the disorder. Because it is unlikely that females will have two altered copies of this gene, males are affected by X-linked recessive disorders much more frequently than females. Females with one copy of the altered gene have mild vision problems, such as decreased visual acuity. A characteristic of X-linked inheritance is that fathers cannot pass X-linked traits to their sons.

Other Names for This Condition

- cone-rod degeneration
- cone-rod retinal dystrophy
- CORD
- CRD
- retinal cone-rod dystrophy
- tapetoretinal degeneration

Diagnosis & Management

Genetic Testing Information

- What is genetic testing?
[/primer/testing/genetic-testing](#)
- Genetic Testing Registry: Cone-rod dystrophy
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C4085590/>
- Genetic Testing Registry: Cone-rod dystrophy 1
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1833564/>
- Genetic Testing Registry: Cone-rod dystrophy 2
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C3489532/>
- Genetic Testing Registry: Cone-rod dystrophy 3
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1858806/>
- Genetic Testing Registry: Cone-rod dystrophy 5
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1832976/>
- Genetic Testing Registry: Cone-rod dystrophy 6
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1866293/>
- Genetic Testing Registry: Cone-rod dystrophy 7
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1863634/>
- Genetic Testing Registry: Cone-rod dystrophy 8
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1854180/>
- Genetic Testing Registry: Cone-rod dystrophy 9
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1423873/>
- Genetic Testing Registry: Cone-rod dystrophy 10
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1846529/>
- Genetic Testing Registry: Cone-rod dystrophy 11
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1835865/>
- Genetic Testing Registry: Cone-rod dystrophy 12
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C2675210/>
- Genetic Testing Registry: Cone-rod dystrophy 13
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C2750720/>
- Genetic Testing Registry: Cone-rod dystrophy 15
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C3150912/>
- Genetic Testing Registry: Cone-rod dystrophy 16
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C3281045/>
- Genetic Testing Registry: Cone-rod dystrophy 17
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C3554610/>

- Genetic Testing Registry: Cone-rod dystrophy 18
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C3809299/>
- Genetic Testing Registry: Cone-rod dystrophy 19
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C4014501/>
- Genetic Testing Registry: Cone-rod dystrophy 20
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C4014856/>
- Genetic Testing Registry: Cone-rod dystrophy 21
<https://www.ncbi.nlm.nih.gov/gtr/conditions/CN231743/>
- Genetic Testing Registry: Cone-rod dystrophy X-linked 3
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1845407/>
- Genetic Testing Registry: CONE-ROD DYSTROPHY, AIPL1-RELATED
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C2751764/>
- Genetic Testing Registry: Cone-rod dystrophy, X-linked 1
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C1844776/>

Research Studies from ClinicalTrials.gov

- ClinicalTrials.gov
<https://clinicaltrials.gov/ct2/results?cond=%22cone-rod+dystrophy%22>

Other Diagnosis and Management Resources

- MedlinePlus Encyclopedia: Color Vision Test
<https://medlineplus.gov/ency/article/003387.htm>
- MedlinePlus Encyclopedia: Visual Acuity Test
<https://medlineplus.gov/ency/imagepages/1124.htm>
- MedlinePlus Encyclopedia: Visual Field Test
<https://medlineplus.gov/ency/imagepages/1143.htm>

Additional Information & Resources

Health Information from MedlinePlus

- Encyclopedia: Blindness and Vision Loss
<https://medlineplus.gov/ency/article/003040.htm>
- Encyclopedia: Color Vision Test
<https://medlineplus.gov/ency/article/003387.htm>
- Encyclopedia: Visual Acuity Test
<https://medlineplus.gov/ency/imagepages/1124.htm>
- Encyclopedia: Visual Field Test
<https://medlineplus.gov/ency/imagepages/1143.htm>

- Health Topic: Retinal Disorders
<https://medlineplus.gov/retinaldisorders.html>
- Health Topic: Vision Impairment and Blindness
<https://medlineplus.gov/visionimpairmentandblindness.html>

Genetic and Rare Diseases Information Center

- Cone-rod dystrophy
<https://rarediseases.info.nih.gov/diseases/10790/cone-rod-dystrophy>

Additional NIH Resources

- National Eye Institute: Low Vision
<https://nei.nih.gov/health/lowvision/>

Educational Resources

- MalaCards: cone-rod dystrophy 1
https://www.malacards.org/card/cone_rod_dystrophy_1
- MalaCards: cone-rod dystrophy 2
https://www.malacards.org/card/cone_rod_dystrophy_2
- Merck Manual Consumer Version: Structure and Function of the Eyes
<https://www.merckmanuals.com/home/eye-disorders/biology-of-the-eyes/structure-and-function-of-the-eyes>
- Orphanet: Cone rod dystrophy
https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=1872

Patient Support and Advocacy Resources

- American Foundation for the Blind
<https://www.afb.org/>
- Foundation Fighting Blindness
<https://www.fightingblindness.org/diseases/other-retinal-conditions>
- Retina International
<http://www.retina-international.org/>
- Retina UK
<https://retinuk.org.uk/about-inherited-sight-loss/types-of-inherited-sight-loss/cone-rod-dystrophy/>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28cone-rod+dystrophy%5BTI%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D>

Catalog of Genes and Diseases from OMIM

- CONE DYSTROPHY 3
<http://omim.org/entry/602093>
- CONE-ROD DYSTROPHY 1
<http://omim.org/entry/600624>
- CONE-ROD DYSTROPHY 2
<http://omim.org/entry/120970>
- CONE-ROD DYSTROPHY 3
<http://omim.org/entry/604116>
- CONE-ROD DYSTROPHY 5
<http://omim.org/entry/600977>
- CONE-ROD DYSTROPHY 6
<http://omim.org/entry/601777>
- CONE-ROD DYSTROPHY 7
<http://omim.org/entry/603649>
- CONE-ROD DYSTROPHY 8
<http://omim.org/entry/605549>
- CONE-ROD DYSTROPHY 9
<http://omim.org/entry/612775>
- CONE-ROD DYSTROPHY 10
<http://omim.org/entry/610283>
- CONE-ROD DYSTROPHY 11
<http://omim.org/entry/610381>
- CONE-ROD DYSTROPHY 12
<http://omim.org/entry/612657>
- CONE-ROD DYSTROPHY 13
<http://omim.org/entry/608194>
- CONE-ROD DYSTROPHY 17
<http://omim.org/entry/615163>
- CONE-ROD DYSTROPHY 18
<http://omim.org/entry/615374>
- CONE-ROD DYSTROPHY 19
<http://omim.org/entry/615860>
- CONE-ROD DYSTROPHY 20
<http://omim.org/entry/615973>
- CONE-ROD DYSTROPHY 21
<http://omim.org/entry/616502>

- CONE-ROD DYSTROPHY 21
<http://omim.org/entry/616502>
- CONE-ROD DYSTROPHY, X-LINKED, 1
<http://omim.org/entry/304020>
- CONE-ROD DYSTROPHY, X-LINKED, 2
<http://omim.org/entry/300085>
- CONE-ROD DYSTROPHY, X-LINKED, 3
<http://omim.org/entry/300476>

Medical Genetics Database from MedGen

- Cone/cone-rod dystrophy
<https://www.ncbi.nlm.nih.gov/medgen/676499>

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