



## Norrie disease

Norrie disease is an inherited eye disorder that leads to blindness in male infants at birth or soon after birth. It causes abnormal development of the retina, the layer of sensory cells that detect light and color, with masses of immature retinal cells accumulating at the back of the eye. As a result, the pupils appear white when light is shone on them, a sign called leukocoria. The irises (colored portions of the eyes) or the entire eyeballs may shrink and deteriorate during the first months of life, and cataracts (cloudiness in the lens of the eye) may eventually develop.

About one third of individuals with Norrie disease develop progressive hearing loss, and more than half experience developmental delays in motor skills such as sitting up and walking. Other problems may include mild to moderate intellectual disability, often with psychosis, and abnormalities that can affect circulation, breathing, digestion, excretion, or reproduction.

### Frequency

Norrie disease is a rare disorder; its exact incidence is unknown. It is not associated with any specific racial or ethnic group.

### Causes

Mutations in the *NDP* gene cause Norrie disease.

The *NDP* gene provides instructions for making a protein called norrin. Norrin participates in the Wnt cascade, a sequence of steps that affect the way cells and tissues develop. In particular, norrin seems to play a critical role in the specialization of retinal cells for their unique sensory capabilities. It is also involved in the establishment of a blood supply to tissues of the retina and the inner ear, and the development of other body systems.

In order to initiate the Wnt cascade, norrin must bind (attach) to another protein called frizzled-4. Mutations in the norrin protein interfere with its ability to bind to frizzled-4, resulting in the signs and symptoms of Norrie disease.

### Inheritance Pattern

This condition is inherited in an X-linked recessive pattern. A condition is considered X-linked if the mutated gene that causes the disorder is located on the X chromosome, 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 must be present in both copies of the gene to cause the disorder. Males are affected by X-linked recessive disorders much more

frequently than females. A characteristic of X-linked inheritance is that fathers cannot pass X-linked traits to their sons.

In X-linked recessive inheritance, a female with one altered copy of the gene in each cell is called a carrier. She can pass on the gene, but generally does not experience signs and symptoms of the disorder. In rare cases, however, carrier females have shown some retinal abnormalities or mild hearing loss associated with Norrie disease.

### **Other Names for This Condition**

- Anderson-Warburg syndrome
- Atrophia bulborum hereditaria
- congenital progressive oculo-acoustico-cerebral degeneration
- Episkopi blindness
- Fetal iritis syndrome
- Norrie syndrome
- Norrie-Warburg syndrome
- Norrie's disease
- Oligophrenia microphthalmus
- pseudoglioma congenita
- Whitnall-Norman syndrome

### **Diagnosis & Management**

#### Genetic Testing Information

- What is genetic testing?  
[/primer/testing/genetictesting](#)
- Genetic Testing Registry: Atrophia bulborum hereditaria  
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C0266526/>

#### Research Studies from ClinicalTrials.gov

- ClinicalTrials.gov  
<https://clinicaltrials.gov/ct2/results?cond=%22norrie+disease%22>

#### Other Diagnosis and Management Resources

- GeneReview: NDP-Related Retinopathies  
<https://www.ncbi.nlm.nih.gov/books/NBK1331>

## **Additional Information & Resources**

### Health Information from MedlinePlus

- Health Topic: Eye Diseases  
<https://medlineplus.gov/eyediseases.html>

### Genetic and Rare Diseases Information Center

- Norrie disease  
<https://rarediseases.info.nih.gov/diseases/7224/norrie-disease>

### Educational Resources

- MalaCards: norrie disease  
[https://www.malacards.org/card/norrie\\_disease](https://www.malacards.org/card/norrie_disease)
- Orphanet: Norrie disease  
[https://www.orpha.net/consor/cgi-bin/OC\\_Exp.php?Lng=EN&Expert=649](https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=649)

### Patient Support and Advocacy Resources

- Foundation Fighting Blindness  
<https://www.blindness.org/>
- Helen Keller National Center for Deaf-Blind Youths and Adults  
<https://www.helenkeller.org/hknc>
- National Organization for Rare Disorders (NORD)  
<https://rarediseases.org/rare-diseases/norrie-disease/>

### Clinical Information from GeneReviews

- NDP-Related Retinopathies  
<https://www.ncbi.nlm.nih.gov/books/NBK1331>

### Scientific Articles on PubMed

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

### Catalog of Genes and Diseases from OMIM

- NORRIE DISEASE  
<http://omim.org/entry/310600>

## Sources for This Summary

- Clevers H. Wnt signaling: Ig-norrin the dogma. *Curr Biol*. 2004 Jun 8;14(11):R436-7. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/15182694>
- Lenzner S, Prietz S, Feil S, Nuber UA, Ropers HH, Berger W. Global gene expression analysis in a mouse model for Norrie disease: late involvement of photoreceptor cells. *Invest Ophthalmol Vis Sci*. 2002 Sep;43(9):2825-33.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/12202498>
- Michaelides M, Luthert PJ, Cooling R, Firth H, Moore AT. Norrie disease and peripheral venous insufficiency. *Br J Ophthalmol*. 2004 Nov;88(11):1475. Erratum in: *Br J Ophthalmol*. 2005 May; 89(5):645.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/15489496>  
*Free article on PubMed Central:* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1772398/>
- National Organization for Rare Disorders (NORD)  
<https://rarediseases.org/rare-diseases/norrie-disease/>
- Ott S, Patel RJ, Appukuttan B, Wang X, Stout JT. A novel mutation in the Norrie disease gene. *J AAPOS*. 2000 Apr;4(2):125-6.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/10773814>
- Rehm HL, Zhang DS, Brown MC, Burgess B, Halpin C, Berger W, Morton CC, Corey DP, Chen ZY. Vascular defects and sensorineural deafness in a mouse model of Norrie disease. *J Neurosci*. 2002 Jun 1;22(11):4286-92.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/12040033>
- Royer G, Hanein S, Raclin V, Gigarel N, Rozet JM, Munnich A, Steffann J, Dufier JL, Kaplan J, Bonnefont JP. NDP gene mutations in 14 French families with Norrie disease. *Hum Mutat*. 2003 Dec;22(6):499.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/14635119>
- Suárez-Merino B, Bye J, McDowall J, Ross M, Craig IW. Sequence analysis and transcript identification within 1.5 MB of DNA deleted together with the NDP and MAO genes in atypical Norrie disease patients presenting with a profound phenotype. *Hum Mutat*. 2001 Jun;17(6):523.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/11385715>
- Xu Q, Wang Y, Dabdoub A, Smallwood PM, Williams J, Woods C, Kelley MW, Jiang L, Tasman W, Zhang K, Nathans J. Vascular development in the retina and inner ear: control by Norrin and Frizzled-4, a high-affinity ligand-receptor pair. *Cell*. 2004 Mar 19;116(6):883-95.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/15035989>

---

Reprinted from Genetics Home Reference:

<https://ghr.nlm.nih.gov/condition/norrie-disease>

Reviewed: March 2007

Published: November 13, 2018

Lister Hill National Center for Biomedical Communications  
U.S. National Library of Medicine  
National Institutes of Health  
Department of Health & Human Services