



## androgen insensitivity syndrome

Androgen insensitivity syndrome is a condition that affects sexual development before birth and during puberty. People with this condition are genetically male, with one X chromosome and one Y chromosome in each cell. Because their bodies are unable to respond to certain male sex hormones (called androgens), they may have mostly female external sex characteristics or signs of both male and female sexual development.

Complete androgen insensitivity syndrome occurs when the body cannot use androgens at all. People with this form of the condition have the external sex characteristics of females, but do not have a uterus and therefore do not menstruate and are unable to conceive a child (infertile). They are typically raised as females and have a female gender identity. Affected individuals have male internal sex organs (testes) that are undescended, which means they are abnormally located in the pelvis or abdomen. Undescended testes have a small chance of becoming cancerous later in life if they are not surgically removed. People with complete androgen insensitivity syndrome also have sparse or absent hair in the pubic area and under the arms.

The partial and mild forms of androgen insensitivity syndrome result when the body's tissues are partially sensitive to the effects of androgens. People with partial androgen insensitivity (also called Reifenstein syndrome) can have genitalia that look typically female, genitalia that have both male and female characteristics, or genitalia that look typically male. They may be raised as males or as females and may have a male or a female gender identity. People with mild androgen insensitivity are born with male sex characteristics, but they are often infertile and tend to experience breast enlargement at puberty.

### Frequency

Complete androgen insensitivity syndrome affects 2 to 5 per 100,000 people who are genetically male. Partial androgen insensitivity is thought to be at least as common as complete androgen insensitivity. Mild androgen insensitivity is much less common.

### Genetic Changes

Mutations in the *AR* gene cause androgen insensitivity syndrome. This gene provides instructions for making a protein called an androgen receptor. Androgen receptors allow cells to respond to androgens, which are hormones (such as testosterone) that direct male sexual development. Androgens and androgen receptors also have other important functions in both males and females, such as regulating hair growth and sex drive. Mutations in the *AR* gene prevent androgen receptors from working properly,

which makes cells less responsive to androgens or prevents cells from using these hormones at all. Depending on the level of androgen insensitivity, an affected person's sex characteristics can vary from mostly female to mostly male.

## **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 each cell. In genetic males (who have only one X chromosome), one altered copy of the gene in each cell is sufficient to cause the condition. In genetic 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.

About two-thirds of all cases of androgen insensitivity syndrome are inherited from mothers who carry an altered copy of the *AR* gene on one of their two X chromosomes. The remaining cases result from a new mutation that can occur in the mother's egg cell before the child is conceived or during early fetal development.

## **Other Names for This Condition**

- AIS
- androgen receptor deficiency
- androgen resistance syndrome
- AR deficiency
- DHTR deficiency
- dihydrotestosterone receptor deficiency

## **Diagnosis & Management**

### Genetic Testing

- Genetic Testing Registry: Androgen insensitivity syndrome, mild  
<https://www.ncbi.nlm.nih.gov/gtr/conditions/CN037063/>
- Genetic Testing Registry: Androgen insensitivity syndrome, partial  
<https://www.ncbi.nlm.nih.gov/gtr/conditions/CN035075/>
- Genetic Testing Registry: Androgen resistance syndrome  
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C0039585/>

### Other Diagnosis and Management Resources

- Accord Alliance: Disorders of Sex Development (DSD) Guidelines  
<http://www.accordalliance.org/dsd-guidelines/>
- GeneReview: Androgen Insensitivity Syndrome  
<https://www.ncbi.nlm.nih.gov/books/NBK1429>
- MedlinePlus Encyclopedia: Androgen Insensitivity Syndrome  
<https://medlineplus.gov/ency/article/001180.htm>
- MedlinePlus Encyclopedia: Intersex  
<https://medlineplus.gov/ency/article/001669.htm>
- MedlinePlus Encyclopedia: Reifenstein Syndrome  
<https://medlineplus.gov/ency/article/001169.htm>

### General Information from MedlinePlus

- Diagnostic Tests  
<https://medlineplus.gov/diagnostictests.html>
- Drug Therapy  
<https://medlineplus.gov/drugtherapy.html>
- Genetic Counseling  
<https://medlineplus.gov/geneticcounseling.html>
- Palliative Care  
<https://medlineplus.gov/palliativecare.html>
- Surgery and Rehabilitation  
<https://medlineplus.gov/surgeryandrehabilitation.html>

### **Additional Information & Resources**

#### MedlinePlus

- Encyclopedia: Androgen Insensitivity Syndrome  
<https://medlineplus.gov/ency/article/001180.htm>
- Encyclopedia: Intersex  
<https://medlineplus.gov/ency/article/001669.htm>
- Encyclopedia: Reifenstein Syndrome  
<https://medlineplus.gov/ency/article/001169.htm>
- Health Topic: Infertility  
<https://medlineplus.gov/infertility.html>

## Genetic and Rare Diseases Information Center

- Androgen insensitivity syndrome  
<https://rarediseases.info.nih.gov/diseases/5803/androgen-insensitivity-syndrome>
- Androgen insensitivity syndrome, mild  
<https://rarediseases.info.nih.gov/diseases/10596/androgen-insensitivity-syndrome-mild>
- Complete androgen insensitivity syndrome  
<https://rarediseases.info.nih.gov/diseases/10597/complete-androgen-insensitivity-syndrome>
- Partial androgen insensitivity syndrome  
<https://rarediseases.info.nih.gov/diseases/5692/partial-androgen-insensitivity-syndrome>

## Educational Resources

- Boston Children's Hospital  
<http://www.childrenshospital.org/conditions-and-treatments/conditions/a/androgen-insensitivity>
- Disease InfoSearch: Androgen Insensitivity Syndrome  
<http://www.diseaseinfosearch.org/Androgen+Insensitivity+Syndrome/435>
- MalaCards: androgen insensitivity syndrome mild  
[http://www.malacards.org/card/androgen\\_insensitivity\\_syndrome\\_mild](http://www.malacards.org/card/androgen_insensitivity_syndrome_mild)
- MalaCards: complete androgen insensitivity syndrome  
[http://www.malacards.org/card/complete\\_androgen\\_insensitivity\\_syndrome](http://www.malacards.org/card/complete_androgen_insensitivity_syndrome)
- My46 Trait Profile  
<https://www.my46.org/trait-document?trait=Androgen%20Insensitivity%20syndrome&type=profile>
- Orphanet: Androgen insensitivity syndrome  
[http://www.orpha.net/consor/cgi-bin/OC\\_Exp.php?Lng=EN&Expert=754](http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=754)
- Orphanet: Complete androgen insensitivity syndrome  
[http://www.orpha.net/consor/cgi-bin/OC\\_Exp.php?Lng=EN&Expert=99429](http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=99429)
- Orphanet: Partial androgen insensitivity syndrome  
[http://www.orpha.net/consor/cgi-bin/OC\\_Exp.php?Lng=EN&Expert=90797](http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=90797)
- Royal Children's Hospital: Complete Androgen Insensitivity Syndrome  
<http://ww2.rch.org.au/emplibrary/chas/CAIS.pdf>

## Patient Support and Advocacy Resources

- AboutKidsHealth: Sex Development: An Overview  
<http://www.aboutkidshealth.ca/En/HowTheBodyWorks/SexDevelopmentAnOverview/Pages/default.aspx>
- Accord Alliance  
<http://www.accordalliance.org/>
- AIS-DSD Support Group  
<http://aisdsd.org/>
- InterACT Advocates for Intersex Youth  
<https://interactadvocates.org/>
- National Organization for Rare Disorders  
<https://rarediseases.org/rare-diseases/androgen-insensitivity-syndrome-partial/>
- Resolve: The National Infertility Association  
<http://www.resolve.org/>

## GeneReviews

- Androgen Insensitivity Syndrome  
<https://www.ncbi.nlm.nih.gov/books/NBK1429>

## Scientific Articles on PubMed

- PubMed  
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28Androgen-Insensitivity+Syndrome%5BMAJR%5D%29+AND+%28androgen+insensitivity+syndrome%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1080+days%22%5Bdp%5D>

## OMIM

- ANDROGEN INSENSITIVITY SYNDROME  
<http://omim.org/entry/300068>

## **Sources for This Summary**

- Chen MJ, Vu BM, Axelrad M, Dietrich JE, Gargollo P, Gunn S, Macias CG, McCullough LB, Roth DR, Sutton VR, Karaviti LP. Androgen Insensitivity Syndrome: Management Considerations from Infancy to Adulthood. *Pediatr Endocrinol Rev.* 2015 Jun;12(4):373-87. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/26182482>
- GeneReview: Androgen Insensitivity Syndrome  
<https://www.ncbi.nlm.nih.gov/books/NBK1429>
- Gottlieb B, Pinsky L, Beitel LK, Trifiro M. Androgen insensitivity. *Am J Med Genet.* 1999 Dec 29; 89(4):210-7. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/10727996>

- Hiort O. Clinical and molecular aspects of androgen insensitivity. *Endocr Dev.* 2013;24:33-40. doi: 10.1159/000342499. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/23392093>
  - Hughes IA, Davies JD, Bunch TI, Pasterski V, Mastroyannopoulou K, MacDougall J. Androgen insensitivity syndrome. *Lancet.* 2012 Oct 20;380(9851):1419-28. doi: 10.1016/S0140-6736(12)60071-3. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/22698698>
- 

Reprinted from Genetics Home Reference:

<https://ghr.nlm.nih.gov/condition/androgen-insensitivity-syndrome>

Reviewed: November 2016

Published: September 19, 2017

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