



SRY gene

sex determining region Y

Normal Function

The *SRY* gene provides instructions for making a protein called the sex-determining region Y protein. This protein is involved in male sexual development, which is usually determined by the chromosomes an individual has. People usually have 46 chromosomes in each cell. Two of the 46 chromosomes, known as X and Y, are called sex chromosomes because they help determine whether a person will develop male or female sex characteristics. Girls and women typically have two X chromosomes (46,XX karyotype), while boys and men usually have one X chromosome and one Y chromosome (46,XY karyotype).

The *SRY* gene is found on the Y chromosome. The sex-determining region Y protein produced from this gene acts as a transcription factor, which means it attaches (binds) to specific regions of DNA and helps control the activity of particular genes. This protein starts processes that cause a fetus to develop male gonads (testes) and prevent the development of female reproductive structures (uterus and fallopian tubes).

Health Conditions Related to Genetic Changes

Swyer syndrome

Mutations in the *SRY* gene have been identified in approximately 15 percent of individuals with Swyer syndrome, also known as 46,XY complete gonadal dysgenesis or 46,XY pure gonadal dysgenesis. *SRY* gene mutations that cause Swyer syndrome prevent production of the sex-determining region Y protein or result in the production of a nonfunctioning protein. A fetus whose cells do not produce functional sex-determining region Y protein will not develop testes but will develop a uterus and fallopian tubes, despite having a typically male karyotype.

46,XX testicular disorder of sex development

In most individuals with 46,XX testicular disorder of sex development, the condition results from an abnormal exchange of genetic material between chromosomes (translocation). This exchange occurs as a random event during the formation of sperm cells in the affected person's father. The *SRY* gene is misplaced in this disorder, almost always onto an X chromosome. A fetus with an X chromosome that carries the *SRY* gene will develop male characteristics despite not having a Y chromosome.

Other disorders

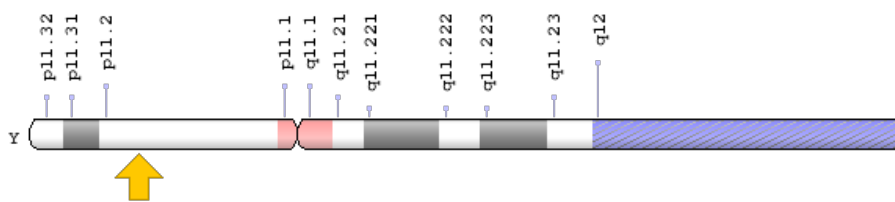
SRY gene mutations that impair but do not eliminate the function of the sex-determining region Y protein have been identified in a small number of people with 46,XY disorder of sex development, or partial gonadal dysgenesis. Affected individuals may have external genitalia that do not look clearly male or clearly female (ambiguous genitalia) or other abnormalities of the genitals and reproductive organs.

About 10 percent of individuals who have both testicular and ovarian tissue, a condition called ovotesticular disorder of sex development, have two X chromosomes with one carrying a misplaced copy of the *SRY* gene.

Chromosomal Location

Cytogenetic Location: Yp11.2, which is the short (p) arm of the Y chromosome at position 11.2

Molecular Location: base pairs 2,786,855 to 2,787,741 on the Y chromosome (Homo sapiens Annotation Release 109, GRCh38.p12) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- essential protein for sex determination in human males
- sex-determining region on Y
- sex determining region protein
- SRY_HUMAN
- TDF
- TDY
- testis-determining factor

Additional Information & Resources

Educational Resources

- Developmental Biology (sixth edition, 2000): Chromosomal Sex Determination in Mammals
<https://www.ncbi.nlm.nih.gov/books/NBK9967/>

Clinical Information from GeneReviews

- Nonsyndromic 46,XX Testicular Disorders of Sex Development
<https://www.ncbi.nlm.nih.gov/books/NBK1416>
- Nonsyndromic Disorders of Testicular Development
<https://www.ncbi.nlm.nih.gov/books/NBK1547>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28SRY%5BTI%5D%29+OR+%28sex+determining+region+Y%5BTI%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1080+days%22%5Bdp%5D>

Catalog of Genes and Diseases from OMIM

- SEX-DETERMINING REGION Y
<http://omim.org/entry/480000>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
http://atlasgeneticsoncology.org/Genes/GC_SRY.html
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=SRY%5Bgene%5D>
- HGNC Gene Symbol Report
https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:11311
- Monarch Initiative
<https://monarchinitiative.org/gene/NCBIGene:6736>
- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/6736>
- UniProt
<https://www.uniprot.org/uniprot/Q05066>

Sources for This Summary

- Assumpção JG, Benedetti CE, Maciel-Guerra AT, Guerra G Jr, Baptista MT, Scolfaro MR, de Mello MP. Novel mutations affecting SRY DNA-binding activity: the HMG box N65H associated with 46,XY pure gonadal dysgenesis and the familial non-HMG box R30I associated with variable phenotypes. *J Mol Med (Berl)*. 2002 Dec;80(12):782-90. Epub 2002 Oct 1.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/12483463>
- Gimelli G, Gimelli S, Dimasi N, Bocciardi R, Di Battista E, Pramparo T, Zuffardi O. Identification and molecular modelling of a novel familial mutation in the SRY gene implicated in the pure gonadal dysgenesis. *Eur J Hum Genet*. 2007 Jan;15(1):76-80. Epub 2006 Oct 25.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/17063144>
- Kellermayer R, Halvax L, Czakó M, Shahid M, Dhillon VS, Husain SA, Süle N, Gömöri E, Mammel M, Kosztolányi G. A novel frame shift mutation in the HMG box of the SRY gene in a patient with complete 46,XY pure gonadal dysgenesis. *Diagn Mol Pathol*. 2005 Sep;14(3):159-63.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16106197>
- King TF, Conway GS. Swyer syndrome. *Curr Opin Endocrinol Diabetes Obes*. 2014 Dec;21(6):504-10. doi: 10.1097/MED.000000000000113. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/25314337>
- Phillips NB, Jancso-Radek A, Ittah V, Singh R, Chan G, Haas E, Weiss MA. SRY and human sex determination: the basic tail of the HMG box functions as a kinetic clamp to augment DNA bending. *J Mol Biol*. 2006 Apr 21;358(1):172-92. Epub 2006 Feb 6.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16504207>
- Queralt R, Madrigal I, Vallecillos MA, Morales C, Ballescá JL, Oliva R, Soler A, Sánchez A, Margarit E. Atypical XX male with the SRY gene located at the long arm of chromosome 1 and a 1qter microdeletion. *Am J Med Genet A*. 2008 May 15;146A(10):1335-40. doi: 10.1002/ajmg.a.32284.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18412126>
- Racca JD, Chen YS, Maloy JD, Wickramasinghe N, Phillips NB, Weiss MA. Structure-function relationships in human testis-determining factor SRY: an aromatic buttress underlies the specific DNA-bending surface of a high mobility group (HMG) box. *J Biol Chem*. 2014 Nov 21;289(47):32410-29. doi: 10.1074/jbc.M114.597526. Epub 2014 Sep 24.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/25258310>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4239596/>
- Rizvi AA. 46, XX man with SRY gene translocation: cytogenetic characteristics, clinical features and management. *Am J Med Sci*. 2008 Apr;335(4):307-9. doi: 10.1097/MAJ.0b013e31811ec1b4.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18414071>
- OMIM: SEX-DETERMINING REGION Y
<http://omim.org/entry/480000>
- Shahid M, Dhillon VS, Jain N, Hedau S, Diwakar S, Sachdeva P, Batra S, Das BC, Husain SA. Two new novel point mutations localized upstream and downstream of the HMG box region of the SRY gene in three Indian 46,XY females with sex reversal and gonadal tumour formation. *Mol Hum Reprod*. 2004 Jul;10(7):521-6. Epub 2004 May 21.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15155818>
- Waters PD, Wallis MC, Marshall Graves JA. Mammalian sex--Origin and evolution of the Y chromosome and SRY. *Semin Cell Dev Biol*. 2007 Jun;18(3):389-400. Epub 2007 Feb 24. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/17400006>

Reprinted from Genetics Home Reference:
<https://ghr.nlm.nih.gov/gene/SRY>

Reviewed: March 2015
Published: February 12, 2019

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