

Sex Reversal (SRY Translocation/ Mutation)

Tina Ng #21

Stuyvesant High School SBS11QHG-02

May 31st, 2013

PHYSIOLOGY

- Occurs in about 1 in every 20,000 births
- Onset: during the creation of the embryo, when the sperm that reaches the egg has a SRY gene mutation.
- Target: Reproductive system/ gonads.
- People notice they have sex reversal when they see that their private parts are smaller than most other people's (applies to males), when they don't seem to go through puberty or when they notice that they have developed small breasts (applies to both).
- Symptoms: Infertility, little pubic hair, androgynous appearance.
 - Females (XY): small breasts, shield-shaped chest, no menstrual cycle, tall. Think Turner Syndrome (XO)
 - Males (XX): short, have azoospermia, hypogonadism, gynecomastia. Think Klinefelter's Syndrome (XXY)

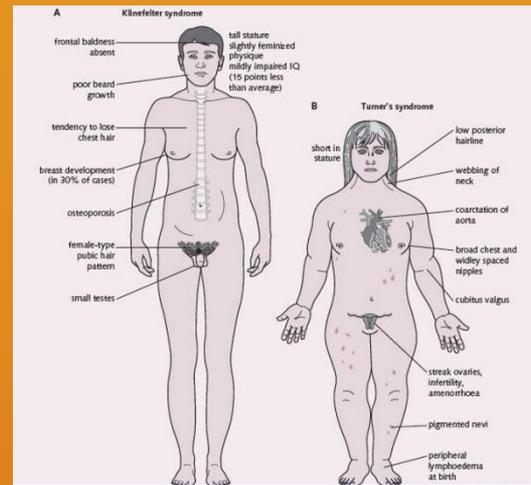


Figure 1

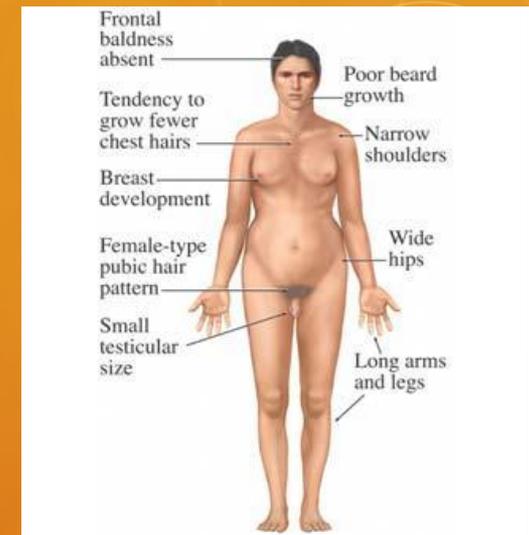


Figure 2

Molecular Cause

- The SRY gene is a transcription factor that binds DNA, and results in the formation of testis. It is at location Yp11.31
- Y-linked
- Females (XX): SRY is deleted from the Y chromosome. "SRY-negative XY female"
- Males (XX): SRY is translocated from its position on the Y chromosome onto the X chromosome. "SRY-positive XX male"
- In the father, when he's creating spermatozoa through meiosis, there is an accident during the separation of the chromosomes.
- SRY activates other genes by coding many other transcription factors. Like a domino effect. If SRY is not present, or is not activated, then ovaries form.

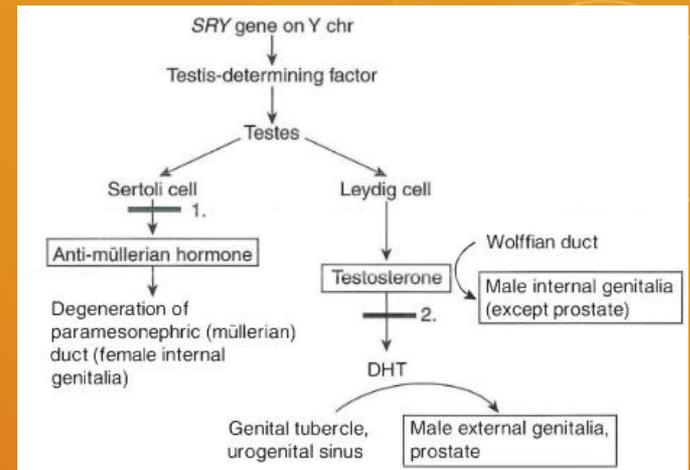


Figure 3

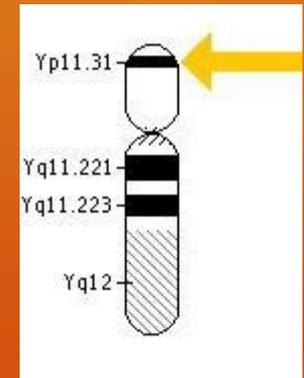


Figure 4

Treatments & Cures Under Study

- SRY males take androgen supplementations.
 - Helps with developing secondary characteristics.
 - If they have gynecomastia, they have to go through breast reduction surgery.
 - Does not help with sperm count.
- SRY females take estrogen and progesterone supplementations.
 - Helps with forming secondary characteristics.
 - Take it when they reach puberty age.
- These do not cure their infertility.
- Geneticists are experimenting with SOX3 by activating it and putting it in the early gonads.
 - Used mice and succeeded. The mice grew testis.

Proposal

- Determine whether or not the mother is carrying a child with the disease using an amniocentesis test (look at karyotype) and an ultrasound test. If the tests come out with different results, then the mother is carrying an SRY patient.
 - Will be hard because not everyone will suspect themselves to have a child that has sex reversal. Also, money might be a problem because there lots of pregnant women all at once.
- Make the baby undergo Sex Reassignment Surgery. If the baby has ovaries and a vagina, then replace with testes and a penis. If the baby has ovaries and a vagina, then replace with testes and a penis.
 - Taking out the gonad and storing it is possible, shown by Dr. Sherman Silber when he took out fifteen girls' ovaries and stored them. Dr. Pascal Piver was also able to transplant ovaries, and the woman who got her ovaries taken out was able to give birth to a health girl. Professor John Radford was able to successfully transplant testes.
 - Rejection is a possibility, but can be lowered with tissue typing.
 - Donors will be hard to find.
- Give child Factrel®, a gonadotropin-releasing hormone. Inject it through the skin or into a vein because it is soluble. It will make the body produce more luteinizing hormone and follicle-stimulating hormone. These hormones then work together to induce follicle growth and Sertoli cells (men), regulate the menstrual cycle (women), and sperm production (men). They should also take androgen and estrogen and progesterone supplementations with their corresponding genders in order to help form their secondary sex characteristics.

References Page

- Images:
 - "Klinefelter's Syndrome Pictures." *Klinefelter's Syndrome Pictures*. N.p., n.d. Web. 30 May 2013. <<http://syndromepictures.com/klinefelter-s-syndrome-pictures/>>.
 - "Embryology Step 1." *Embryology Step 1*. N.p., n.d. Web. 30 May 2013. <<http://www.studyblue.com/notes/note/n/embryology-step-1/deck/3188610>>.
- Nussbaum, Robert L., Roderick R. McInnes, Huntington F. Willard, and Margaret W. Thompson. *Thompson & Thompson Genetics in Medicine / Robert L. Nussbaum, Roderick R. McInnes, Huntington F. Willard ; with Clinical Case Studies Prepared by Cornelius F. Boerkoel, III*. 6th ed. Philadelphia: Saunders, 2004. Print.
- "Result Filters." *National Center for Biotechnology Information*. U.S. National Library of Medicine, n.d. Web. 19 May 2013. <<http://www.ncbi.nlm.nih.gov/pubmed/12871878>>.
- "The Human Y Chromosome's Azoospermia Factor B (AZFb) Region: Sequence, Structure, and Deletion Analysis in Infertile Men." -- *Ferlin Et Al. 40 (1): 18*. N.p., n.d. Web. 19 May 2013. <<http://jmg.bmj.com/content/40/1/18.full>>.
- Board, A.D.A.M. Editorial. *Turner Syndrome*. U.S. National Library of Medicine, 30 Mar. 2012. Web. 21 Feb. 2013. <<http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001417/>>.
- "Y Chromosome." - *Genetics Home Reference*. N.p., n.d. Web. 07 Mar. 2013. <<http://ghr.nlm.nih.gov/chromosome/Y>>.
- "X Chromosome." - *Genetics Home Reference*. N.p., n.d. Web. 08 Mar. 2013. <<http://ghr.nlm.nih.gov/chromosome/X>>.
- "SRY." - *Sex Determining Region Y*. N.p., n.d. Web. 07 Mar. 2013. <<http://ghr.nlm.nih.gov/gene/SRY>>.
- "Spermatogenesis." N.p., n.d. Web. 19 May 2013. <<http://www.uwyo.edu/wjm/repro/spermat.htm>>.
- Staff, Mayo Clinic. "Definition." *Mayo Clinic*. Mayo Foundation for Medical Education and Research, 09 Dec. 2010. Web. 18 May 2013. <<http://www.mayoclinic.com/health/male-hypogonadism/DS00300>>.
- 06 May 2013. <<http://www.rxlist.com/factrel-drug.htm>>.

References Page (Continued)

- "Gynecomastia Symptoms, Causes, Treatment - Surgical Treatments on MedicineNet." *MedicineNet*. N.p., n.d. Web. 10 Mar. 2013. <<http://www.medicinenet.com/gynecomastia/page4.htm>>.
- "American Physiological Society Physiological Reviews." *Sex Determination and Gonadal Development in Mammals*. N.p., n.d. Web. 10 Mar. 2013. <<http://physrev.physiology.org/content/87/1/1.full>>.
- "Sex Reversal Gene: Male Mice Can Be Created Without Y Chromosome Via Ancient Brain Gene." *ScienceDaily*. ScienceDaily, 22 Dec. 2010. Web. 20 Mar. 2013. <<http://www.sciencedaily.com/releases/2010/12/101222121513.htm>>.
- "Sex Reassignment Surgery (SRS):." *Tssurgeryguide*. N.p., n.d. Web. 06 May 2013. <<http://www.tssurgeryguide.com/sex-reassignment-surgery.html>>.
- "Transsexual Sex Reassignment Surgery (male to Female)." *Transsexual Sex Reassignment Surgery (male to Female)*. N.p., n.d. Web. 19 May 2013. <<http://ai.eecs.umich.edu/people/conway/TS/SRS.html>>.
- "Doctors Say More Ovary Transplants Possible." *Doctors Say More Ovary Transplants Possible*. N.p., n.d. Web. 19 May 2013. <<http://phys.org/news165490159.html>>.
- "Man Fathers Child after Testicular Transplant." - *28 February 2001*. N.p., n.d. Web. 19 May 2013. <<http://www.newscientist.com/article/dn1851-man-fathers-child-after-testicular-transplant.html>>.
- "Transplant Rejection: MedlinePlus Medical Encyclopedia." *U.S National Library of Medicine*. U.S. National Library of Medicine, n.d. Web. 19 May 2013. <<http://www.nlm.nih.gov/medlineplus/ency/article/000815.htm>>.
- "Gonadotropin-releasing Hormone (GnRH) for Infertility." *WebMD*. WebMD, n.d. Web. 19 May 2013. <<http://www.webmd.com/infertility-and-reproduction/gonadotropin-releasing-hormone-gnrh-for-infertility>>.
- "Factrel." *Facts and Comparisons at Drugs.com*. N.p., n.d. Web. 06 May 2013. <<http://www.drugs.com/cdi/factrel.html>>.
- "Factrel (Gonadorelin) Drug Information: Description, User Reviews, Drug Side Effects, Interactions - Prescribing Information at RxList." *RxList*. N.p., n.d. Web.