

## Notes - X-Linked Traits

**X-Linked Traits** – The X chromosome is much larger than the Y chromosome and has more genes on it. This means that there are some genes on the X chromosome that do not exist on the Y chromosome. Genes that are on the X chromosome, but not the Y chromosome, are called **X-linked**.

Hemophilia is a genetic disease in which a person's blood does not clot properly when they get a cut. This is caused by a recessive allele of an X-linked gene.

### Codes

$X^H$  – Blood clots normally.

$X^h$  – Hemophilia (blood doesn't clot).

Y – No gene for blood clotting.

### Combinations

$X^H X^H$  – Woman with normal blood clotting.

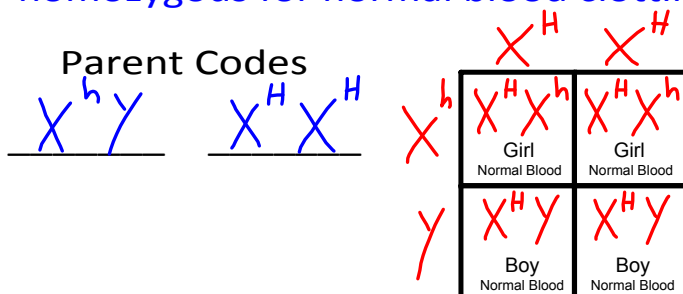
$X^H X^h$  – Woman with normal blood clotting.

$X^h X^h$  – Woman with hemophilia.

$X^H Y$  – Man with normal blood clotting.

$X^h Y$  – Man with hemophilia.

Show a cross between a man with hemophilia and a woman who is homozygous for normal blood clotting.



G-Ratio:  $\frac{X^H X^h \quad X^H X^h}{X^H Y \quad X^H Y} = \frac{2:2}{2:2} \rightarrow 1:1$

P-Ratio:  $\frac{X^H X^h \quad X^H X^h}{X^H Y \quad X^H Y} = \frac{2:2}{2:2} \rightarrow 1:1$

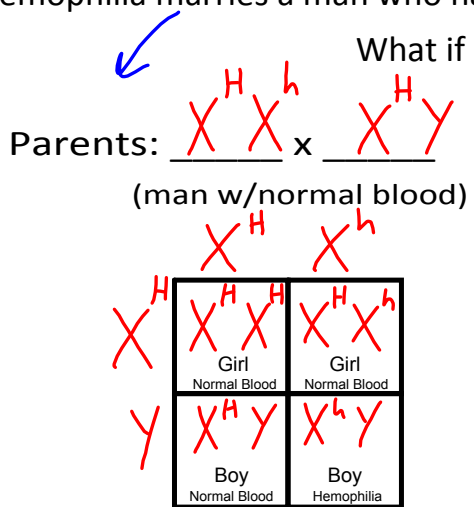
Chances of having a child with hemophilia? 0%

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A **carrier** is someone who has the gene for a trait, but does not show the actual trait. This happens when the individual is heterozygous.

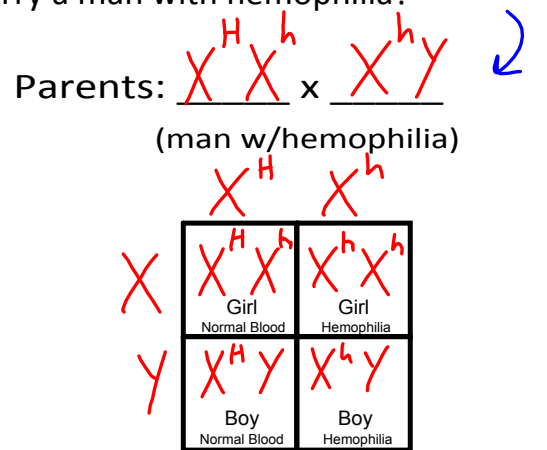
*If right-handedness (R) is dominant and left-handedness (r) is recessive, then someone who is heterozygous (Rr) is a carrier for the recessive left-handed allele. (They are right handed, but can pass on a left-handed gene to their kids.)*

How would the children turn out if a woman who is a carrier for hemophilia marries a man who has normal blood clotting?



G-Ratio:  $1 : 1 : 1 : 1$

P-Ratio:  $2 : 1 : 1$   
Girl Normal Blood    Boy Normal Blood    Boy Hemophilia



G-Ratio:  $1 : 1 : 1 : 1$

P-Ratio:  $1 : 1 : 1 : 1$   
Girl Normal Blood    Girl Hemophilia    Boy Normal Blood    Boy Hemophilia