Sex Linked Traits

SBI3U Biology

Sex Chromosomes

22 pairs of chromosomes control most of our genes

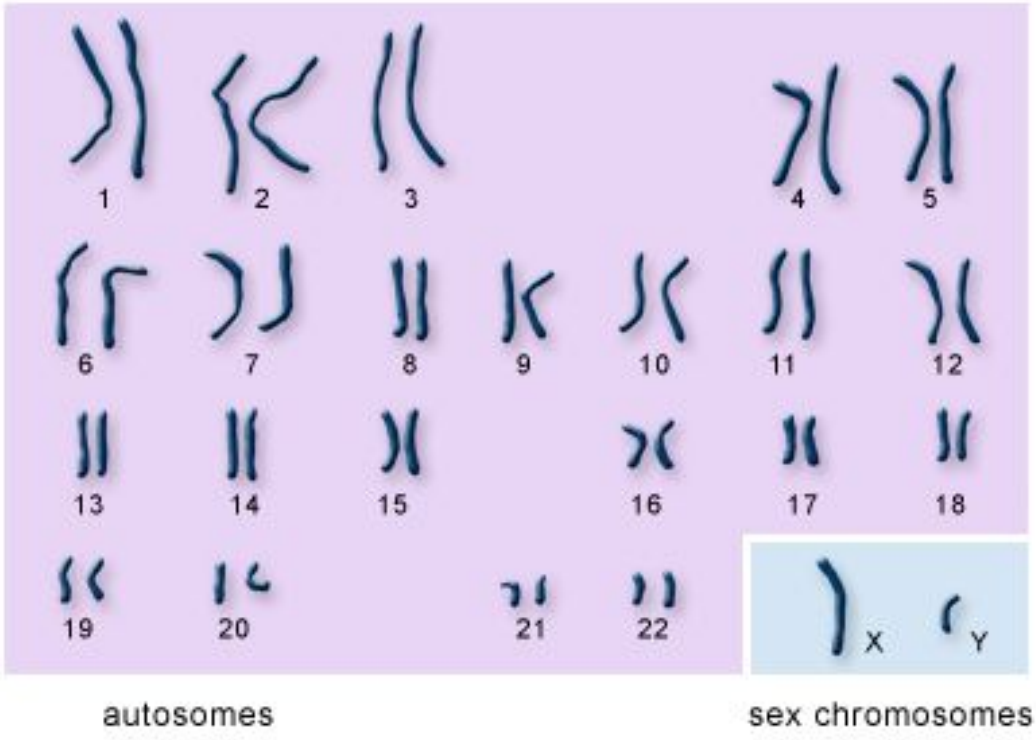
These are **autosomes**

1 pair determines sex

This is pair 23

XX female

XY male



U.S. National Library of Medicine

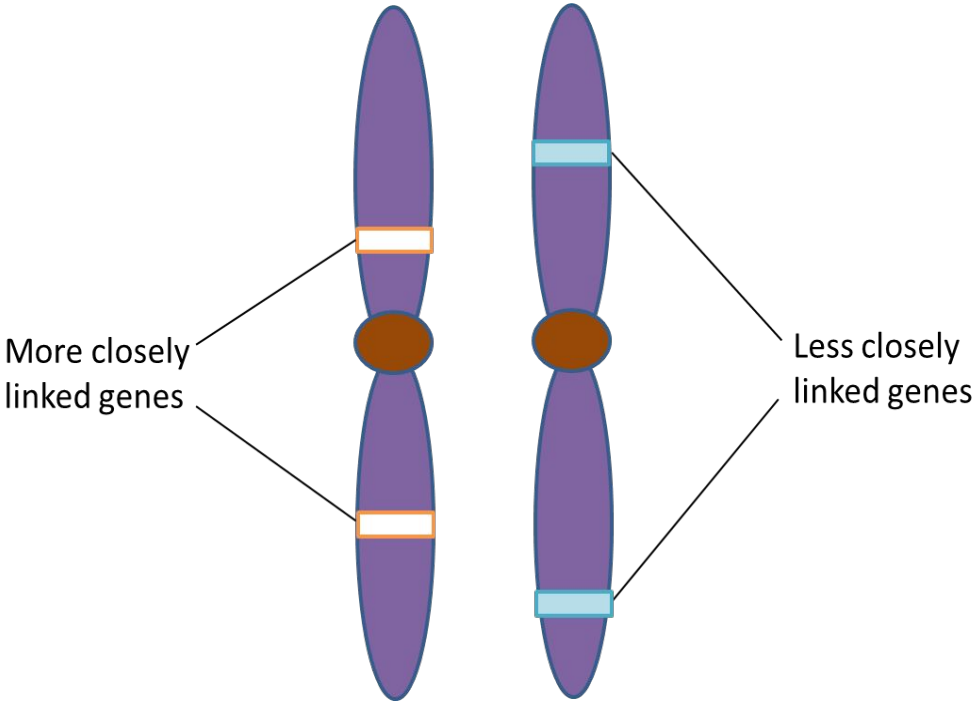
Linked Genes

A term describing genes on the same chromosome

They tend to be inherited together

Eg., blonde hair & blue eyes

Traits on the X chromosome are called **sex linked**



Sex Linked Genes

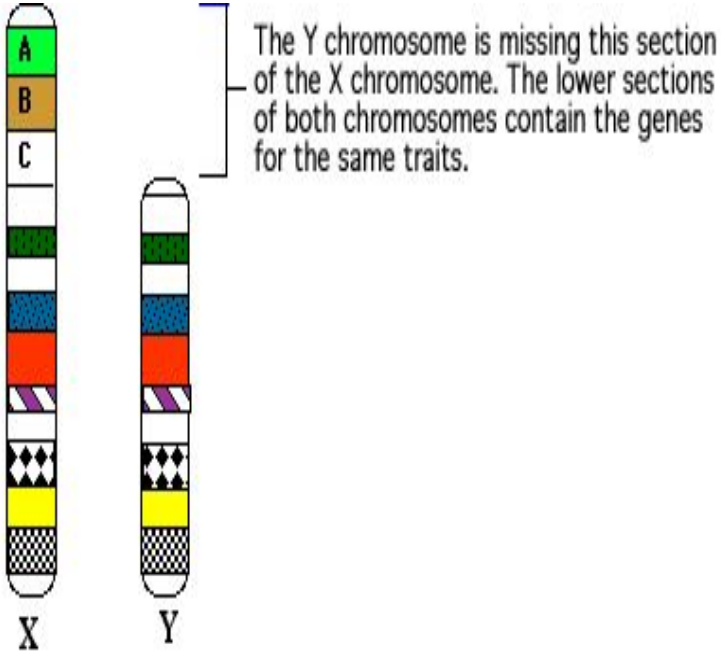
The X chromosome has about 800 genes on it

The Y chromosome has only 70

Women inherit two X, so the laws of dominance apply to them, as usual.

Men get X and Y, a mismatched pair. They are considered to be **hemizygous**

They are *more likely* to show any trait on the X chromosome.



How to write Sex Linked alleles

The allele is a superscript on the X chromosome.

Treat the X with a superscript as one symbol. They go together.

(*kind of like how x^2 in math is not just x and 2*)

DOMINANT ALLELE

RECESSIVE ALLELE

X^AX^a X^AY

Colour Blindness

Men are more likely to be colour blind.
It is a **recessive trait**.

The trait can be “hidden” in women because they can be heterozygous.
These women are **carriers**.

Colour Vision | Carrier | Colourblind

Men are **hemizygous**.

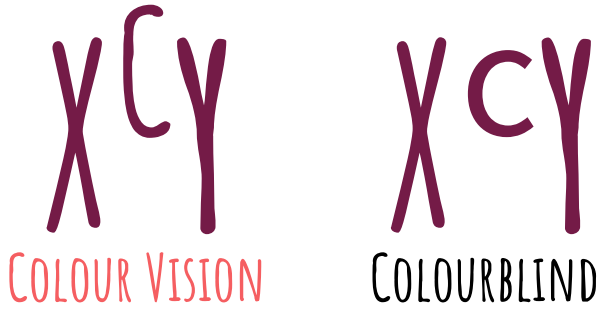
The trait appears more easily.

Colour Vision | Colourblind

Colour Blindness

Three possible genotypes for women.

33% Chance of colourblindness



Two possible genotypes for men.

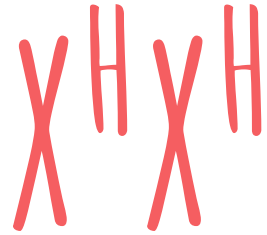
50% Chance of colourblindness

Hemophilia

Men are more likely to have hemophilia. It is also a recessive trait.

The trait causes poor or impaired blood clotting. People can die of internal bleeding due to it.

Female hemophiliacs are very rare.

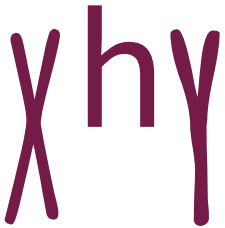


Healthy Blood

Carrier

Hemophiliac

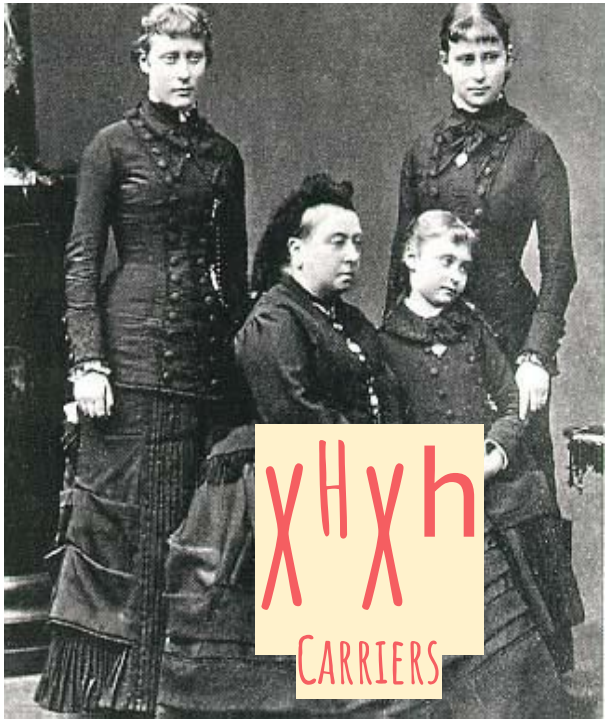
Healthy Blood



Hemophiliac

Hemophilia

Queen Victoria passed on Hemophilia to most of the Royal Families of Europe, including Russia. Her granddaughter Alix of Hess became Empress Alexandra of Russia, who had a hemophiliac son, Alexei.



Punnett Squares

No difference from autosomal traits.

X^CX^c X^CY

Carrier Colour Vision

	X^C	X^c
X^C	X^CX^C	X^CX^c
Y	X^CY	X^cY

GENOTYPIC RATIO:
1:1:1:1

PHENOTYPIC RATIO:

3:1 based on vision

1:2:1 based on vision + sex