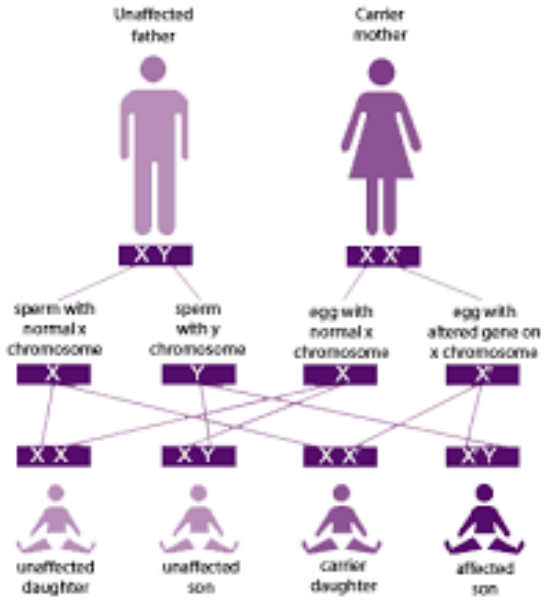
Sex-linked Traits:

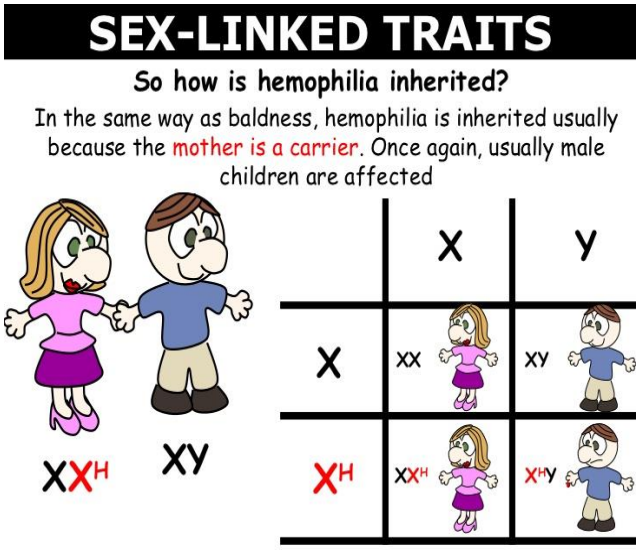
Definition:

Sex-linked traits are a kind of non-Mendelian inheritance pattern that has traits that are passed on via the sex chromosomes of an organism. Sex-linked traits are found on the sex chromosomes of the species and are passed down in that manner. Most of the time, sex-linked traits are seen in one sex and not the other, although both sexes are physically able to inherit a sex-linked trait. These traits are not as common as other traits because they are found only one set of chromosomes, the sex chromosomes, instead of the multiple pairs of non-sex chromosomes.

Sex-linked traits are often associated with recessive disorders or diseases. The fact they are rarer and only in one sex over the other most of the time makes it difficult for the trait to be selected against by natural selection. That is how these disorders continue to be passed down from generation to generation despite the fact they are clearly not the favoured adaptation and can cause severe health issues.



Most traits, in humans, are passed down in the somatic cells of the body via the DNA that is condensed into chromosomes during mitosis or cell replication. However, there are a few traits that are passed down on the X or Y chromosomes that are known as sex-linked traits since they are found on the sex chromosomes and often appear in only one sex as opposed to the other.



Part of the reason that sex-linked traits only show up in one sex over the other has a lot to do with the differences between the X and Y chromosome. The Y chromosome is much smaller than the X chromosome, even though they are considered a matching pair. A human female has a genotype of XX, meaning they have two X chromosomes. Males are XY and have only one X chromosome and a Y chromosome.

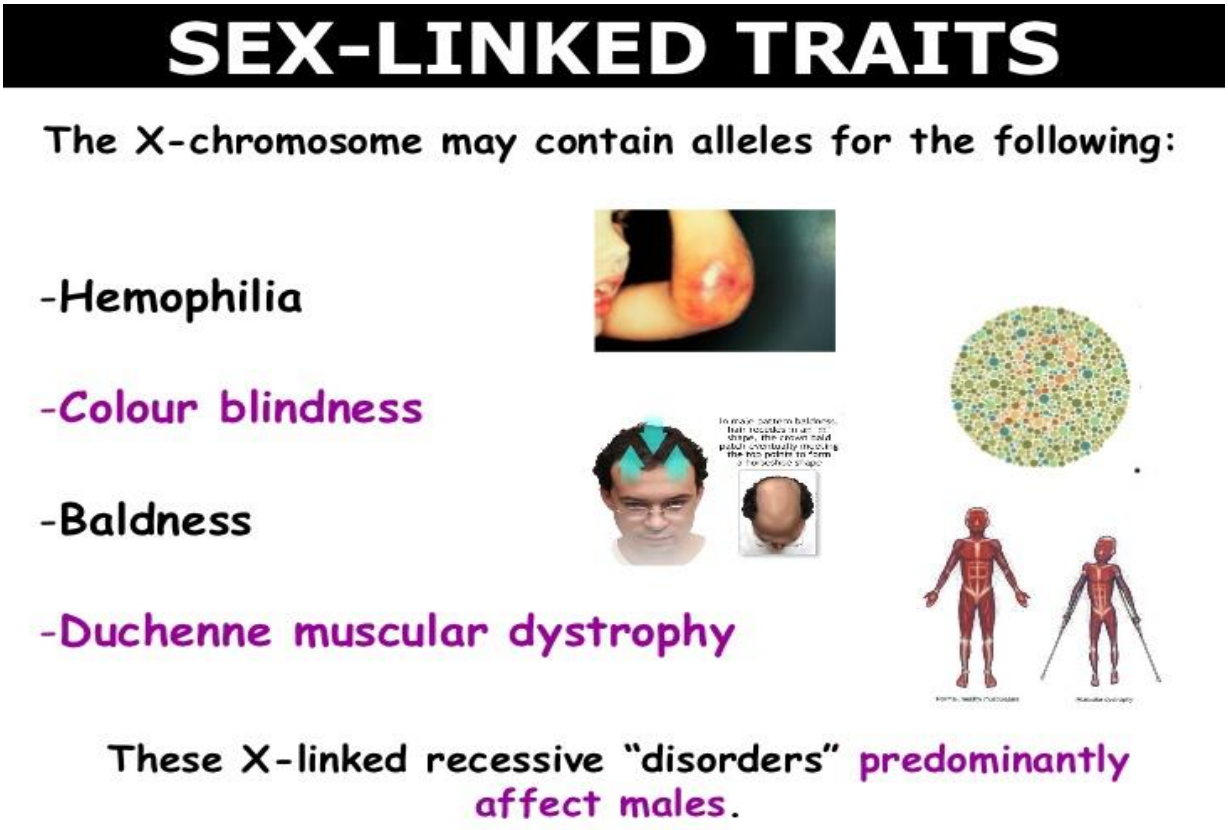
If a female has a recessive trait on one of the X chromosomes, then most likely the corresponding part on the other X chromosome will mask that recessive trait and it will not be seen. However, the males do not have another X chromosome and the Y chromosome is too small to have a corresponding part to the X chromosome that can mask the recessive trait. Therefore, if the male has the recessive trait on the X chromosome, it will be visible in the phenotype because there is only one allele that controls that trait.

Most sex-linked traits are found on the X chromosome, but only show up in human males due to the mismatched XY chromosome pair. However, there are a few sex-linked traits found on the Y chromosome only in humans that again, only males show since females do not have a Y chromosome. This does not mean that females cannot show sex-linked traits.

It is much rarer in females because they must have two recessive alleles for that trait on their X chromosomes rather than just one that males need to show the same trait.

EXAMPLE:

One example of a sex-linked trait are Colour-blindness, Haemophilia. Haemophilia is a recessive disorder that causes the blood not to clot due to a missing blood clotting factor. The alleles for haemophilia are found on the X chromosome. Most humans that have the disorder of haemophilia are males, although there have been recorded cases of a few females with the disease.



When a female has hemophilia, both X chromosomes are affected or one is affected and the other is missing or non-functioning. In these females, bleeding symptoms can be similar to males with hemophilia. When a female has one affected X chromosome, she is a "carrier" of hemophilia.

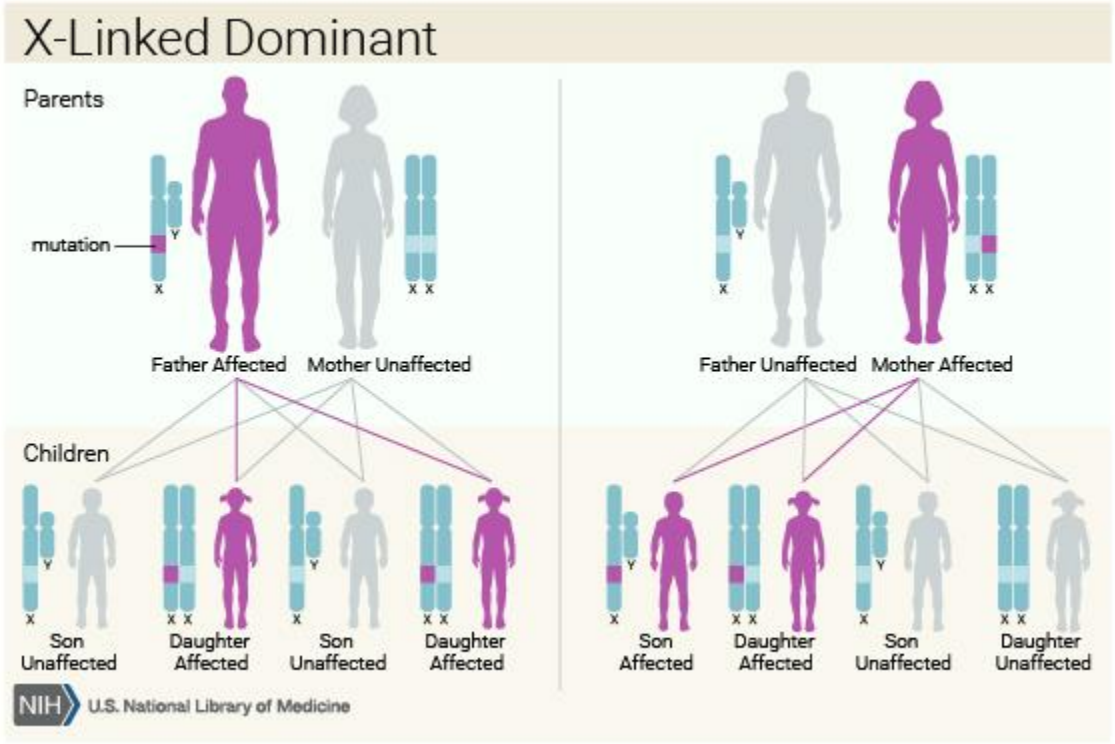
A female who inherits one affected X chromosome becomes a “carrier” of hemophilia. She can pass the affected gene on to her children. In addition, a female who is a carrier sometimes can have symptoms of hemophilia. In fact, some doctors describe these women as having mild hemophilia.

Hypertrichosis of the ears, webbed toes, and porcupine man are examples of Y-linked inheritance in humans. Hypertrichosis of the ears (or hairy ears) is a condition wherein there is a conspicuous growth of hair on the outside rim of the ear, are example of Y-linked traits, Y-linked traits never occur in females, and occur in all male descendants of an affected male. The concepts of dominant and recessive do not apply to Y-linked traits, as only one allele (on the Y) is ever present in any one (male) individual.

Sex-linked diseases are passed down through families through one of the X or Y chromosomes. X and Y are sex chromosomes. Dominant inheritance occurs when an abnormal gene from one parent causes disease, even though the matching gene from the other parent is normal.

It also depends on whether the trait is dominant or recessive. Sex-linked diseases are inherited through one of the sex chromosomes, which are the X and Y chromosomes. If the mother carries the abnormal X gene, half of all their children (daughters and sons) will inherit the disease tendency.

Genes on the X chromosome are said to be X-linked. X-linked genes have distinctive inheritance patterns because they are present in different numbers in females (XX) and males (XY). X-linked human genetic disorders are much more common in males than in females due to the X-linked inheritance pattern.


X-Linked Dominant
Parents
mutation
Father Affected
Mother Unaffected
Father Unaffected
Mother Affected
Children
Son Unaffected
Daughter Affected
Son Unaffected
Daughter Affected
Son Affected
Daughter Affected
Son Unaffected
Daughter Unaffected
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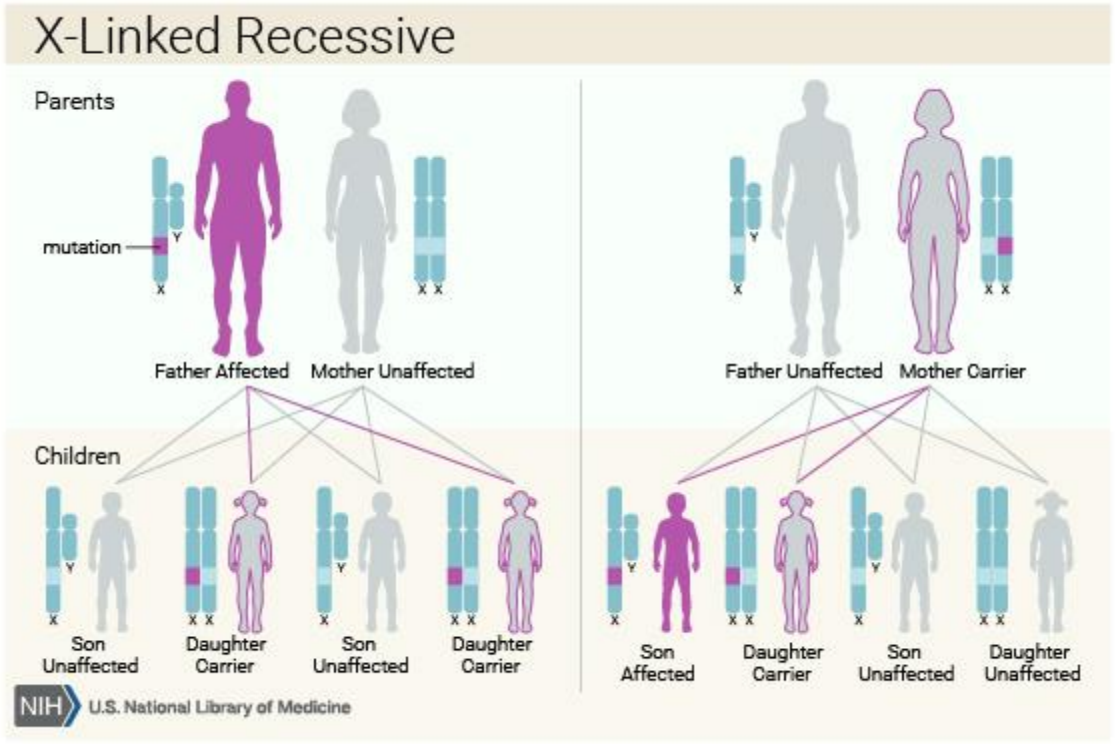
X-Linked Recessive
Parents
mutation
Father Affected
Mother Unaffected
Father Unaffected
Mother Carrier
Children
Son Unaffected
Daughter Carrier
Son Unaffected
Daughter Carrier
Son Affected
Daughter Carrier
Son Unaffected
Daughter Unaffected
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