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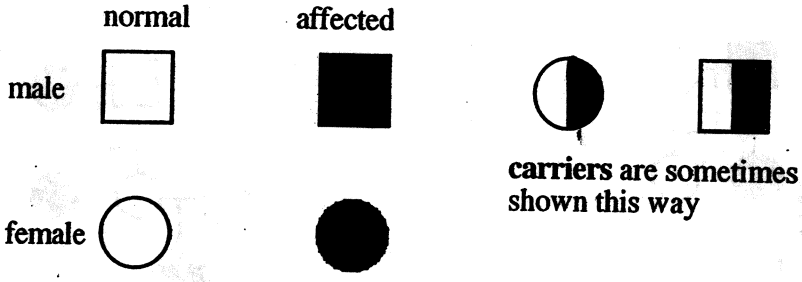
# Genetics Pedigrees

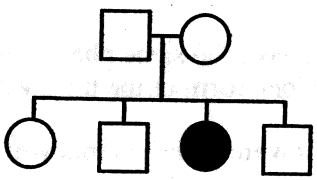
**Pedigrees**

- family tree showing transmission of a **form of a trait** through the generations. By looking at the inheritance pattern of a **phenotype**, you can determine the **genotypes** of individuals in a family.
- **the colored symbols represent the FORM OF THE TRAIT you are following.**
- pedigrees can show whether a trait is dominant or recessive, sex-linked or autosomal.

The following symbols are commonly used:




A **horizontal** line between 2 symbols represents marriage, and the progeny are displayed below the parents.



Example: albinism versus normal pigmentation. (albinism is recessive)

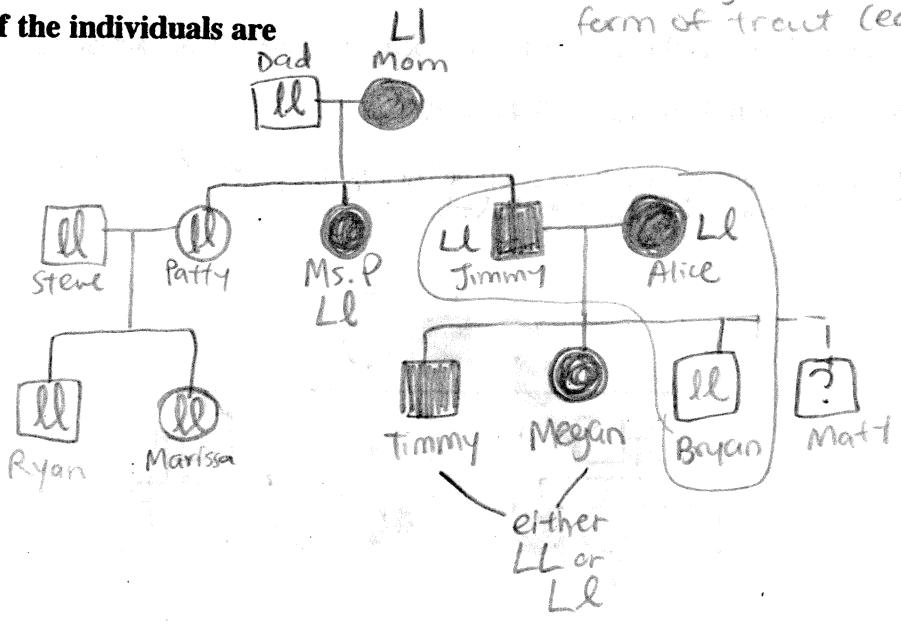
***Pedigrees can allow you to identify:***

**1. Which form of the trait is dominant and which form is recessive**

**2. Whether a trait is autosomal or sex linked**

**3. What the genotypes of the individuals are**

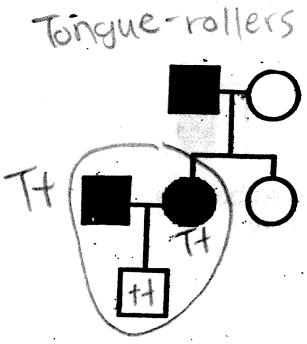
Following lobed, non-attached form of trait (ears)

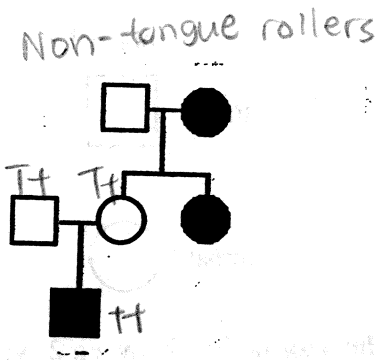


**Determining which form of the trait is dominant, and which form is recessive.**

Consider the trait of tongue rolling. There are 2 forms of this trait. One form of the ability to roll your tongue, and the other is the inability to roll your tongue.

When constructing a pedigree you must decide on which form of the trait you want to follow. The individual squares and circles will be colored in for all the men and women who have the form of the trait you chose to follow. For example, fill in all the men and women who have the ability to roll their tongue.




Look for a pattern where the 2 parents of a child have the same phenotype, but their phenotype is different from the childs. In other words, the parents have one form of the trait, while the child has the other form.

The only way this phenotype pattern could occur were if the parents were heterozygous and the child is homozygous recessive.

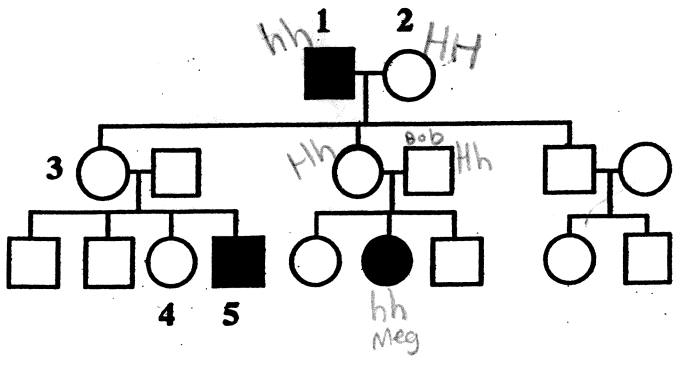
If you had chosen to follow the other form of the trait and you filled in all the individuals that couldn't roll their tongue, you would still see a pattern where the parents have the same phenotype and their child has a different phenotype. Again, the parents would have to be heterozygous and the child would have to be homozygous recessive.

***So Remember:***
**Anytime the 2 parents are phenotypically different from a child you know that the parents are heterozygous and the child is homozygous recessive .**

In the pedigree shown below is the form of the trait being followed Dominant or Recessive?

What are the genotypes of Individuals 1,2,3,4 and 5?

After reading the next section on sex linkage come back to this problem and see if you can explain why this trait is definitely autosomal and not sex linked.




recessive autosomal

It is not sex-linked bc Bob does not have same phenotype as Meg. He'd have to be $X^hY$ if Meg was $X^hX^h$ & sex-linked.

**Determining whether a trait is autosomal or sex linked.**

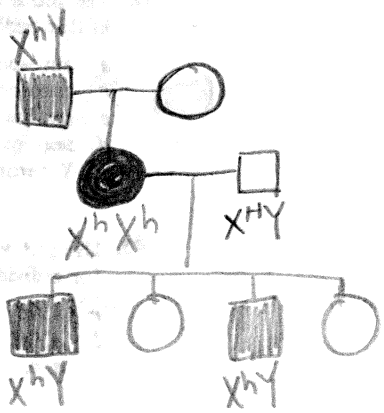
**Assuming the from of the trait you are following is recessive,** if the pedigree shows that many more males than females show the trait you can assume that it's most likely sex linked. This is the case because males only need to inherit one allele to show this form of the trait, while females would have to inherit two alleles.

can't always tell, but sometimes you can eliminate sex-linkage

*Some additional hints that help you determine **sex linkage:***

1. If the female shows the phenotype then all her sons would also show the phenotype. For example, if the female was $X^hX^h$ then all her sons would be $X^hY$.

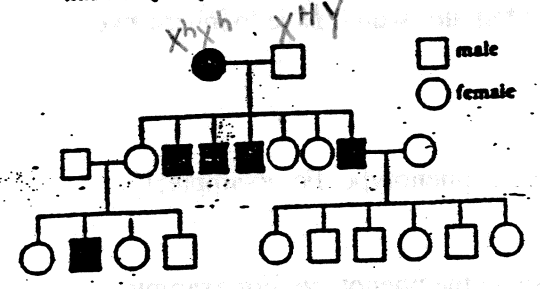
2. If a female shows the phenotype then her father would also have to show the phenotype. For example, if the female was $X^hX^h$ then her father would have to be $X^hY$. Her mother could be heterozygous or homozygous recessive



no sex-linked dominant

HW

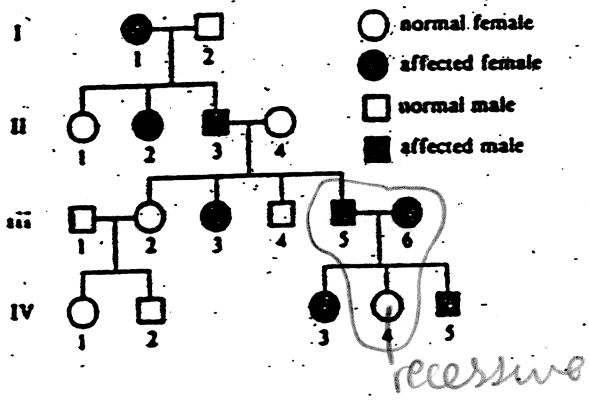
Below is a pedigree for the hereditary disease agammaglobulinemia, a disease in which the patients demonstrate a lack of immunity to pathogenic bacteria and viruses.




90. What is the *most likely* mode of inheritance of this disease?

*a* autosomal dominant
*b* autosomal recessive
*c* ~~sex-linked dominant~~
(*d*) sex-linked recessive

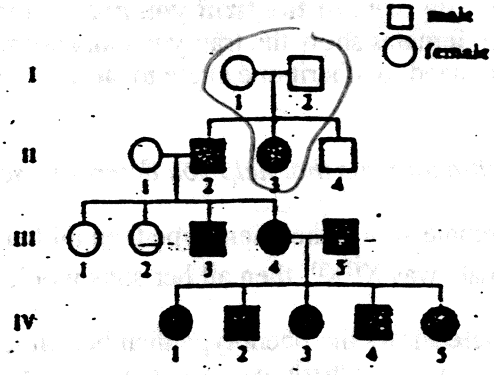
The diagram below is a pedigree for a rare hereditary disease. Afflicted individuals are indicated by shaded symbols.




91. What is the mode of inheritance of this disease?

(*a*) autosomal dominant
*b* autosomal recessive
*c* ~~sex-linked dominant~~
*d* sex-linked recessive
*e* none of the above

*Examine the following human pedigree for questions 92 and 93.*



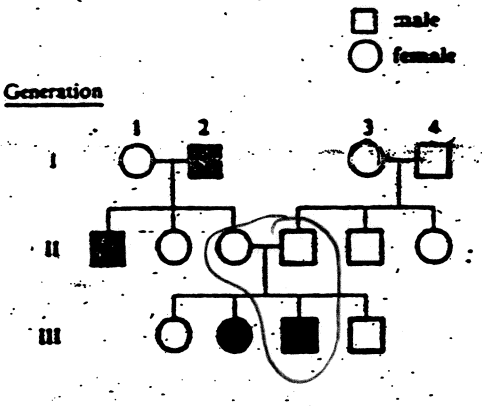

92. The mode of inheritance of the trait shown in this pedigree is

*a* autosomal dominant.
(*b*) autosomal recessive.
*c* ~~sex-linked dominant.~~
*d* sex-linked recessive.
*e* Y-chromosome linked.

93. Using *A* versus *a* for symbols, the genotype for individual II-1 is

(*a*) *A/a*.
*b* *A/A*.
*c* *a/a*.
*d* either *A/a* or *A/A*.
*e* $X^aX^a$.

*In answering questions 94 and 95, refer to the following pedigree in which circles symbolize females and squares males. Filled symbols designate individuals who show a certain phenotype, and open symbols designate individuals who do not show the phenotype.*




94 The phenotype of this pedigree is probably inherited as

*a* an autosomal dominant.
(*b*) an autosomal recessive.
*c* ~~a sex-linked dominant.~~
*d* a sex-linked recessive.

95 The most likely genotype for individual I in generation I is

*a* *G/G*.
(*b*) *G/g*.
*c* *g/g*.
*d* $X^GY$.
*e* $X^gY$.