GENETICS: X LINKED GENES

****In fruit flies, eye color is a sex linked trait. Red is dominant to white ****

1. What are the sexes and eye colors of flies with the following genotypes:

\[ \begin{align*}
X^R X^r & \quad F - Red \\
X^R X^r & \quad F - Red \\
X^R X^r & \quad X^R Y \quad M - Red \\
X^r X^r & \quad X^r Y \quad M - White \\
X^r X^r & \quad F - White
\end{align*} \]

2. What are the genotypes of these flies:

- white eyed, male \( X^r Y \)
- white eyed, female \( X^r X^r \)
- red eyed female (heterozygous) \( X^E X^r \)
- red eyed, male \( X^E Y \)

3. Show the cross of a white eyed female \( X^r X^r \) with a red-eyed male \( X^R Y \).

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\[ \begin{array}{c|c|c|c}
 & X^R & X^r & Y \\
X^r & X^r Y & X^r Y & X^r Y \\
X^r & X^r Y & X^r Y & X^r Y
\end{array} \]
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4. Show a cross between a pure red eyed female and a white eyed male.
What are the genotypes of the parents:

\( X^E X^r \) & \( X^r Y \)

How many are:
- white eyed, male \( 0\% \)
- white eyed, female \( 0\% \)
- red eyed, male \( 50\% \)
- red eyed, female \( 50\% \)

5. Show the cross of a red eyed female (heterozygous) and a red eyed male. What are the genotypes of the parents?

\( X^E X^r \) & \( X^E Y \)

How many are:
- white eyed, male \( 25\% \)
- white eyed, female \( 0\% \)
- red eyed, male \( 25\% \)
- red eyed, female \( 50\% \)

Math: What if in the above cross, 100 males were produced and 200 females. How many total red-eyed flies would there be? \( 250 \) (half the males + all of the females)

6. In humans, hemophilia is a sex linked trait. Females cannot pass hemophilia to their sons. Males will either have the disease or not (but they won't ever be carriers)
\[X^H X^H = \text{female, normal} \quad X^H Y = \text{male, normal}\]
\[X^H X^h = \text{female, carrier} \quad X^h Y = \text{male, hemophiliac}\]
\[X^h X^h = \text{female, hemophiliac}\]

Show the cross of a man who has hemophilia with a woman who is a carrier.

What is the probability that their children will have the disease? \(50\%\)

7. A woman who is a carrier marries a normal man. Show the cross. What is the probability that their children will have hemophilia? What sex will a child in the family with hemophilia be?

8. A woman who has hemophilia marries a normal man. How many of their children will have hemophilia, and what is their sex?

9. In cats, the gene for calico (multicolored) cats is codominant. Females that receive a B and an R gene have black and orange splotches on white coats. Males can only be black or orange, but never calico.

Here's what a calico female's genotype would look like. \(X^B X^R\)

Show the cross of a female calico cat with a black male.

What percentage of the kittens will be black and male? \(25\%\) \(X^By\)
What percentage of the kittens will be calico and male? \(0\%\) not possible.
What percentage of the kittens will be calico and female? \(25\%\) \(X^B X^R\)

10. Show the cross of a female black cat, with a male orange cat.

What percentage of the kittens will be calico and female? \(50\%\)
What color will all the male cats be? \(\text{black}\)