

Shunya Wu

Genetic Questions 1

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1) Monohybrid Cross

Short hair in rabbits (S) is dominant over long hair (s). The following crosses are carried out, producing the progeny shown. Give all possible genotypes of the parents in each cross.

a) short haired female x short haired male \Rightarrow progeny:

4 with short hair and 2 with long hair

b) short haired female x long haired male \Rightarrow 12 short haired offsprings

a) $X_S X_S \times X_S Y$

a) $SS \times SS \Rightarrow S, ss, SS$

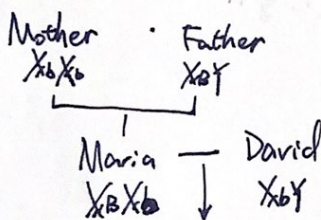
b) $X_S X_S \times X_s Y \Rightarrow X_S X_s, X_S Y$

b) $SS \times ss \Rightarrow S_s$
or $S_s \times ss$ at low chance

2) Sex-linked Inheritance

Color blindness in human is most commonly due to an X-linked recessive allele. Maria has normal vision, but her mother is color-blind. David is color-blind.

If David and Maria have a child together, what is the probability the child will be color-blind?



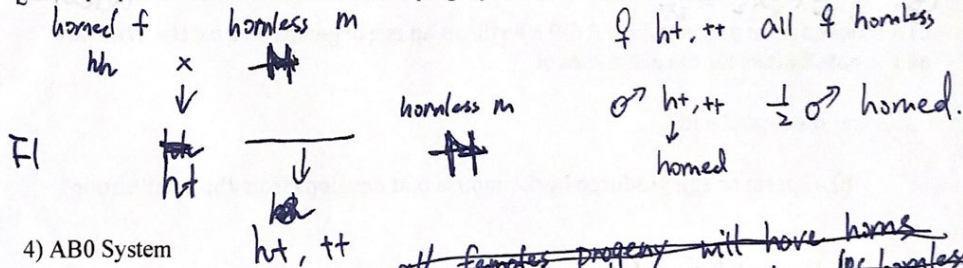
offsprings: $X_B X_b, X_B Y, X_b X_b, X_b Y$
blind.

blind-probability: $\frac{1}{2}$

3) Sex-influenced traits

In sheep, the presence of horns is produced by an autosomal allele that is dominant in males and recessive in females. A horned female is crossed with a hornless male. One of the resulting F1 females is crossed with a hornless male.

What proportion of the male and female progeny from this cross will have horns?



4) AB0 System

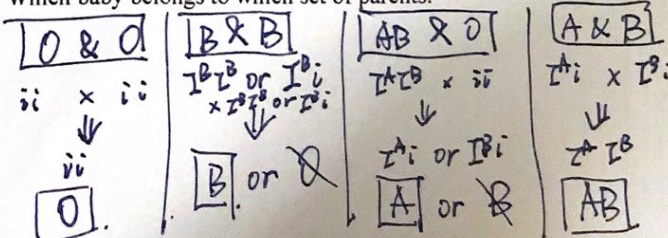
At the neonate ward was big confusion. A new mother was convinced that she got the wrong infant back after a check up. Is it possible to correlate the infants lying in the ward with their parents unambiguously by simple blood typing?

The neonates have the following blood types: A, B, AB and O.

The parents on the ward: O & O, A & B, AB & O and B & B.

Which baby belongs to which set of parents.

result:

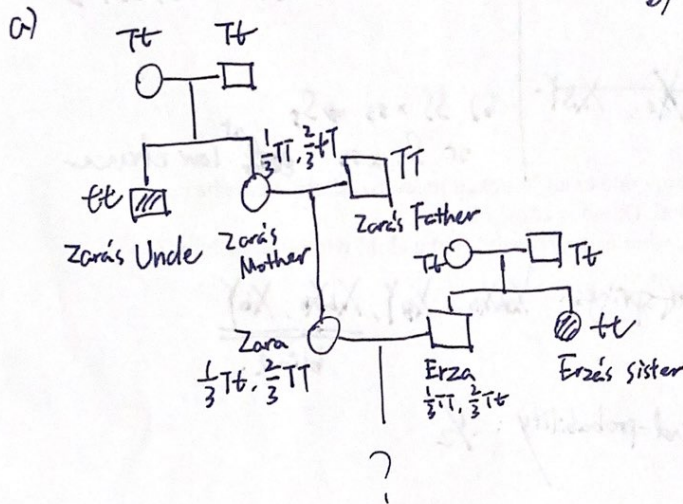


neonates	A	B	AB	O
parents	AB & O	B & B	A & B	O & O

5) Tay-Sachs is a recessive lethal disease in which there is neurological deterioration early in life. An affected person usually dies during early childhood or adolescence. The disease is rare in the population overall but is found at relatively high frequency in Ashkenazi Jews from Eastern Europe. Zara's maternal uncle had the disease. Zara is trying to determine the probability that she and her husband Ezra could have an affected child. Zara's father does not come from a high-risk population, while Ezra's sister died of the disease at an early age.

a) Draw the pedigree of the individuals described. Include the genotypes where possible.

b) Determine the probability that Zara's and Ezra's child will be affected.



b) Zara's Mother has a $\frac{1}{3}$ chance of TT and $\frac{2}{3}$ chance of Tt

$$\text{Zara: TT: } \frac{1}{3} \times 1 + \frac{2}{3} \times \frac{1}{2} = \frac{2}{3}$$

$$\text{Tt: } \frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$$

$$\text{Ezra: } \frac{1}{3} \text{ TT, } \frac{2}{3} \text{ Tt}$$

so their children:

$$\text{TT: } \frac{2}{3} \times (\frac{1}{3} + \frac{2}{3} \times \frac{1}{2}) + \frac{1}{3} \times \frac{1}{2} \times (\frac{1}{3} + \frac{2}{3} \times \frac{1}{2}) = \frac{5}{9}$$

$$\text{Tt: } \frac{2}{3} \times \frac{2}{3} \times \frac{1}{2} + \frac{1}{3} \times \frac{1}{3} \times \frac{1}{2} + \frac{1}{3} \times \frac{2}{3} \times \frac{1}{2} = \frac{7}{18}$$

$$\text{tt: } \frac{1}{3} \times \frac{1}{2} \times \frac{2}{3} \times \frac{1}{2} = \frac{1}{18}$$

$\frac{1}{18}$ chance that their child will be affected

6) A mouse sperm of genotype a B C D E fertilizes an egg of genotype a b c d e. What are all the possibilities for the genotypes of

a) the zygote and

b) a sperm or egg produced by the mouse that develops from this fertilization?

a) a a B b C c D D E e

b) a B C D E, a B C D e, a B c D E, a B c D e, a b C D E, a b C D e, a b c D e, a b c D E