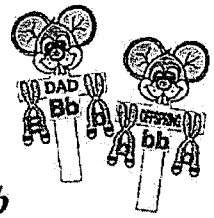

Human Inheritance Lab

Purpose
To determine personal phenotypes and genotypes for some observable traits
To determine the frequencies (%) of dominant and recessive traits in a population

Materials
Pencil, lab, scrap paper, PTC paper

Procedure
You will determine your phenotype and try to determine your genotype for the traits listed below. Remember, if you show a dominant trait, you may be homozygous or heterozygous for that trait. Suppose, however, that one of your parents shows the recessive trait. In that case, the parent would have passed on a gene for the recessive trait and you would be heterozygous for that trait. If neither of your parents shows the recessive trait, you may not know if you are heterozygous or homozygous dominant for that trait. In that case, put both possible genotypes (heterozygous and homozygous dominant).

1) In the second column of the first table, write yes or no depending on whether or not you possess each trait. If it is not a yes/no possibility, put which trait you show (example: attached or free for ear lobes). Work with a partner. For traits that you cannot observe directly, ask your partner for help.

2) Complete the second table for the class, once results have been shared. Calculate the percentage of your classmates with the recessive trait for each row and determine if it adheres to Mendel's findings.

- Ear lobes (E): Free ear lobes have at least one dominant allele. People with attached earlobes are recessive.
- Eye color (B): Inheritance of eye color is controlled by multiple genes, but people having the homozygous recessive genotype have blue eyes. People who have a dominant allele may have different shades of brown, hazel, or green eyes.
- Widow's Peak (W): A hairline that forms a downward point in the middle of the forehand is caused by a dominant allele. A smooth hairline is caused by a recessive genotype.
- Tongue roller (T): A dominant allele gives some people the ability to roll their tongues into a "U" shape when it is extended. People with the recessive alleles cannot roll their tongues.
- Tongue folder (F): A dominant allele gives some people the ability to fold their tongues over while sticking it out. People with the recessive genotype cannot.
- Bent Little Finger (L): A dominant allele results in the end joint of the little finger of each hand bending inward. Straight little fingers are a result of the recessive genotype.
  Place your hands on a flat surface, palms down, and relax. Check to see if the first joints of your little fingers are bent or straight.
- Mid-Digital Hair (H): Individuals who have hair on the middle joints of their fingers have at least one dominant allele. Those with two recessive alleles do not have hair on the joint.
- Red hair (R): Individuals with red hair have the recessive genotype. Those with any other color hair have at least one dominant allele.
- Curly hair (C): Individuals having curly hair have at least one dominant allele. People having straight hair have the recessive genotype.

- Freckles (K): The recessive genotype means the individual lacks freckles. An individual with freckles will have at least one dominant allele.
- Dimples (D): An individual without dimples is homozygous recessive, while an individual with dimples has at least one dominant allele.
- Cleft Chin (M): An individual with a genotype of homozygous recessive will have a cleft chin, while a person with at least one dominant allele will not have a cleft chin.
- Hitchhiker's thumb (J): A person that can bend the last joint of the thumb to approximately a 45 degree angle has the recessive genotype while an individual that cannot do it has at least one dominant allele.
- Index Finger Length (I): If the index finger is shorter than the ring finger (4^{th} finger next to the pinky), you have a dominant allele. If not, you have a recessive allele.
- Left-over-right thumb crossing (Q): When the hands are folded in a natural fashion, the left thumb crosses the right thumb in a dominant genotype. If reversed, a recessive genotype is present.
- PTC taster (P): The ability to taste the manmade substance (bitter) is the dominant genotype. The inability to taste the bitterness is the recessive genotype.

Discussion:

1) If a man does not have Hitchhiker's thumb, what are the two possible genotypes?

2) If a man is homozygous for Hitchhiker's thumb and marries a woman with homozygous dominant alleles, what is the probability of them having children with Hitchhiker's thumb?

3) Is anyone dominant for every trait? Is anyone recessive for every trait? If not, what does this show about dominance and recessiveness of traits in people?

4) Two people that look alike have thousands of common traits. Does anyone have a genetic twin in the class? How often do you think that genetic twins (aside from identical twins) exist? Explain your answer.

5) What is the ratio of tongue rollers to non-tongue rollers in the class? What is the frequency (%) of tongue rollers in the class?

6) What is the ratio of dimples to non-dimples in the class? What is the frequency (%) of dimpled students in the class?

7) What is the probability of having both of these traits (tongue-rolling and dimples)? To determine this, multiply the percent of tongue rollers times the percent of those with dimples. Remember you cannot multiply %...you must make it a decimal first. This will give you the percent frequency of someone having both traits.

8) Go to the link http://learn.genetics.utah.edu/content/begin/traits/ptc/ and find the evolutionary advantage to being able to taste bitter substances such as PTC.

Individual Data

Traits	Phenotype (YES/NO)	Possible Genotype
Ear lobes (E)		
Eye color (B)		
Widows peak (W)		
Tongue roller (T)		
Tongue folder (F)		
Bent little finger (L)		
Mid-Digital Hair (H)		
Red hair (R)		
Curly hair (C)		
Freckles (K)		
Dimples (D)		
Cleft chin (M)		
Hitchhiker's thumb (J)		
Index Finger Length (I)		
Left-over-right thumb crossing (Q)		
PTC taster (P):		

Class data

Traits	Phenotype (YES/NO)	Possible Genotype
Ear lobes (E)		
Eye color (B)		
Widows peak (W)		
Tongue roller (T)		
Tongue folder (F)		
Bent little finger (L)		
Mid-Digital Hair (H)		
Red hair (R)		
Curly hair (C)		
Freckles (K)		
Dimples (D)		
Cleft chin (M)		
Hitchhiker's thumb (J)		
Index Finger Length (I)		
Left-over-right thumb crossing (Q)		
PTC taster (P):		