

Investigating Inherited Traits: Variations of the Human Face (Ugly Baby Lab)

Name _____ Period _____

Introduction

Read the entire investigation before you begin.

Heredity is the passing on of traits, or characteristics, from parent to offspring. The genetic makeup of an individual is known as its genotype. The physical traits you can observe in a person are his or her phenotype. Phenotype is a result of the genotype and the individual's interaction with the environment. The units of heredity are called genes. Genes are found on the chromosomes in a cell. An allele is one of two or more forms of a gene. When the two alleles of a pair are the same, the genotype is homozygous, or pure. When the two alleles are not the same, the genotype is heterozygous, or hybrid. In nature, specific combinations of alleles happen only by chance. Some alleles are expressed only when the dominant allele is absent. These alleles produce recessive phenotypes. Alleles that are expressed when the genotype is either homozygous or heterozygous produce dominant phenotypes. An allele that codes for a dominant trait is represented by a capital letter, while an allele that codes for a recessive trait is represented by a lowercase letter. Sometimes when the genotype is heterozygous, neither the dominant nor recessive phenotype occurs. In this case, called incomplete dominance or codominance, an intermediate phenotype is produced. In humans, the sex of a person is determined by the combination of two sex chromosomes. People who have two X chromosomes (XX) are females, while those who have one X chromosome and one Y chromosome (XY) are males. In this investigation, you will see how different combinations of alleles produce different characteristics.

Problem How are traits inherited?

Pre-Lab Discussion. Answer the following questions on a separate piece of paper using complete sentences.

1. What does a single side of the coin represent?
2. What are the chances that any coin or disk tossed will land heads up?
3. How is a coin toss like the selection of a particular allele?
4. For the traits in this investigation, do all heterozygous pairs of alleles produce an intermediate phenotype?
5. Can you accurately determine a person's genotype by observing his or her phenotype? Explain.

Materials (per pair) 2 coins, colored pencils

Procedure

1. Obtain two coins. Label one coin "Dad" and the other coin "Mom". You will flip your coins to determine the traits in a hypothetical offspring.
2. Start by determining the sex of the offspring. Flip the coins. If both coins land the same side up, the offspring is a female. If the coins land different sides up, the offspring is a male. Record the sex of the offspring in the blank on the worksheet.
3. For the rest of the coin tosses you will make, heads will represent the dominant allele and tails will represent the recessive allele.
4. You should now flip your coins at the same time to determine the phenotype of the first trait, the shape of the face. Note: The coins should be flipped only once for each trait. After each flip, record the trait of your offspring on the appropriate line on the worksheet.

- Continue to flip the coins for each trait listed in the table in Figure 1. Note: Some information in Figure 1 has been simplified. Some listed traits are actually produced by two or more genes.
- Using the recorded traits, draw the facial features for your offspring on a separate piece of unlined paper in color.

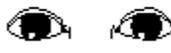
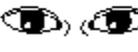
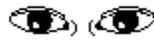
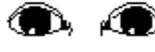
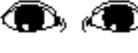
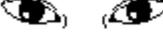
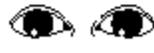
	Traits	Dominant (both heads)	Hybrid (one head, one tail)	Recessive (both tails)
1	Shape of face	 round <i>RR</i>	 round <i>Rr</i>	 Square <i>rr</i>
2	Cleft in chin	 present <i>CC</i>	 present <i>Cc</i>	 absent <i>cc</i>
3	Texture of hair	 curly <i>HH</i>	 wavy <i>Hh</i>	 straight <i>hh</i>
4	Widow's peak	 present <i>WW</i>	 present <i>Ww</i>	 absent <i>ww</i>
5	Spacing of eyes	 close together <i>EE</i>	 medium distance <i>Ee</i>	 far apart <i>ee</i>
6	Shape of eyes	 almond <i>AA</i>	 almond <i>Aa</i>	 round <i>aa</i>
7	Position of eyes	 straight <i>SS</i>	 straight <i>Ss</i>	 slant upward <i>ss</i>
8	Size of eyes	 large <i>LL</i>	 medium <i>Ll</i>	 small <i>ll</i>

Figure 1

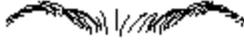
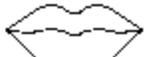
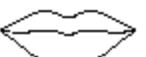
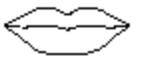
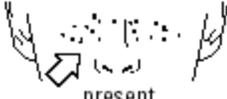
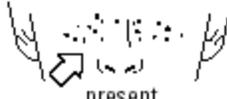
	Traits	Dominant (both heads)	Hybrid (one head, one tail)	Recessive (both tails)
9	Length of eyelashes	 long LL	 long Ll	 short ll
10	Shape of eyebrows	 bushy BB	 bushy Bb	 fine bb
11	Position of eyebrows	 not connected NN	 not connected Nn	 connected nn
12	Size of nose	 large LL	 medium Ll	 small ll
13	Shape of lips	 thick TT	 medium Tt	 thin tt
14	Size of ears	 large LL	 medium Ll	 small ll
15	Size of mouth	 large LL	 medium Ll	 small ll
16	Freckles	 present FF	 present Ff	 absent ff
17	Dimples	 present DD	 present Dd	 absent dd

Figure 1 continued

Analysis and Conclusions

Answer the following questions on a separate piece of paper using complete sentences.

1. **Calculating** What percent chance did you and your partner have of “producing” a male offspring? A female offspring? Explain your answer.
2. **Predicting** Would you expect the other pairs of students in your class to have an offspring completely similar to yours? Explain your answer.
3. **Inferring** What are the possible genotypes of the parents of a child who has wavy hair (*Hh*)?
4. **Classifying** List all the traits in this investigation that showed incomplete dominance.
5. **Drawing Conclusions** Do you think that anyone in your class has all the same genetic traits that you have? Explain your answer.
6. **Drawing Conclusions** How might it be possible for you to show a trait when none of your relatives shows it?

Going Further

Repeat this investigation with your partner to “produce” your second offspring. After completing all of your tosses, make a drawing of the offspring. Answer the following questions on a separate piece of paper using complete sentences.

1. What similarities exist between your first and second offspring?
2. What differences?
3. Would you expect a third offspring to resemble either the first or the second offspring? Explain your reason.

Turn in the following:

1. The worksheet for both your ugly babies ☺
2. The drawing of the ugly baby **you** drew
3. The answers to Pre-Lab Discussion, Analysis and Conclusions and Going Further (make sure you note which answers are to which set of questions). All answers must be in your own words.

4. Name _____ Period _____

Partner's name _____

Data Table for Baby #1

Baby's
name

Trait	Dad's gene	Mom's gene	Baby's genotype	Baby's phenotype
Sex		X		
1. Face shape				
2. Cleft chin				
3. Hair type				
4. Widow's peak				
5. Eye spacing				
6. Eye shape				
7. Eye position				
8. Eye size				
9. Length of eyelashes				
10. Eyebrow shape				
11. Eyebrow position				
12. Size of nose				
13. Shape of lips				
14. Size of ears				
15. Size of mouth				
16. Freckles				
17. Dimples				

Baby's total **genotype**: _____

Describe what your baby will look like in words (their **phenotype**):

Data Table for Baby #2

Baby's
name

Trait	Dad's gene	Mom's gene	Baby's genotype	Baby's phenotype
Sex		X		
1. Face shape				
2. Cleft chin				
3. Hair type				
4. Widow's peak				
5. Eye spacing				
6. Eye shape				
7. Eye position				
8. Eye size				
9. Length of eyelashes				
10. Eyebrow shape				
11. Eyebrow position				
12. Size of nose				
13. Shape of lips				
14. Size of ears				
15. Size of mouth				
16. Freckles				
17. Dimples				

Baby's total **genotype**: _____

Describe what your baby will look like in words (their **phenotype**):
