GENETICS

FACE LAB: A STUDY OF PHENOTYPE

INTRODUCTION:

Look around the room. No two people look the same. If you have ever been to a family reunion you know the situation is still the same. Sometimes, you can see family resemblances, but you still don't have trouble telling people apart. Even relatives as close as siblings can be very different in appearance. The outward appearance of a person is also known as their phenotype. There is tremendous variation in phenotypes in human populations. This situation exists because a large variety of traits exist in human populations to start with, and because humans continue to create variation as they reproduce. Todays lab is going to tackle the problem of why siblings can differ so much in appearance. Hopefully, it will answer that question and stimulate others.

CONGRATULATIONS!! YOU ARE GOING TO BE A PARENT!!

What would your baby look like if both you and your lab partner (who will simulate your spouse) have one dominant gene and one recessive gene for each of the facial features illustrated on the following pages? In other words, each of you will be heterozygous for each trait. In order to find out which gene you pass on : you and your spouse will each flip a coin to determine what gene will be contributed to your offspring. If you flip Heads, you will pass on the dominant trait, and if you flip Tails, you pass on the recessive trait. Each child will have 2 genes for each trait, one from each parent. Record the genetic contributions on your data sheet. When you have determined all of the features for the baby, draw a picture of your son/daughter as they would look in high school. You and your spouse will produce one child.

The traits with an asterisk by them are believed to be inherited in the manner described. Most of the traits in this activity, however, were created to illustrate the way human heredity works in a simplified model, and to reinforce basic genetic principles. In actuality, inherited characteristics of the face are very much more complex than this activity illustrates. Most of these facial characteristics are determined by many genes working together in ways geneticists do not yet understand.

Your first task is to determine the SEX of your child. The male parent determines sex, therefore, he flips the coin.

Heads = X chromosome (female) Tails = Y chromosome (male)

Pick a name for your child and record it on your data sheet.

For the rest of these traits, both parents flip the coin. Remember, if you get Heads you pass the Dominant trait on (large letter). If you flip tails, you pass on the recessive trait (small letter). Read carefully to determine when multiple alleles influence the trait.

2. FACE SHAPE. Each parent flips once to determine the face shape

ROUND (RR, Rr)

SQUARE (rr)

3. CHIN SHAPE will invlve the next three flips. Flip to determine if the chin of your child is:

VERY PROMINENT (VV, Vv)

LESS PROMINENT (vv)

4. CHIN SHAPE - If your child has a Genotype of VV or Vv for chin shape --flip again. If they have a genotype of vv - the next two traits cannot be expressed - vv prevents the expression of the next two pairs of genes. So you can skip these two spaces on the chart if your child is vv.

ROUND (RR, Rr)

SQUARE (rr)

*5. CLEFT CHIN

PRESENT (AA, Aa)

ABSENT (aa)

6. SKIN COLOR - Skin color is very complex. We are going to use a simplified model. Some Geneticists think that at least seven gene pairs may be in involved, but for simplicity's sake we are going to use three pairs of genes.

Flip your coins first to determine the genotype of the first pair of genes. (AA, Aa, aa). Record below. Flip your goins again to determine the second pair of genes. (BB, Bb, bb). Record below. Flip for the last time to determine the third pair of genes. (CC, Cc, cc). Record Below.

Genotype first flip____, second flip____ third flip____

Count the number of Capital Letters in your complete Genotype (6 Genes) Look below to determine the skin color of your child.

6 capitals = very dark black
5 capitals = very dark brown
4 capitals = dark brown
3 capitals = medium brown
2 capitals = light brown
1 capital = light tan
NO Capitals = White.

#7. HAIR TYPE

CURLY (CC)

WAVY (Cc)

STRAIGHT (cc)

#8 WIDOW'S PEAK - The hair line comes to a point in the center of the forehead.

PRESENT (WW, Ww)

ABSENT (ww)

9. COLOR OF EYEBROWS

VERY DARK (HH)

MEDIUM DARK (Hh)

LIGHT (hh)

10. EYEBROW THICKNESS

BUSHY (BB, Bb)

FINE (bb)

11. EYEBROW PLACEMENT

NOT CONNECTED (NN, Nn)

CONNECTED (nn)

12. EYE COLOR. Darker eyes are produced in the presence of more active alleles. In this situation, the large letters (A or B) represent alleles which are active in depositing dark pigment. Small letters (a and b) represent alleles which deposit little pigment.

To determine the color of the eyes assume there are 2 gene pairs involved. One gene pair codes for depositing pigment in the front of the iris and one which codes for depositing pigment in the back of the iris. In reality eye color is more complex - but this is a simplified model. Determine the genotype of the first pair of genes (AA, Aa, aa). Record belcw. Then, determire the genotype of the second pair of genes (BB,Bb,bb), Record below. CHECK THE GEONTYPES LISTED IN THE COLUMN TO DETERMINE YOUR CHILD'S EYE COLOR.

First Flip_____ Second Flip_____

AABB = Dark Brown
AABb = Brown
AaBB = Brown
AaBb = Brown
AAbb = Dark Blue
aaBB = Dark Blue
Aabb = Light Blue
aabb = Pale Blue

13. EYES - DISTANCE APART:
CLOSE TOGETHER (EE) AVERAGE DISTANCE (Ee) FAR APART (ee)

14. EYES - SIZE
LARGE (EE) MEDIUM (Ee) SMALL (ee)

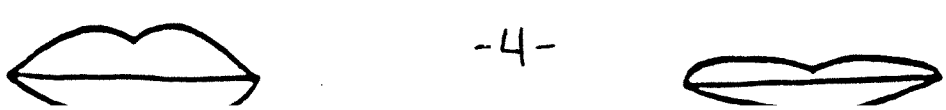
15. EYES - SHAPE
ALMOND (AA, Aa) ROUND (aa)

16. EYES - SLANTEDNESS
HORIZONTAL (HH, Hh) UPWARD SLANT (~~hh~~)

*17. EYELASHES
LONG (LL, Ll) SHORT (ll)

18. MOUTH - SIZE
LONG (MM) AVERAGE (Mm) SHORT (mm)

19. LIPS
THICK (LL, Ll) THIN (ll)

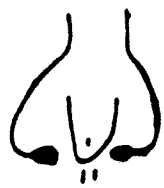


20. LIPS - PROTRUDING
VERY PROTRUDING (HH) SLIGHTLY PROTRUDING (Hh) ABSENT (hh)



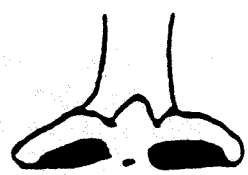
*21. DIMPLES
PRESENT (DD, Dd) ABSENT (dd)


22. NOSE SIZE
BIG (HH) MEDIUM (Hn) SMALL (nn)


23. NOSE SHAPE
ROUNDED (RR, Rr) POINTED (rr)


24 NOSTRIL SHAPE,
ROUNDED (RR, Rr) POINTED (rr)

*25. EARLOBE ATTACHMENT
FREE (Ff, FF) ATTACHED (ff)


*26. DARWIN'S EARPOINT
PRESENT (DD, Dd) ABSENT (dd)


#27 EAR PITS

PRESENT (PP, Pp)

ABSENT (pp)

#28 HAIRY EARS (Hairy ears are sex limited to males)

PRESENT (HH, Hh)

ABSENT (hh)

29. FRECKLES ON CHEEKS

PRESENT (FF, Ff)

ABSENT (ff)

30 FRECKLES ON FOREHEAD

PRESENT (FF, Ff)

ABSENT (ff)

31. HAIR COLOR is another trait which seems to involve several sets of genes. For the purpose of this exercise assume that it is controlled by 3 sets of genes. (Of course it really is more complex) Flip your coins first to determine the genotype of the first pair of genes. (AA, Aa, aa) Record below. Flip your coins next to determine the genotype of the second pair of genes. (BB, Bb, bb) Record below. Flip your coins last to determine the genotype of the third pair of genes. (CC, Cc, cc) Record below. Look at the choices below to find the hair color of your child.

Genotype -- First Flip_____ Second Flip _____ Third Flip _____

6 Capitals = Black
5 Capitals = Dark Brown
4 Capitals = Medium Brown
3 Capitals = Light Brown
2 Capitals = Ash Blond
1 Capital = Blond
NO Capitals = Red

Face Lab - Data Sheet Mother Name_____ Fathers Name _____
Child's Name _____

Trait #	Trait	Gene from Mom	Gene From DAD	Genotype Child	Phenotype Child
1	Sex				
2.	Face Shape				
3.	Chin Shape				
4.	Chin Shape				
5.	Cleft Chin				
6.	Skin Color				
7.	Hair type				
8.	Widow's Peak				
9.	Eyebrows/Color				
10.	Eyebrows/thickness				
11.	Eyebrows/placement				
12.	Eyes/Color				
13.	Eyes/Distance/apart				
14.	Eyes/size				
15.	Eyes/shape				
16.	Eyes/Slant				
17.	Eyelashes				
18.	Mouth size				
19.	Lips				
20.	Lips/protruding				
21.	Dimples				
22.	Nose/size				
23.	Nose/shape				
24.	Nostril/shape				
25.	Earlobe/attachment				
26.	Earpoints				
27.	Earpits				
28.	Hairy ears				
29.	Freckles/Cheek				
30.	Freckles/Forehead				
31.	Hair Color				