Family Pedigree Project

What you will be doing for your Pedigree Analysis Project is constructing a pedigree of your family for a simple, innocuous, human trait. That is, something more related to normal human variation than a genetic disorder. If your family exhibits a genetic disorder, and you feel comfortable dealing with it, that is also a good source for your analysis. Begin now and choose a trait and start checking with your parents, grandparents, and as many close relatives as you can show in your pedigree for that trait. Don't use a trait that everyone in your family has. Ideally, you'd want something that varies a bit throughout your family and is easy to spot and verify. You'll want to carry your pedigree back at least three generations.

You will need to construct the pedigree on paper or computer but by long hand. You will be expected to **gather all your data** about the trait in your family. From that data, **draw the pedigree** according to the standard conventions. Once the pedigree is drawn, you must **discuss the pedigree and determine the pattern of inheritance** of your trait.

A. DIAGRAM OF PHENOTYPES
1. Use the standard symbols for pedigree charts. Color or shading with a color-key identifying the least common phenotype, is a good way to do this. Place a "?" for each person not tested for the trait. Be sure to name the trait in the title.
2. Identify the alleles for each individual as much as possible. Use uppercase for dominant and lower case for recessive.

B. PATTERN RECOGNITION
1. If both parents have the same phenotype, and they have at least one child with the different phenotype, then the parents' phenotype must be dominant and that child's phenotype must be recessive
2. If the dominant/recessive status is not revealed by the tell-tale pattern described above (#1), say this clearly in your paper.

Assembly of your finished pedigree project:

1. Cover page:
    a. Title (Family tree and pedigree project)
    b. Your name
    c. Date
2. Single page showing the pedigree symbols and explanation of the trait you chose.
3. Data list (may be several pages)
4. Your family tree with names
5. Pedigree tree for trait (No names, use generation (I, II, III, IV) and individual (1, 2, 3, …)
6. 250 word essay (1/2 page). Discuss the following
    a. Why you chose the trait featured in your project
    b. How you went about collecting info for your family tree
    c. Challenges encountered in collecting data
    d. Your analysis of probabilities for “?” alleles you could not solve
    e. What you learned through this project
    f. ***Do not*** explain how you solved / determined the genotypes for the pedigree trees.

Review the list below of these common, innocuous, human genetic traits. You can use anyone of them for your pedigree analysis project. It is important to remember that the more data you have, the more worthwhile the project. Try to have at least 3 generations. Less than that and you may not have enough information to determine genotypes.

Common Human Traits.

1. **Tongue Rolling.** Attempt to roll your tongue into a U-shape, in which the sides of your tongue are curled upwards. Tongue rollers carry a dominant gene R. Non-tongue rollers are homozygous recessive (rr).

2. **Widow's Peak.** A dominant gene W causes the hairline to form a distinct downward point in the center of the forehead (like Richard Nixon). Baldness will mask the expression of this gene. If you have a Widow's Peak, you have at least one dominant gene. No downward point of the hairline, and you are homozygous recessive (ww).

3. **Earlobe Attachment.** The inheritance of a dominant gene E results in the free or unattached earlobe. If the lobe is attached directly to the head, the individual is homozygous recessive, and the ee genotype is present. Other genes, working alone or together, affect the size and shape of the earlobe and are not considered here. We are only looking at whether the earlobe is attached or not.

4. **Hitchhiker's Thumb.** Some individuals can bend the last joint of the thumb backwards at about a 45 degree angle. These individuals are homozygous for a recessive gene, hh, but there is considerable variation in the expression of the gene. For our purposes, we shall consider those who cannot bend at least one thumb backwards about 45 degrees, are carrying the dominant gene, H.

5. **Bent Little Finger.** The dominant gene, B, causes the terminal bone of the little finger to angle toward the fourth (ring) finger. Individuals whose little fingers are straight possess the homozygous recessive condition, bb. Check for this characteristic by laying your hands flat on the desk and relaxing them.

6. **Mid-digital Hair.** The presence of hair on the middle segment of the fingers is caused by a dominant gene, M. The homozygous recessive condition, mm, results in the lack or absence of hair on the middle segments of the fingers. Examine your hands closely since the hairs may be small in length and light in color.

7. **Facial Dimples.** The inheritance of cheek dimples is controlled by a dominant gene, D. The homozygous recessive, dd gene condition, lacks the ability to express facial dimples.

8. **Big Toe Length.** The length of the big toe is governed by the dominant gene, H. Individuals whose big toe is shorter in comparison to the second toe possess the dominant gene. The inheritance of the homozygous recessive, hh, results in the big toe being longer than or inheritance of the homozygous recessive, hh, results in the big toe being longer than or equal to the second toe.

9. **Index Finger Length.** If your second finger (index finger) is shorter than your fourth finger (ring finger) on the same hand, you have a short second finger in relationship to the length of your fourth finger. The gene for short second finger, S', is also sex-influenced in its expression (like baldness). It is dominant in males and recessive in females. That is, while all S'S' individuals have short second fingers, S'S'' males show short second fingers and S'S'' females do not. The gene for long second finger, S'', is dominant in females.

10. **Human Blood Type.** Human blood type are an example of multiple alleles. There are two dominant genes and one recessive gene. The dominant gene IA codes for type A blood, while the dominant gene IB codes for type B blood. Type A blood may be homozygous dominant (IA IA) or heterozygous (IA i). Conversely, type B blood can also be homozygous dominant (IB IB) or heterozygous (IB i). Type O blood is recessive, so it would be caused by a homozygous recessive condition (ii). Type AB blood is interesting in that it is an example of co-dominance. Both the A and the B gene are simultaneously expressed. The genotype would be IA IB.

OMIM (Online Mendelian Inheritance in Man): http://omim.org/about