

Week 7 Lab Exercise: Mendelian Traits

Introduction

A Mendelian trait is a characteristic determined by only one gene. The goal of this exercise is to determine your phenotype and genotype for selected Mendelian traits.

Before completing this lab, be sure you have reviewed and understand the lecture notes for this week especially the concept of dominant, recessive, genotype, phenotype, alleles, homozygous, and heterozygous.

This lab requires you to examine your physical traits. For some traits, you will need to look in a mirror.

Be sure to have the lab report available to you as you complete the exercise.

Directions: there are twelve human Mendelian traits described below. Each one has two tables to complete on the lab report. The first table is where you chose letters to indicate the dominant and recessive alleles. The second table is where you indicate your genotype and phenotype. Some traits may have additional questions to answer. Record your answers on the lab report.

We will do the first trait together on the next page so you understand how to complete the tables.

1. Ability to roll the tongue into a U-shape. The ability to roll (or fold) your tongue into a distinct U-shape is a dominant trait. See the first image in the link below:

<http://www.reachoutmichigan.org/funexperiments/agesubject/lessons/handouts/genetics.html>

Step 1. Chose letters to represent the alleles and complete the chart below. You can use any letter of the alphabet to represent the alleles. The best practice is to use a letter where it is easy to distinguish between the capital and lower case version of the letter especially when writing by hand. Good examples are the letters T, A, E, B, R, and H. Examples of letters you may want to avoid are O, C, L, and Z. For this example, I will use letter “R”. The description of the trait for tongue rolling above tells you which is the dominant and which is the recessive trait. As it says: *The ability to roll (or fold) your tongue into a distinct U-shape is a dominant trait.* This means “Roller” is dominant so “non-roller” must be recessive. To assign letters, “R” would be for roller and “r” would be for non-roller. The chart would be completed as shown below in red.

Phenotype	Letter
Roller	R
Non roller	r

Step 2: Determine your phenotype and genotype. The phenotype is expressed in words and the genotype is expressed in letters. Look in the mirror. Determine if you can roll your tongue as shown in the link above. If you cannot roll your tongue, your phenotype is “non roller”. Since non roller is recessive, the only way a recessive trait will show is if the individual has two recessive alleles so genotype is “rr”. If you can roll your tongue, your phenotype is “roller”. Roller is dominant. There are two genotypes that a roller can have: RR or Rr. If you show the dominant phenotype, we do not know your complete genotype but we do know you have at least one capital letter. You would indicate your genotype as “R_” where the “_” indicates there is a second allele but we do not know which one it is (it can be either “r” or “R”). The chart would be completed as shown below in red.

If you are a Roller:

Phenotype	Genotype
Roller	R_

If you are a Non-roller

Phenotype	Genotype
non roller	rr

Complete the rest of the examples. Record your answer on the lab report.

2. Ear lobe attachment. Ear lobes can be attached or free. With an attached ear lobe, the lobe is attached to the skin of the face. A free ear lobe is freely hanging and is the dominant form. Consult the figure at right



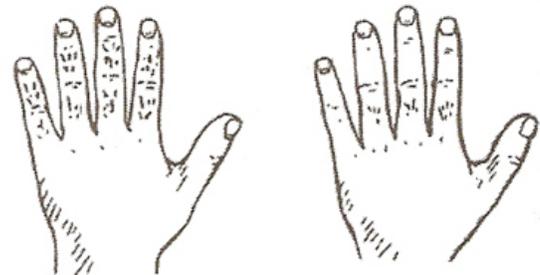
Attached ear lobe Free ear lobe

3. Hairline. The hairline can be straight or form a V-shape on the forehead. The V-shape is called a Widow's peak and it is dominant. The term Widow's peak is from English folklore where it was believed the shape of woman's hairline could be used to predict if she would outlive her husband. Consult the figure at right.



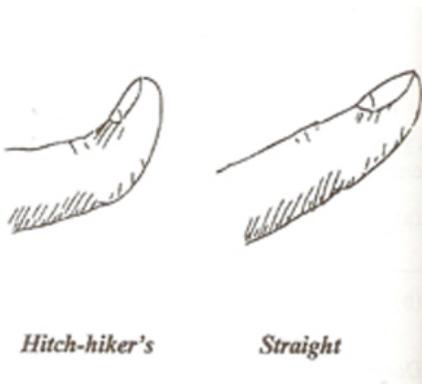
Widow's peak No widow's peak

4. Mid-digital hair. A dominant gene causes the growth of hair in the region of your finger between your fingernail and your knuckle. Consult the figure at right.



Present Absent

5. Hitch-Hiker's thumb. The ability to bend your thumb backwards is considered recessive. Consult the figure below:



Hitch-hiker's

Straight

6. Handclaspng. Which thumb ends up on top when clasping the hands is determined by genes. Right over left is dominant and left over right is recessive.

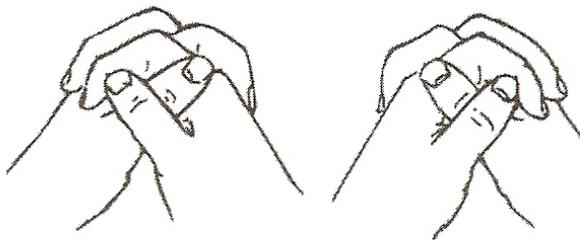
Procedure. To get the most accurate results, follow the procedure listed below. Without thinking too much about it, clasp your hands together.

6A. Which thumb is on top? _____

6B. Repeat the procedure again. Which thumb ends up on top? _____

If your answer to 6A and 6B are the same, use that answer. For example, if the right is on top for both, you are “right thumb over left”.

If your answers to 6A and 6B are different, deliberately clasp your hands so that the right one end up on top. Does it feel natural or comfortable to have the right thumb on top? If you answer “no” then you are “left thumb over right”.



*Right Thumb
Over left*

*Left Thumb
Over Right*

7. Cleft chin: A cleft chin is denoted by a dimple in the chin. The dimpled state is dominant and the absence of a dimple is recessive.

8. Dimples: Cheek dimples, or an indentation in the cheek when smiling, is a dominant condition (D). Absence of dimples is recessive. If a dimple appears on only one cheek, consider that as having dimples.

9. Bent little finger: A dominant gene B causes the last joint of the little (pinky) finger to bend inward toward the fourth finger.

10. Curly hair: The presence of curly hair is believed to be dominant to the trait of having straight hair. If you have wavy hair, consider that to be straight.

11. Freckles: This trait is reportedly due to a single gene. The presence of freckles is dominant and the absence of freckles is recessive.

12. Big toe length: Individuals whose big toe is shorter in comparison to the second toe possess a dominant gene for big toe length. The recessive condition results in the big toe being longer than or equal to the length of the second toe.