

Activity: An Inventory of My Traits

Adapted from Genetic Science Learning Center

Objectives:

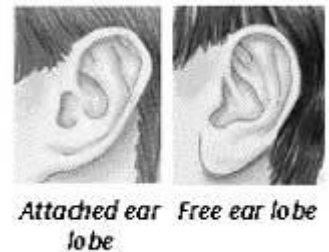
- Learn a number of easily observable genetic traits.
- Compare individual traits with other students in the class.
- Discover that some traits are more common in a population than others.
- Construct/analyze a table/bar graph summarizing class data.

Traits are observable characteristics that are passed down from parent to child. Inherited traits do not come from aunts, uncles, cousins, and siblings. Traits can only be inherited from parents. An individual will have many traits they share in common with others. In fact, about 99.8% of your genetic information is the same as your six billion or so fellow humans on Earth. It is the final 0.2% that makes you special. Some traits are more common in a population than others.

A widespread misconception is that traits due to dominant alleles are the most common in the population. While this is sometimes true, it is not always the case. For example, the allele for Huntington's disease is dominant, while the allele for not developing this disorder is recessive. At most, only 1 in 20,000 people will get Huntington's; most people have two recessive, normal alleles. While a few traits are due to only one gene (and its alleles), most human genetic traits are the product of interactions between several genes.

The traits listed below have commonly been presented as being determined by single genes; however, several have been shown to involve more than one gene, and research studies do not agree on the inheritance patterns of others.

Earlobe Attachment: If earlobes hang free, they are detached. If they attach directly to the side of the head, they are attached earlobes. Some scientists have reported that this trait is due to a single gene for which **unattached earlobes** are **dominant** and attached earlobes are recessive. Other scientists have reported that this trait is probably due to several genes. The size and appearance of the lobes are also inherited traits.



Tongue Rolling: In 1940, the famous geneticist Alfred Sturtevant noted that about 70% of people of European ancestry are able to roll up the lateral edges of the tongue, while the remaining 30% were unable to do so. Tongue rolling ability may be due to a single gene with the ability to **roll the tongue a dominant trait** and the lack of tongue rolling ability a recessive trait. However, there is some question about the inheritance of tongue rolling. Recent studies have shown that around 30% of identical twins do not share the trait.



Dimples: Dimples are reportedly due to a single gene with **dimples dominant** (people may exhibit a dimple on only one side of the face) and a lack of dimples recessive.



Freckles: This trait is reportedly due to a single gene; the **presence of freckles is dominant**; the absence of freckles is recessive.

Hand Clasp: Fold your hands together by interlocking your fingers without thinking about it. Which thumb is on top – your left or your right? One study found that 55% of people place their left thumb on top, 45% place their right thumb on top and 1% has no preference. A study of identical twins concluded that hand clasping has at least some genetic component. However, other scientists have not found evidence that genetics plays a significant role in determining this trait.

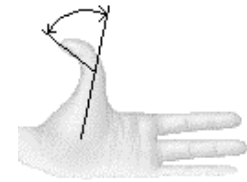


Naturally Curly Hair: Early geneticists reported that **curly hair was dominant** and straight hair was recessive. More recent scientists believe that more than one gene may be involved.

Hairline Shape: Hairline shape is reportedly due to a single gene with a **widow's peak dominant** and a straight hairline



Thumb Extensibility: Try to bend your thumbs backwards at the joints. Some people can form at least a 45-degree angle, which is called a hitchhiker's thumb. Other people have straight thumbs which do not bend in this way. The thumb extension trait is reportedly due to a single gene. **Straight thumb is dominant**, with 75% of the U.S. Caucasian population displaying this trait. Only 25% of the population has the recessive hitchhiker's thumb. A complicating factor of hitchhiker's thumb is that about one person in twenty carries the recessive allele and will not express the characteristic despite having the *hh* genotype.



Colorblindness: Colorblindness is due to a recessive allele located on the X chromosome. Women have two X chromosomes, one of which usually carries the allele for normal color vision; therefore, few women are colorblind. Men only have one X chromosome, so if they carry the allele for colorblindness, they will exhibit this trait. Thus, colorblindness is seen more frequently in men than in women.

PTC Tasting: For some people the chemical phenylthiocarbamide (PTC) tastes very bitter. For others, it is tasteless. The **ability to taste PTC shows dominant inheritance** and is controlled by a gene on chromosomes 7. This gene codes for part of the bitter taste receptor in tongue cells. One of its five alleles (forms) causes a lack of ability to sense bitter tastes; the other four alleles produce intermediate to fully sensitive taste abilities. Approximately 75% of people can taste PTC while the remaining 25% cannot. PTC-like chemicals are found in the Brassica family of vegetables, such as cabbage, brussels sprouts, and broccoli. People who can taste PTC often do not enjoy eating these vegetables, since they taste bitter to them. Non-tasters tend not to notice bitter tastes and therefore may be more likely to become addicted to nicotine (which is bitter).

Blue-gray Eye Color: Eye color is the product of the action of several genes. If your eyes are some color other than blue-gray, your eye color is due to pigments deposited at the front of the iris (the colored portion of your eye). People with blue-gray eyes have little or no pigment deposited on the surface of the iris. The presence of blue-gray eyes indicates that an individual is homozygous recessive for that trait. Any other eye color is dominant to blue-gray. (Although brown eye color usually behaves as if dominant to blue eye color, it is possible for two blue-eyed parents to have brown-eyed children.)

Darwin's Tubercle: The **presence of a bump on the superior portion of the external ear flap is a dominant trait**. It may be present on one or both ears. A smooth ear is a recessive trait.



Longer second toe: Compare the height of your second toe to your big toe. A **longer second toe is a dominant trait** and a shorter second toe is recessive trait.



Crossing Legs: Without thinking, cross your legs. Which leg is on top – your left or your right? **Right over left is a dominant trait** and left over right is recessive trait.



Inventory of Traits (Self) Data Chart

Trait	Which is Dominant or Recessive?	Answer to Trait		Are you Dominant or Recessive?
		Yes	No	
Attached Earlobe		Yes	No	
Tongue Roller		Yes	No	
Dimples		Yes	No	
Freckles		Yes	No	
Curly Hair		Yes	No	
Hand Clasping (Right over Left)		Yes	No	
Widow's Peak		Yes	No	
Hitchhiker's Thumb		Yes	No	
Color Blind		Yes	No	
PTC Tasting		Yes	No	
Blue/Gray Eyes		Yes	No	
Darwin's Tubercle		Yes	No	
Longer Second Toe		Yes	No	
Crossing Legs (Right over Left)		Yes	No	

Inventory of Traits (CLASS) Data Chart

Number of Students Participating in Survey

Trait			#	%			#	%	Is the majority of the class dominant or recessive?
	Yes	No			Yes	No			
Attached Earlobe	Yes	No			No				
Tongue Roller	Yes	No			No				
Dimples	Yes	No			No				
Freckles	Yes	No			No				
Curly Hair	Yes	No			No				
Hand Clasping (Right over Left)	Yes	No			No				
Widow's Peak	Yes	No			No				
Hitchhiker's Thumb	Yes	No			No				
Color Blind	Yes	No			No				
PTC Tasting	Yes	No			No				
Blue/Gray Eyes	Yes	No			No				
Darwin's Tubercle	Yes	No			No				
Longer Second Toe	Yes	No			No				
Crossing Legs (Right over Left)	Yes	No			No				

Questions:

1. **Compare and contrast** the frequency of the trait tongue rolling in the classroom population with the frequency of the general population.

Trait	Preference	Frequency (%) in General Population*
Tongue Rolling	Can roll tongue	70
	Cannot roll tongue	30

2. A widespread misconception is that traits due to dominant alleles are always the most common in the population. Looking at the class data, does the data collected support this? Support your answer with data.
3. Using graph paper, create a double bar graph using the percentages of any four traits from the class data chart. Use a color key to differentiate between "yes" and "no." Computer graph: +2 extra credit