HUMAN TRAITS

Purpose:

- To observe the expression of a series of genes in an individual's phenotype
- To demonstrate a small part of the range of human variation
- To understand the genetic basis for human diversity

Materials:

Introduction:

Many of you are already familiar with many of the genetic traits of humans such as baldness, eye color, color blindness and blood types. One often forgets that more familiar characters such as size and position of eyes, number and shape of fingers, total body size and body proportion may also be genetically determined (although such characters as body size may be profoundly influenced by environment). The tremendous number of genetic traits makes humans extremely variable. With the exception of identical twins, it is highly improbable that any two persons will have the same (or even similar) combinations of genetically determined traits.

In this exercise, you will inventory yourself for the series of genetic traits listed in Table 1.1, some of which are illustrated in Figure 1.1. These are known to be single-gene traits, expressions of two alleles at one gene locus.

Procedure

Divide into groups of two to four students. Go through the traits in Table 1.1; score your own phenotype for each trait in Table1.2. Write the symbols for your possible genotypes in the space provided (use the symbols given in Table 1.1.). If you know your parents' phenotypes, include them in the space provided. Your lab instructor will tally the phenotypes and genotypes for the entire class.

Table 1.1 Single-gene human genetic traits and their alleles.

Trait (alleles)	Expression
Bent pinky **(*B, b*)**	Dominant allele causes the distal segment of the fifth finger to bend distinctly inward toward the fourth (ring) finger (Figure 1.1a).
PTC tasters **(*T, t*)**	Phenylthiocarbamide (PTC) tastes bitter to heterozygous or homozygous dominant individuals, but is tasteless to homozygous recessives. Put a small piece of paper that has been impregnated with PTC on the tip of your tongue.
Blue eyes (***E, e***)	Blue-eyed persons are homozygous recessive and lack pigment in the iris of the eye; heterozygous or homozygous dominant individuals have iris pigment, the color of which is determined by other genes.
Middigital hair **(*M, m*)**	People lacking hair in the middle segments of the fingers are homozygous recessive. The presence of hair on one or more middle segments of the fingers may be governed by a series of alleles each of which is dominant to the recessive.
Tongue rolling **(*R, r*)**	Persons with a dominant allele in heterozygous or homozygous condition can roll their tongues into a tube-like shape (Figure 1.1b); homozygous recessives are non-rollers and can never learn to roll their tongues.

Table 1.1 continued

Trait (alleles)	Expression
Widow's Peak **(*W, w*)**	Dominant allele in heterozygous or homozygous individuals results in a V-shaped front hairline (Figure 1.1c); homozygous recessives have straight hairlines.
Thumb crossing **(*C, c*)**	In a relaxed interlocking of fingers, left thumb over right indicates the dominant allele is present in either heterozygous or homozygous individuals; homozygous recessives naturally place the right thumb over the left.
Ear lobes **(*A, a*)**	Ear lobes may be either adherent or free and pendulous. Homozygous recessives have attached ear lobes (Figure 1.1d); heterozygous or homozygous dominant individuals have detached (free) ear lobes.
Hitchhiker's thumb **(*H, h*)**	Homozygous recessives can bend the distal joint of the thumb backward to a nearly 90^0 angle; heterozygous or homozygous dominant condition yields thumbs that cannot bend backward more than approximately 30^0.

Figure 1.1 Phenotypic expressions of single-gene human genetic traits.

Figure 1.1a. Bent pinky

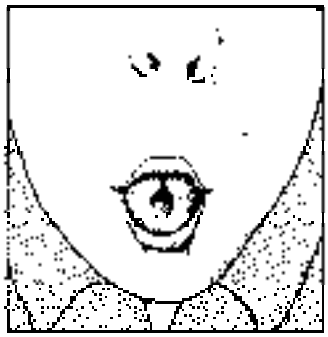

Figure 1.1b . Tongue rolling.

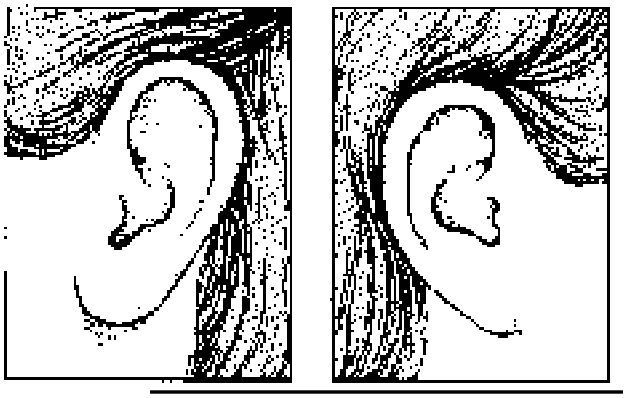

Figure 1.1d. Unattached versus attached ear lobes.

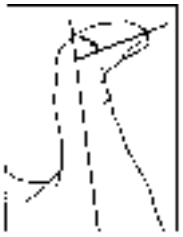

Figure 1.1e. Hitchhiker's thumb.

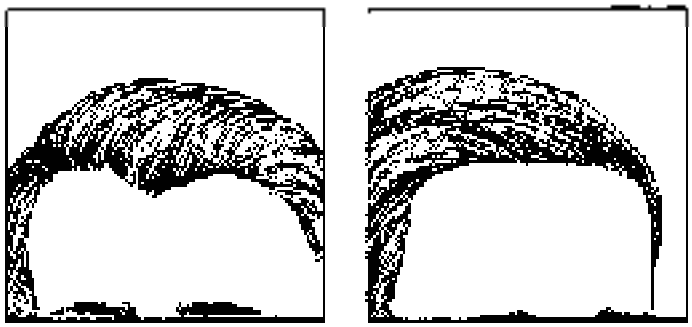

Figure 1.1c. Widow's peak vs. straight hairline.

Record your phenotype and circle your probable genotype in the following chart and determine the percentages in your class.

Table 1.2. Personal inventory and class percentages of phenotypes and possible genotypes for single-trait genes described in Table 1.1.

Trait	Your phenotype	Your possible genotype(s)	Parent's phenotypes	Number in class	%of class with trait
Bent pinky					
PTC taster					
Blue eyes					
Mid-digital hair					
Tongue-rolling					
Widow's peak					
Thumb crossing					
Ear lobes					
Hitchhiker's thumb					

Question:

1. Is it true that dominant phenotypes are always the most common in a population? Explain your answer.

2. What determines how often a phenotype occurs in a population?

3. Is it possible to determine the genotype of a person showing a dominant phenotype? A recessive phenotype? Why?