

How are human traits inherited?



Did you ever wonder how you got your curly hair and fair skin? Or why you are color blind and your siblings are not? Or why your brother or sister looks so much like you . . . or not like you at all? In the sections that follow, we will examine the basics of how human traits are inherited to help you understand some of the mechanisms that resulted in many of your distinguishing traits. Meanwhile, try to roll your tongue into a tube. You have heredity to credit for your ability to do it (if you can), not expertise or practice!

14.1 Some human traits are caused by dominant or recessive alleles.

Some human traits are inherited in a Mendelian fashion. That is, they are inherited showing the same patterns of dominance and recessiveness Gregor Mendel saw when he studied pea plants. Usually, every individual who carries the dominant allele manifests the trait. Only individuals who carry two recessive alleles exhibit the recessive trait. **Table 14.1** lists some of these traits, or characteristics, that are caused by dominant or recessive alleles.

CONCEPT CHECKPOINT

1. Unattached earlobes are a dominant trait. If A denotes the allele for unattached earlobes, and a denotes the allele for attached earlobes, what is (are) the possible genotype(s) of a person who has unattached earlobes?
2. Could both parents of a person with unattached earlobes have attached earlobes? Why or why not?

14.2 Some human traits are caused by incomplete dominance of alleles.

Alleles do not always exhibit clear-cut dominance or recessiveness. The pea plants that Mendel worked with exhibited complete dominance, and for this reason his work challenged the concept of blending inheritance (see Chapter 13). However, since Mendel's time, researchers have discovered many cases of **incomplete dominance** in which alternative alleles are not dominant over or recessive to other alleles governing a particular trait. Instead, heterozygotes are phenotypic intermediates. Inheritance patterns follow Mendelian patterns, but the results differ when alleles exhibit incomplete dominance rather than complete dominance and recessiveness.

Humans have traits that exhibit incomplete dominance, such as the extent of curliness of the hair. A curly-haired individual and a straight-haired individual will have children with wavy hair. Persons with wavy hair will have children who are either straight haired, wavy haired, or curly haired.

Figure 14.1 shows a cross between two wavy-haired people. H denotes the functional hair allele. The genotype HH is necessary for the curly trait to be expressed. With only one functional H allele, the person with the HH' genotype has wavy hair. The $H'H'$ person without the functional H allele has straight hair.

14.3 Some human traits are caused by codominant alleles.

A slightly different situation that Mendel did not encounter but that builds on his work occurs with alleles that are codominant. With

TABLE 14.1

Common Dominant and Recessive Human Traits

Trait	Dominant	Recessive
Front hairline	Widow's peak (V-shaped front hairline) WW or Ww	Straight front hairline ww
Tongue rolling	Can roll tongue into tubelike shape RR or Rr	Cannot roll tongue into tubelike shape rr
Thumb crossing	Natural placement of left thumb over right when hands are folded (fingers interlocked) CC or Cc	Natural placement of right thumb over left when hands are folded (fingers interlocked) cc
Pinky finger shape	Bent pinky—last segment of pinky finger bends toward the ring finger BB or Bb	Straight pinky bb
Earlobe attachment	Earlobes are unattached—they hang free AA or Aa	Earlobes are attached to the side of the head aa
Thumb shape	When straightening out the thumb as in hitchhiking, the last segment (tip) of the thumb bends back to a 30 degree angle or less HH or Hh	Hitchhiker's thumb—when straightening out the thumb as in hitchhiking, the last segment (tip) of the thumb bends back to nearly a 90 degree angle hh