



SECTION  
**7.4**

HUMAN GENETICS AND PEDIGREES  
**Reinforcement**

**KEY CONCEPT** A combination of methods is used to study human genetics.

The patterns of inheritance in humans are the same as the patterns of inheritance in other sexually reproducing organisms. Phenotypes are often the result of varying degrees of dominance, several genes, multiple alleles, or sex-linked genes.

Only females can be carriers of sex-linked disorders. Females, who have an XX genotype for their sex chromosomes, must have two recessive alleles to show a recessive phenotype, such as for a recessive sex-linked disorder. Males, on the other hand, have an XY genotype. They will show all of the phenotypes from the genes on their X chromosome, even the recessive alleles, because they cannot have a second, dominant allele that could mask the recessive allele.

The potential for a genetic disorder to be passed on through a family can be studied using pedigree analysis. A **pedigree** is a chart that is used to trace phenotypes and genotypes within a family. It can help show whether someone in a family may have recessive alleles that cause a genetic disorder.

Known phenotypes in a family are used to infer genotypes. Both autosomal genes and sex-linked genes can be traced with pedigrees.

- Tracing autosomal genes: Equal numbers of males and females will have the recessive phenotype. Anyone with the recessive phenotype must be homozygous recessive. Two heterozygous parents can have children who are homozygous dominant, heterozygous, or homozygous recessive.
- Tracing sex-linked genes: More males than females will have the recessive phenotype. Males with a recessive allele will pass it on to all of his daughters. Females can be carriers of a recessive allele and pass it on to either sons or daughters.

In addition to pedigrees, other methods of studying human genetics are used. **Karyotypes**, for example, are pictures of all of a person's chromosomes that can show any large changes in the chromosomes.

1. Why can only females be carriers of sex-linked disorders?

---

---

2. What is a pedigree?

---

3. What is one major difference in pedigrees between autosomal and sex-linked genes?

---

---