

Review: Genotype and Phenotype

Genotype

A genotype is a set of letters that expresses which alleles are present in an individual or a gamete. Humans and most animals are diploid. This means they have two copies of every chromosome and thus two alleles for every gene. Haploid sperm and egg from these individuals typically only have one copy of each chromosome and thus one allele for each gene. When you state a genotype, make sure that it has the correct number of alleles for each gene.

An example of a genotype for a diploid individual is AA. This is a genotype that has one gene and there are two alleles for the gene because the individual is diploid. A genotype can include multiple genes as long as it has the correct number of alleles for each gene. A genotype of AABBCcdd represents four genes an individual has. An example of a genotype for a haploid gamete is ABCd. This is a genotype that has four genes and there is only one allele for each gene because the gamete is haploid.

Heterozygous and homozygous are terms to explain the combination of alleles a diploid individual has. Heterozygous means that there are two different alleles for a gene. Homozygous is a word to mean there are two of the same alleles for a given gene. You must state whether these alleles are dominant or recessive when calling a genotype homozygous. Because of these classifications, you can explain the genotype of an individual as heterozygous, homozygous dominant, or homozygous recessive.

An example of a heterozygous genotype is Aa because there is one dominant and one recessive allele for a gene called gene A. An example of a homozygous dominant genotype is AA because there are two dominant alleles for a gene called gene A. An example of a homozygous recessive genotype is aa because there are two recessive alleles for a gene called gene A.

Phenotype

A phenotype is an observable state of an individual. A phenotype could be what someone could see, such as fur color, or something someone could measure, such as blood type. A phenotype is the expression of the alleles that an individual has. After the alleles are expressed through the process of transcription and translation to produce a protein, the type of protein or the amount of protein that is produced is the measurable phenotype.

Relationship Between Genotype and Phenotype

An individual's genotype will often affect its phenotype. In Mendelian genetics, one allele is dominant over another and the dominant allele completely masks (hides) the recessive allele. Because of this dominance pattern, a heterozygous individual will express only their dominant allele and thus will have a dominant phenotype. A homozygous recessive individual is the only type of individual who expresses the recessive phenotype. In this course, many problems will provide genotype or phenotype of individuals. You may be asked to explain one given the other. To complete such problems, you must know which alleles are expressed and which are or can be masked and then imagine how that expression pattern affects the phenotype. The relationship between genotype and phenotype lays the foundation for the topic of haplosufficiency.