

Lecture 38

Basic Genetics

Introduction to genetics

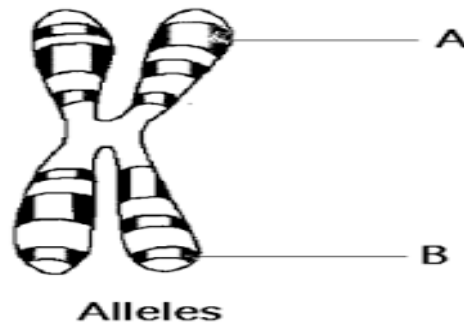
Genetics is the study of heredity, the process in which a parent transfers genes onto their children. In genetics, a feature of an organism is called a "trait". Some traits are features of an organism's physical appearance; for example, a person's eye-color, height or weight. There are many other trait types, and these range from aspects of behavior to resistance to disease. Traits are often inherited, for example tall and thin people tend to have tall and thin children. Other traits come from the interaction between inherited features and the environment. For example a child might inherit the tendency to be tall, but if little food is available and the child is poorly nourished, it will still be short. The way genetics and environment interact to produce a trait can be complicated: for example, the chances of somebody dying of cancer or heart disease seem to depend on both their family history and their lifestyle.

Characterizing Genes

Use library resources to define the following words and write their definitions using your own words.

Allele

An allele is an alternative form of a gene (one member of a pair) that is located at a specific position on a specific chromosome. These DNA coding determine distinct traits that can be passed on from parents to offspring through sexual reproduction.



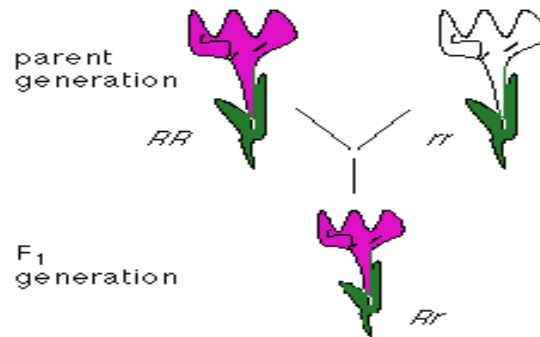
Genes

Genes are the working subunits of DNA. Each gene contains a particular set of instructions, usually coding for a particular protein or for a particular function.



Dominant

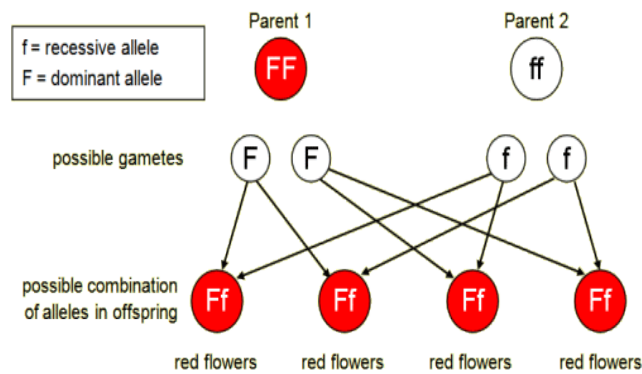
A dominant allele produces a dominant phenotype in individuals who have one copy of the allele, which can come from just one parent.



Genetic Terms

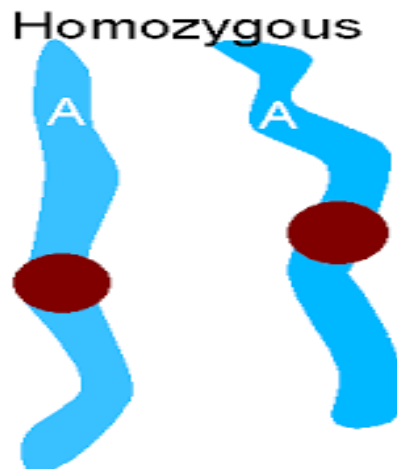
Recessive

Two copies of a mutant gene, one copy from each parent are received. Its appearance is masked when dominant allele is transmitted from parents.



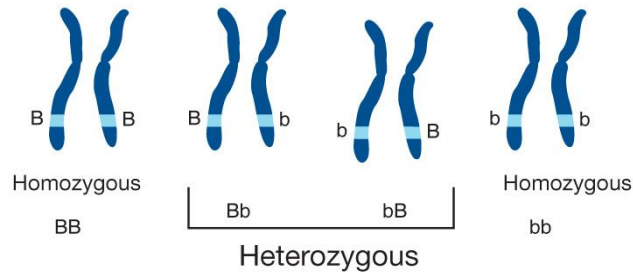
Homozygous

A cell is said to be homozygous for a particular gene when identical alleles of the gene are present on both homologous chromosomes.



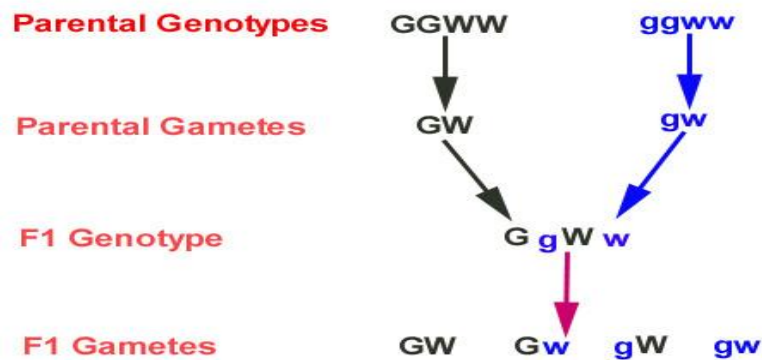
Heterozygous

A diploid organism is heterozygous at a gene locus when its cells contain two different alleles of a gene.



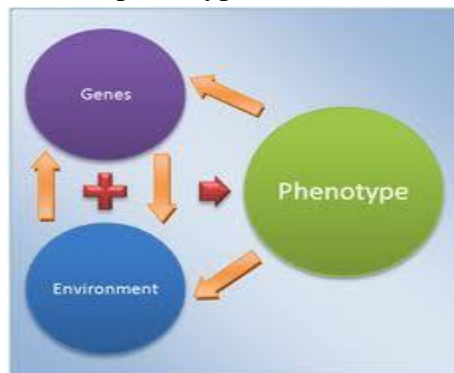
Genotype

The genotype is the genetic makeup of a cell, an organism, or an individual usually with reference to a specific characteristic under consideration.



Phenotype

The observable physical or biochemical characteristics of an organism, as determined by both genetic makeup and environmental influences. The expression of a specific trait, such as stature or blood type, based on genetic and environmental influences. An individual or group of organisms exhibiting a particular phenotype.



Mendelian Inheritance

An analysis of genetic crosses depends upon an understanding of Mendel's two laws:

1. The principle of segregation

The two members of a gene pair (alleles) segregate (separate) from each other in the formation of gametes. Half the gametes carry one allele, and the other half carries the other allele.

2. The principle of independent assortment

The Principle of Independent Assortment describes how different genes independently separate from one another when reproductive cells develop. Genes for different traits assort independently of one another in the formation of gametes.

Features

1. The inherited traits are determined by genes that are passed from parents to children.
2. A child inherits two sets of genes, one from each parent.
3. A trait may not be observable, but its gene can be passed to the next generation.
4. Each person has 2 copies of every. These copies may come in different variations, known as alleles that express different traits.

For example, 2 alleles in the gene for freckles are inherited from mom and dad:

- Allele from mom = has freckles (F)
- Allele from dad = no freckles (f)
- Child has the inherited gene pair of alleles, **Ff** (F allele from mom and f allele from dad).

Both a man and a woman are heterozygous for freckles.
Freckles are dominant over no freckles. What is the chance that their child will have freckles?

Mother - **Ff**

	F	f
F	FF Freckles	Ff Freckles
f	fF Freckles	ff NO Freckles

Father - **Ff**

3:1 Ratio
Freckles:No Freckles
75% Chance child will have Freckles

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References

- <https://en.wikiversity.org/wiki/Genetics/Introduction>
<http://biology.about.com/od/geneticsglossary/g/alleles.htm>
<http://www.news-medical.net/life-sciences/What-are-Genes.aspx>
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