

6:14a Mendel's Genetics

In the Beginning

- Gregor Mendel was born in 1822.
- Studied science and math at a local university.
- Became a priest and lived in an Austrian monastery
- His work with the garden pea set the foundation for modern genetics.

Mendel's Laws

- Using pea plants, Mendel determined the following ideas:
- Units (genes) are responsible for the plants characteristics and they came in pairs.
- Some of these appear more often than their alternate traits
- These pairs separate during reproduction.

Genetic Vocabulary:

- Gene: factor that controls the trait.
- Allele: an alternate form of a gene.
- Hybrid: An organism containing different alleles for a trait. (heterozygous)
- Pure Bred: An organism containing the same alleles for a trait. (homozygous)
- Dominant: The allele that appears the most often. Represented by a capital letter.
- Recessive: The allele the will appear only in a pure form. Represented by a lower case letter.
- Genotype: the genes in the cell
- Phenotype: the outward appearance of the trait.

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How can the Chances of an Offspring's Traits be Determined?

- The chance of an offspring showing a certain trait can be determined by using the Punnett square.
- The table contains spaces for the parent's gametes and the possible offspring from that mating.
- Their letters represents the alleles.
- Genes come in pairs and must be separated during gamete formation.
- These gametes (letter) of each pair are placed in each of the outside spaces.
- They are then combined to form the possible offspring.

Punnett Square: Bb X Bb

	B	b
B	BB	Bb
b	Bb	bb

Explanation

- Notice that each parent has two alleles for the given trait.
- These letters represents the diploid state of the cell in each parent (Bb).
- When each parent produces gametes (sperm or egg), these pairs must separate.
- During fertilization only one sperm can fertilize one egg at a time.
- The Punnett square shows all the possible combinations between these two parents.

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Independent Assortment

- Since an organism contains more than one trait, Mendel attempted to demonstrate whether one gene had any control over others in the organism.
- He crossed two pure bred plants, one dominant and the other recessive. TTBB x ttbb.
- All the offspring showed the dominant traits.
- He then mated these F2 offspring and found the following:
 - BbTt x BbTt

	BT	Bt	bT	bt
BT	BBTT	BBTt	BbTT	BbTt
Bt	BBTt	BBtt	BbTT	Bbtt
bT	BbTT	BbTt	bbTT	bbTt
bt	BbTt	Bbtt	bbTt	bbtt

Explanation

- The Gametes contain one of each of the alleles. (BT).
- Each of the offspring contains four alleles exactly like the parents. (BbTt).
- Notice the number of possible offspring has increased.
- The phenotypic ratio is 9:3:3:1

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Human Genetics

- Multiple Alleles:
- Blood type is an example of a trait containing more than one allele for a trait.
- Blood type A and B are co-dominant, while O is recessive.
- This forms the possible blood types of A, B, AB, and O.
- Colorblindness and Hemophilia are examples of sex-linked traits. These genes are recessive and found only on the X chromosome.

Karyotyping and Pedigrees

- A karyotype is a display of all the chromosomes in a cell's nucleus.
- Chromosomes come in pairs and by using this display any chromosomal number abnormalities will show up.
- Pedigrees are maps of a family showing the sex of the members and the inheritance of a trait from generation to generation.

Karyotype

