University of Mosul
Lecture No.: 1
College of Veterinary Medicine
Date: 2024-2025
Unit of Scientific Affairs
Website: : http://orcid.org/0000-0002-4223-6906

Lecture title: **GENETICS**

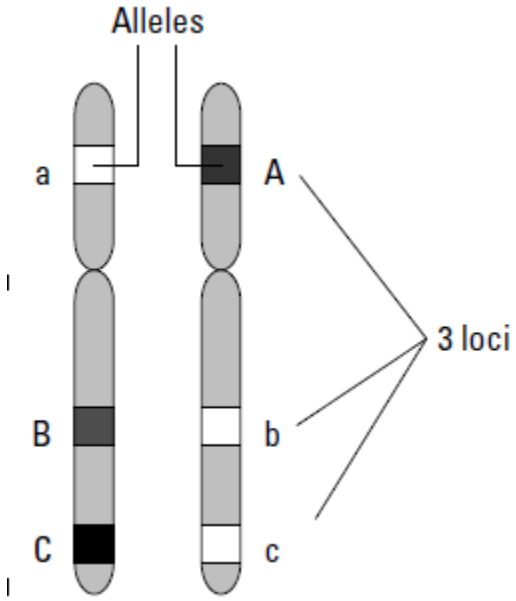
Lecturer Affiliation: **Department of public health/ Vet. Med**

Summary:

GENETICS

Genetics: Science that studies the inheritance of traits from parents to offspring.
Gene: The genetic unit which transmitted from one generation to the next.

Allele: Is one of the possible forms of a gene, most gene have two allele a dominant allele and recessive allele, e.g.: (Aa).



Chromosome: A structure composed of large molecule of DNA and associated proteins (Histones) that carry genetic information.
Trait: Any observable or measurable characteristic of an individual. **There are two types of traits:**
1- observable traits—traits which described the appearance of an animal like coat color, size, head shape.
2- measurable traits—traits that can be measured on animal like weaning weight, lactation yield, time to run a mile, etc.
phenotype: An observed category or measured level of performance for trait in an animal.

$$P = G + E$$

where ***P*** represents an individual's phenotype, ***G*** represents its genotype**,** and ***E*** represents environmental effects.

performance: A word used instead of phenotype for traits that are measured.

Inbreeding: is the mating of relatives.

Linebreeding The mating of individuals within a particular line.

Outbreeding or **Outcrossing:** The mating of unrelated individuals.

Breed: A race of animals within a species. Animals of the same breed usually have a common origin and similar traits.

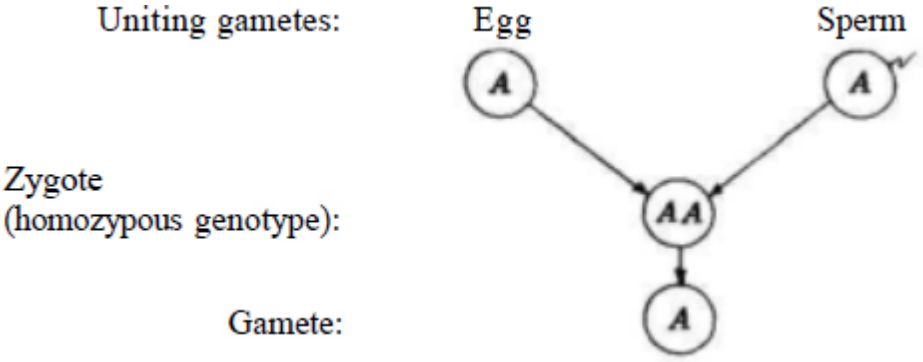
Line: A group of related animals within a breed.

genotype: All of the genes possessed by an individual .

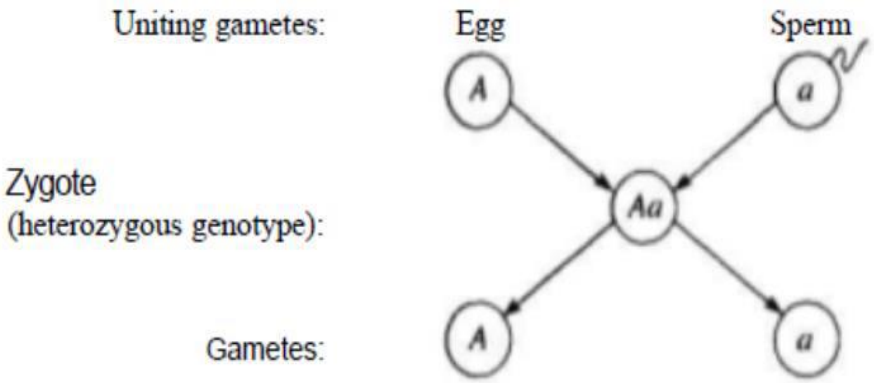
Zygote: The fertilized egg of organisms.

Gamete: It is a haploid sex cell that is a sperm in males **and** egg in females.

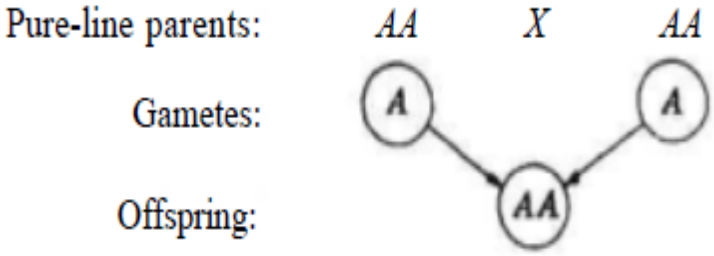
Homozygous. The union of gametes carrying identical alleles produces a homozygous genotype.



Heterozygous. The union of gametes carrying different alleles produces a heterozygous genotype.



Pure Line: A group of individuals with similar genotype.



Hybrid: is the offspring resulting from organisms of different breed varieties, species

MENDEL'S LAWS:

1- **Law of segregation**: States the alleles of any locus segregate in to separate gametes.

2- Law of dominance: States that one of the inherited genes will be dominant and the other recessive.

3- **Law of independent assortment: States** that the alleles of each pair are not influenced by any other pair.

Codominant Alleles: Alleles that lack dominant and recessive relationships may be called incompletely dominant, partially dominant, this means that each allele is capable of some degree of expression when in the heterozygous condition. **Example:**

Genotype	Phenotype
BB	Black Color
bb	White Color
Codominant Bb	Black and White

SINGLE-GENE CROSSES

1. The Six Base Types of Mattings.: There are six type of mating according to parents' genotypes as the following examples:

1- **Parent** BB x BB

Gametes B B

F1 BB

2- **Parent** **BB x Bb**

Gametes B Bb

F1 1/2 BB 1/2 Bb

3- **Parent** **BB x bb**

Gametes B b

F1 bb

4- **Parent** **Bb x Bb**

Gametes B b B b

F1 1/4 BB 1/2 Bb 1/4bb

5- **Parent** **Bb x bb**

Gametes Bb b

F1 1/2 Bb 1/2 bb

Matting Summary

no	parents	Gametes	progeny
1	BB x BB	B and B	ALL BB
2	BB x Bb	B and Bb	1/2BB + 1/2Bb
3	BB x bb	B and b	ALL Bb
4	Bb x Bb	Bb and Bb	1/4BB +1/2Bb + 1/4bb
5	Bb x bb	Bb and b	1/2Bb + 1/2 bb
6	bb x bb	b and b	ALL bb

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Lethal Alleles.

The phenotypic of some gene's expression is the death of the individual in either the prenatal or postnatal period prior to maturity. A **fully dominant lethal allele kills in both the homozygous and heterozygous conditions.** This gene arises by mutation from a normal allele. the mutant dominant lethal is removed from the population in the same generation in which it arose.

Recessive and incomplete dominance Lethal genes: that kill only when homozygous. ***Maybe of two kinds of Recessive and incomplete dominance Lethal genes:***

(I) one that has no obvious phenotypic effect in heterozygotes.

(2) one that exhibits a distinctive phenotype when heterozygous.

Example: The amount of chlorophyll in pea is controlled by a pair of codominant alleles, one of which exhibits a lethal effect when homozygous, and a distinctive color phenotype when heterozygous.

Genotype	Phenotype
$C'C'$	Green (normal)
$C'C^2$	Pale green
C^2C^2	White (lethal)

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Lethal Genes Creeper Gene

- Lethal genes have also been observed in chickens,
  - When developing embryo contains two copies of a recessive allele, the embryo dies in the eggshell
  - Chick heterozygous with creeper allele will survive

	P	p
P	PP lethal	Pp creeper
p	Pp creeper	pp normal

Creeper Hen