



INTRODUCTION TO GENETICS

Zheen

Genetics I

MA 205 A

First week

10/5/2023

Outline

- **Genetics**
- **subdivisions of genetics**
- **Genetic terms**

Objectives

- Define (genetics , gene,.....)
- Compare homozygous and heterozygous



- **Genetics:** is a branch of biology concerned with the study of heredity and variation.
- It aims to explain how characteristics of living organisms are passed on from one generation to the next.
- **Genetic science deals with:**
- Transmission of traits from parent to offspring.
- Expression and variation of those traits
- The structure and function of the genetic material

- **Four major subdivisions of genetics:**
- **Classical genetics:** describes how traits (physical characteristics) are passed along from one generation to another.
- **Molecular genetics:** the study of the chemical and physical structures of DNA, RNA and protein.
- **Population genetics** : is a subfield of genetics that deals with genetic differences within and between populations.
- **Quantitative genetics** : a highly mathematical field that examines the statistical relationships between genes and the traits they encode.



Genetic terms:

- **Gamete** : gametes are sex cells (in animal : sperm and ovum; in plants: pollen nucleus and ovum).
- **Heredity**: The transmission of characteristics from parents to offspring.
- **Trait**: specific characteristics that varies from one individual to another.
- **Gene**: genes are short lengths of DNA found on chromosomes. They code for specific proteins.



Genetic terms:

- **Allele** : Alleles are different versions of a particular gene.
- **Dominant allele**: An allele whose phenotypic effect is the same in both heterozygous and homozygous conditions.
- **Recessive allele**: An allele whose phenotypic effect is masked in the heterozygous by another dominant allele



Genetic terms:



- **Homozygous:** homozygous individuals are individuals that possess either the same two copies of the dominant allele or two copies of the recessive allele.
- **Heterozygous:** heterozygous individuals are individuals that possess two different alleles of a gene.
- **Carrier:** heterozygous individual who does not display symptoms of a recessive genetic disorder but can transmit the disorder to his or her offspring.



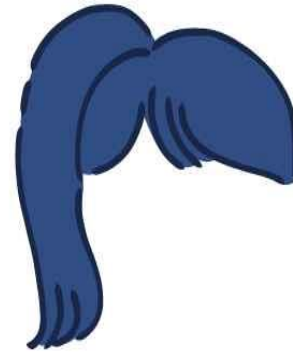
Genetic terms:

- **Genotype:** refers to the sets of genes carried by an organism that are capable of being passed on to the next generation.
- **Phenotype:** Observable characteristics of an organism, resulting from interactions between the genotype and environment.
- **Karyotype:** The general appearance of the chromosomes of an organism with regard to number, size and shape.

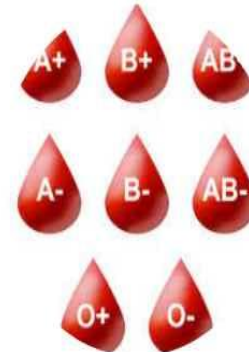
Genotype and Phenotype

		
Phenotype:	purple flower	white flower
Genotype: (partial)	AA or Aa	aa

Phenotype



Hair Color

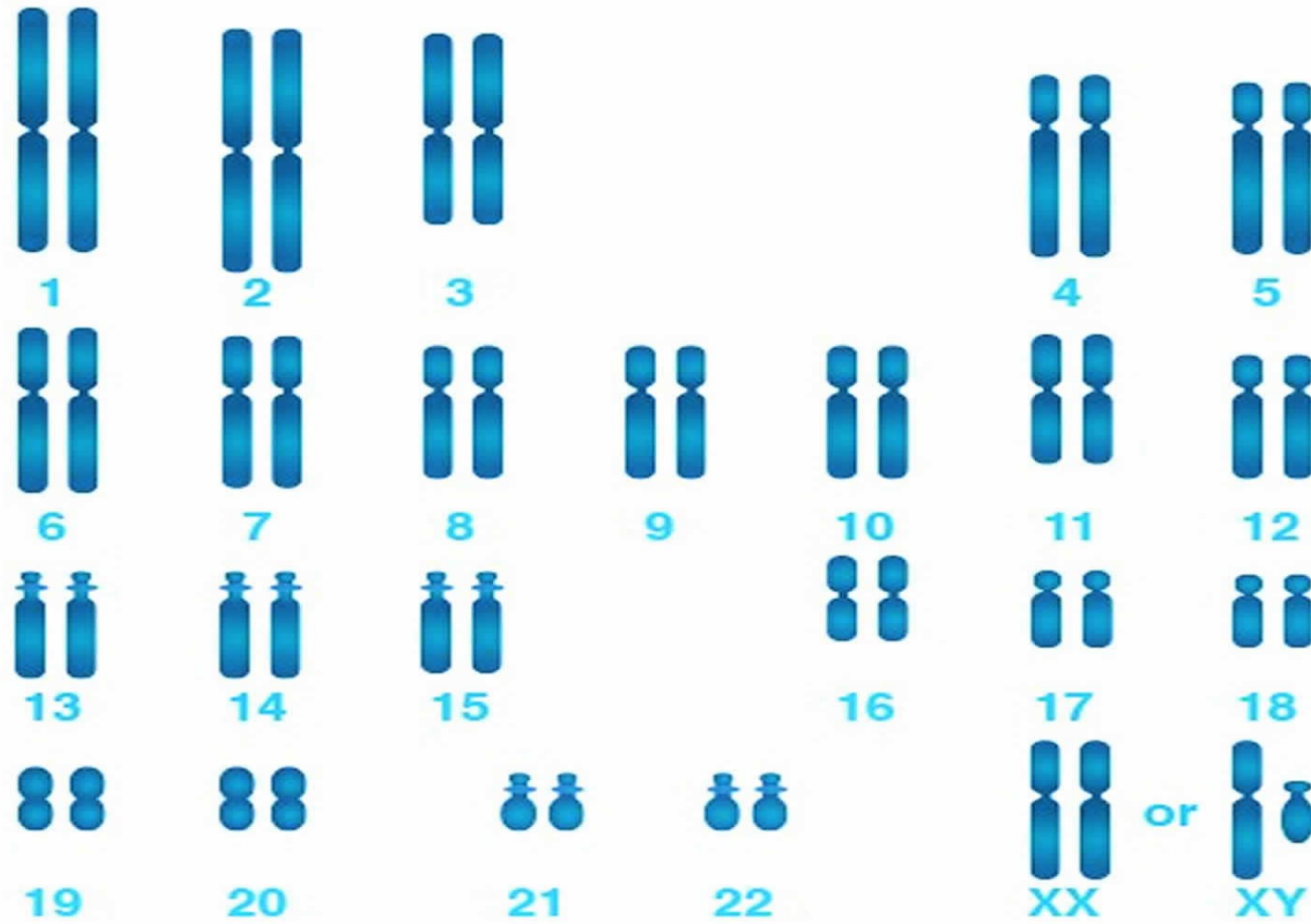


Blood Group



Height

human karyotype





Genetic terms:

- **Diploid:** a cell that contains both sets of homologous chromosome.
- **Haploid:** a cell that contains only a single set of chromosomes.
- **Mutation:** change in the nucleotide sequence of DNA.
- **X-linked:** pattern of inheritance, refers to an allele carried on the X chromosome.
- **Chromatids:** one of the two identical sister parts of a duplicated chromosome

Genetic terms:

- **Genome:** The complete set of chromosomes with their associated genes.
- **Chromosome :** chromosomes are thread like structures of DNA, carrying genetic information in the form of genes. They are located in the nucleus of cells
- **Autosomal chromosome:** in humans, the 22 pairs of chromosomes that are not the sex chromosomes (XX or XY).
- **Sex chromosomes:** pair of chromosomes involved in sex determination; in males, the XY chromosomes; in females, the XX chromosomes.



References:

- Gangane , SD. (2017) Human genetics, 5th edition . Elsevier. India.
- Pal, G.P. (2011) Medical genetics. Aitbs publishers and distributors, India.
- Peter, J.R. (2016) i Genetics. 3rd edition. Pearson education, India.