The Genomes

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- **Genomes**

- The study of the genome, in the fields of molecular biology and genetics is the **genetic material** of an organism. It consists of DNA (deoxyribonucleic acid) or RNA ribonucleic acid (in some viruses).

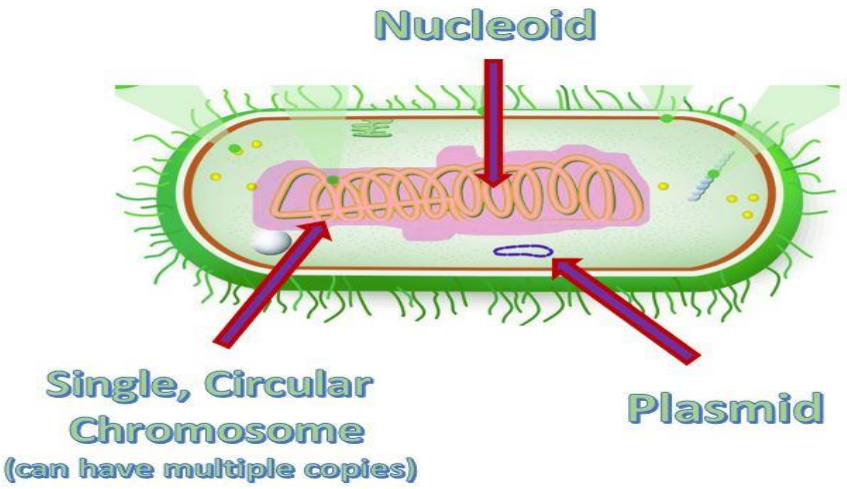
- The genome includes both the genes (the coding regions) and the noncoding DNA, was well as mitochondrial DNA and chloroplast DNA.

- **Types of Genomes**

* **Prokaryotes cell** :

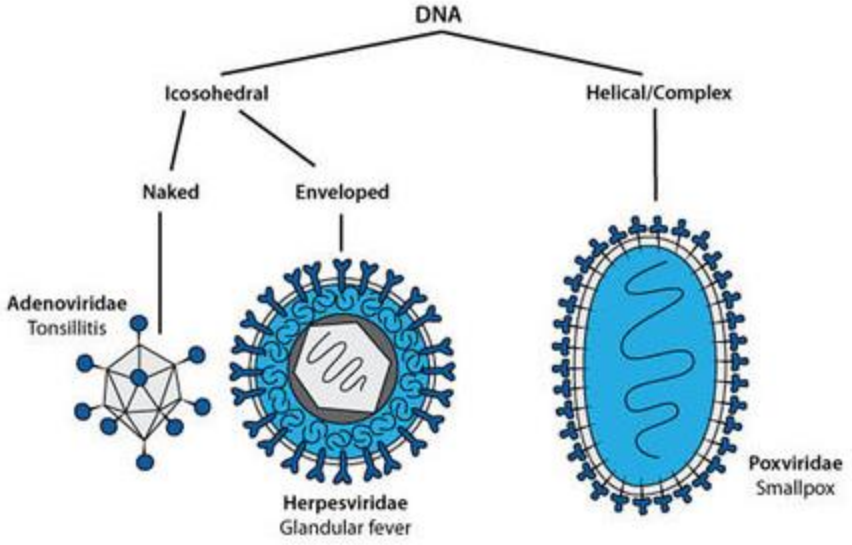
1) Archaea and Bacteria: unicellular organisms they do not have a nucleus, but, instead, have a single, circular chromosome with double-stranded **DNA** located in nucleoid.

* Bac. has plasmid DNA(contain many genes which not necessary for its life but it carry genes e.g. antibiotic resistance gene).

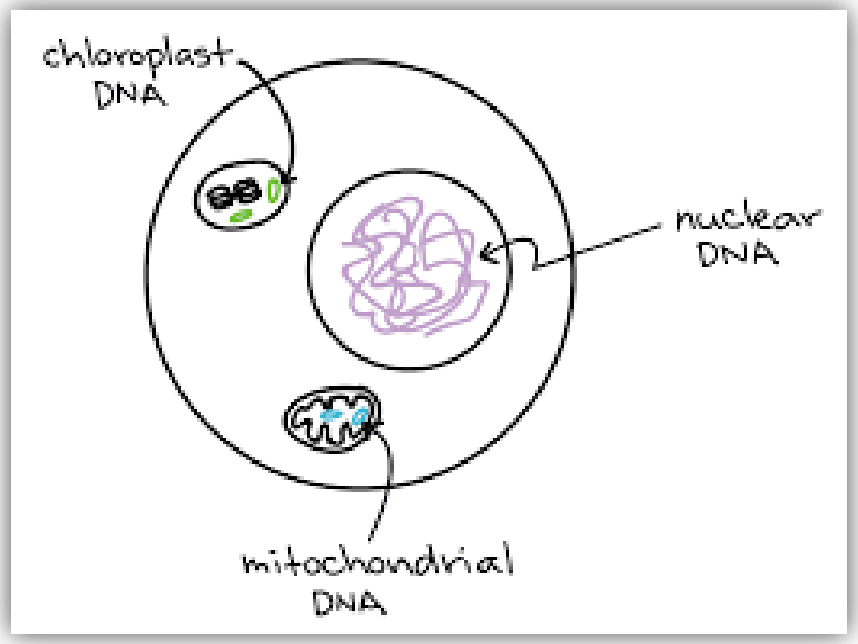


2) virus : Viral genomes can be composed of either RNA or DNA.

- The genomes of RNA viruses can be either single-stranded or double-stranded, and may contain one or more separate RNA molecules.
- DNA viruses can have either single-stranded or double-stranded genomes. Most DNA virus genomes are composed of a single, linear molecule of DNA, but some are made up of a circular DNA molecule.



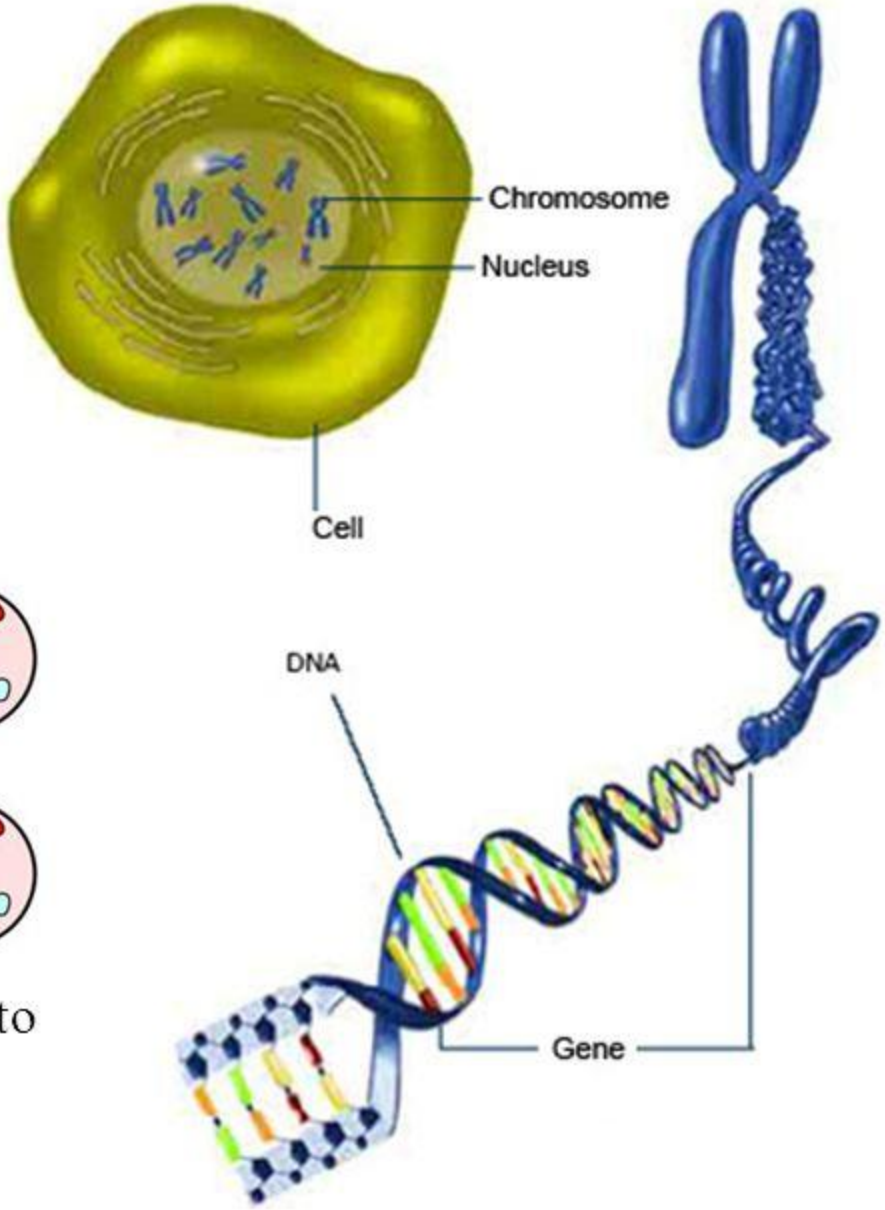
- **Eukaryotes cells** with nuclei such as those found in (Humans, animals, parasite, plants and yeast), have Nuclear genome.

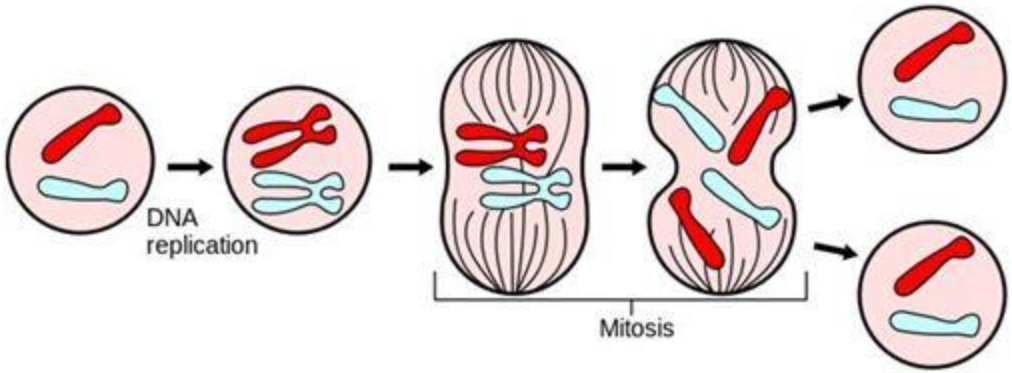


In addition to the chromosomes in the nucleus, organelles such as the chloroplasts and mitochondria (mtDNA) have their own DNA.

DNA in Eukaryotic Cells

- Contained in the **nucleus**
- Always linear, no plasmids
- Cell division occurs via **mitosis**





During **mitosis**, a eukaryotic cell divides into two daughter cells. The DNA is replicated before the cell divides. Each daughter cell receives an identical copy of the DNA.

- Eukaryotic genomes are composed of one or more linear DNA chromosomes.
- The number of chromosomes varies widely from which each have only one pair, to that has 720 pairs.
- A typical human cell has two copies of each of 22 autosomes, one inherited from each parent, plus two sex chromosomes, making it diploid.
- Gametes, such as ova, sperm, spores, and pollen, are haploid, meaning they carry only one copy of sex chromosome.

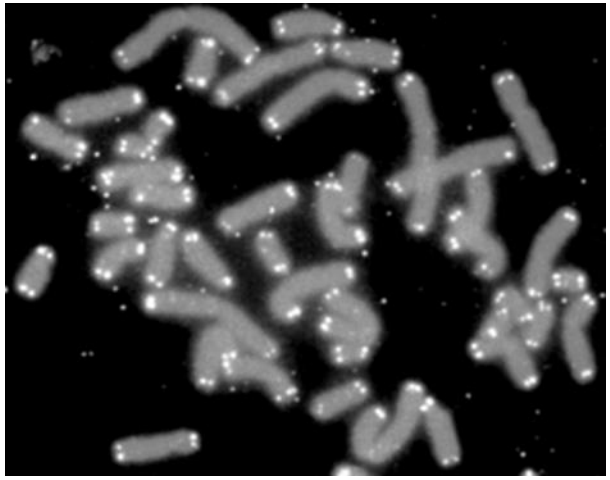
- In the nucleus of eukaryotes the nuclear genome has many physical organizations:

1) The nuclear genome is split into a number of individual DNA molecules, as a different chromosome.
2) These DNA molecules are linear, not circular.
3) In most cells of most eukaryotes there are two copies of each chromosome, and hence two copies of each gene. This is called the **diploid** complement, while **haploid** refers to the situation usually found only in reproductive cells (ova and sperm) where the nucleus contains just a single copy of sex chromosome which called gametes.

4) Unlike prokaryotes, eukaryotes have **exon-intron** organization of protein coding genes and variable amounts of repetitive DNA.

5) Most Eukaryotic nuclear genomes, mammals and plants, are made up of repetitive DNA, individual sequence elements that are repeated many times over, either in tandem arrays or interspersed throughout the genome. some of these sequences are repeated several thousand to several million times in the genome, others only as 10 to several hundred copies.

6) The complex association between the **DNA** of the chromosomes and the **proteins** to which it binds is called a **chromatin**.



Human chromosomes (grey) capped by telomeres (white)

7) Telomers

Is a region of repetitive nucleotide sequences at each end of a chromosome, which protects the end of the chromosome from deterioration or from fusion with neighboring chromosomes.

the sequence of nucleotides in telomeres is AGGGTT.