

## CYTOGENETICS

### CYTOGENETICS

- Field of genetics involving microscopic examination of chromosomes
- Tightly compacted chromosomes have distinctive shapes and number
- Giemsa staining - Chemical dye gives a distinctive banding pattern
- Karyotype - produces imaging

### THE BASICS OF GENETICS

#### CELLS AND CHROMOSOMES

- Every eukaryotic species has a characteristic number of chromosomes in each cell nucleus
- Somatic cells = non-reproductive
  - have two sets of chromosomes
  - $2n = 46$  - pancreas cells, muscle cells, etc...
- Gametes = reproductive cells: sperm and eggs
  - have half as many chromosomes as somatic cells
  - $n=23$
- Eukaryotic chromosomes consist of chromatin
- Chromatin - a complex of DNA and protein that condenses during cell division

#### CELLULAR ORGANIZATION OF THE GENETIC MATERIAL

- Most cell division results in daughter cells with identical genetic information, DNA
- Non-identical daughter cells = gametes: sperm/egg cells
- All the DNA in a cell constitutes the cell's genome
- A genome:
  - = a single DNA molecule
  - (common in prokaryotic cells)
  - = a number of DNA molecules
  - (common in eukaryotic cells)
- DNA molecules in a cell are packaged into chromosomes

### DISTRIBUTION OF CHROMOSOMES DURING EUKARYOTIC CELL DIVISION

In preparation for cell division:

- DNA = replicated, chromosomes = condense
- Each duplicated including DNA chromosome has two sister chromatids, which separate during cell division

Centromere

- narrow "waist" of the duplicated chromosome
- where the two chromatids are most closely attached
- not visible

Chromosome

- Contains the genetic material (DNA)
- Contains proteins
- "packed" within cell's nucleus

TELOMERES:

telomerase, cell senescence, cancer, & pre-mature aging

- repetitive sequences of non-coding DNA (genome.gov)
- TTAGGG (THYMININE, THYMININE ADENINE GUANINE, GUANINE, GUANINE)
- specific DNA-protein structures found at both ends of each chromosome protecting a genome from nucleolytic degradation, unnecessary recombination, repair, and intrachromosomal fusion
- Located at the both tip of the chromosome

TELOMERES AND CELLULAR SENESCENCE

normal, dividing cell

- approximately 30 to 50 times without apoptosis involved

repeated cell replication and division is possible

- DNA sequence loss
- cell replication stopped

When young mas makapal pa yung telomerase kasi habang tumatanda mas numinipis kasi sa DNA replication.

- Neurons does not divide
- Stratified tissues are fast in cell division.

REPLICATION AND TELOMERES

- Once the telomeres is absent form a chromosome the person maybe prone to cancer mutations.

Telomerase - enzyme

# Text Of Cytogenetics

**N Noddings**



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