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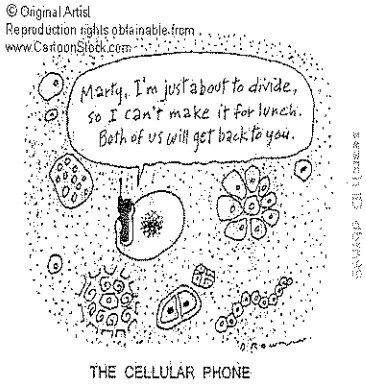



# Chapter 10: Cell Growth and Division

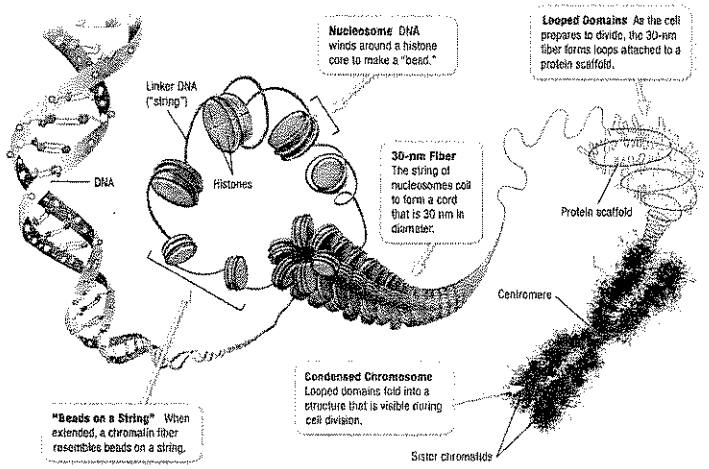
## *Section 1: Cell Reproduction*

### Why Cells Reproduce

1. How many cells are produced by humans in one day? 2 TRILLION
2. The process of making exact copies of cells to replace old ones is called CELL REPRODUCTION.
3. A body grows by producing more CELLS rather than the existing cells getting larger.
4. There are two main reasons why large cells are inefficient. The first is that as a cell gets larger, substances must travel FARTHER to reach where they are needed. The second is the demands placed on the cell's DNA. DNA instructions cannot be copied quickly enough (DNA→mRNA) to make the PROTEINS the cell needs to support itself.
5. During cell division, each new cell called a "DAUGHTER" cell is smaller than the original cell and gets an entire copy of the cell's DNA.

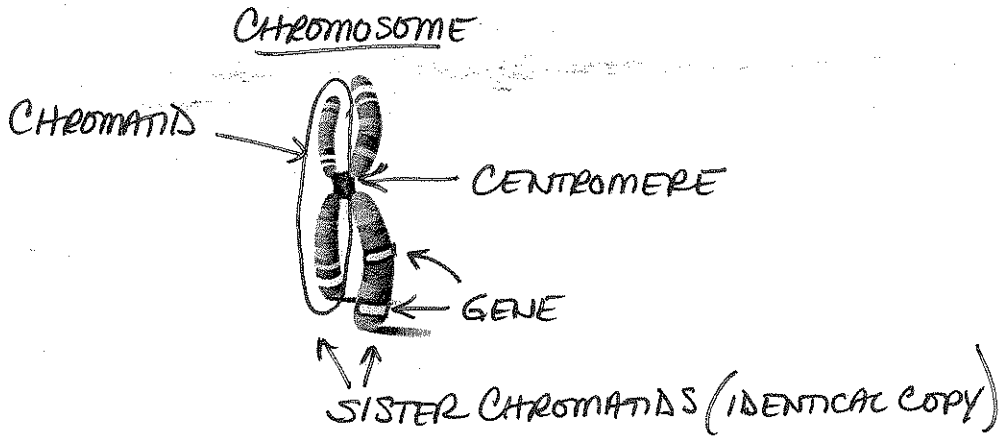
### Chromosomes

1. A cell's activity is directed by its DNA.
2. A gene is a segment of DNA that codes for RNA and PROTEINS.
3. Packages of DNA are called CHROMOSOMES.
4. A Prokaryotic cell has a single CIRCULAR molecule of DNA.
5. A human cell contains 46 separate, linear DNA molecules that are packaged into 46 CHROMOSOMES.
6. DNA wound around proteins is called CHROMATIN.



7. During most of a cell's life its chromosomes are uncoiled, but as the cell prepares to divide, the chromosomes CONDENSE even further. This ensures that the DNA molecules don't get TANGLED UP during cell division.

8. In the figure below, label the parts of the chromosome. Chromosome, chromatid, centromere, sister chromatids, genes.



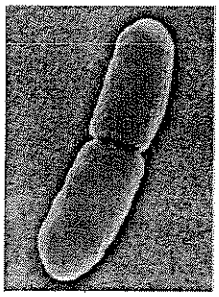

Preparing for Cell Division

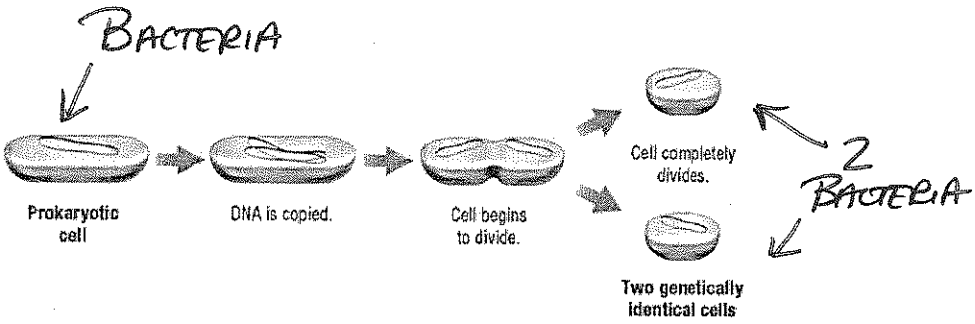
1. All new cells are produced by the DIVISION OF PREEXISTING CELLS.

2. All newly formed cells require DNA, so before a cell divides, a copy of DNA is made for each DAUGHTER CELL.

3. What is the name of the process in which identical copies of DNA are made? (not in book)
DNA REPLICATION (WOO HOO!).

4. In prokaryotic cell division the DNA is copied then the cell membrane pinches in half creating two genetically IDENTICAL cells.


Cell dividing




5. In eukaryotic cell division each daughter cell must contain enough of each ORGANELLE to carry out its functions. The DNA within the nucleus must also be copied, sorted, and SEPARATED.

***Section 2: Mitosis***

Eukaryotic Cell Cycle

1. The cell cycle is the REPEATING sequence of cellular GROWTH and DIVISION during the life of a cell.

2. The life of a eukaryotic cell goes through phases of GROWTH, DNA REPLICATION, PREPARATION FOR CELL DIVISION, and DIVISION of the nucleus and cytoplasm.

*terphase*

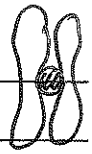
3. For each phase of Interphase, describe what is taking place.

G1 (first gap phase):

THE CELL GROWS AND BUILDS MORE ORGANELLES; FOR CELLS NOT DIVIDING THEY STAY IN G1 (NERVE/BRAIN CELLS)

S (synthesis phase):

DNA IS COPIED (DNA REPLICATION); EACH CHROMOSOME CONSISTS OF TWO IDENTICAL SISTER CHROMATIDS.



G2 (second gap phase):

CELL GROWS AND PREPARES TO DIVIDE BY FORMING MICROTUBULES (SPIDER WEBS THAT WILL MOVE STUFF AROUND).

*Cell Division*

4. The process of dividing the nucleus into two daughter nuclei is called MITOSIS.

5. The process of separating the organelles and the cytoplasm is called CYTOKINESIS.

ages of Mitosis

1. Mitosis is a continuous process that can be observed in four stages: PROPHASE, METAPHASE, ANAPHASE, and TELOPHASE.

2. Before we begin with the phases of Mitosis, define the terms below.

Spindle: LONG HOLLOW PROTEIN TUBES (SPIDER WEBS); WILL MOVE THINGS

~~Centrosome~~: CELL PART WHICH PRODUCES SPINDLES

CENTRIOLES:

3. For each phase of Mitosis, describe what is taking place.

Prophase:

CHROMOSOMES BECOME VISABLE; NUCLEAR MEMBRANE DISSOLVES, CENTRIOLES START STRETCHING SPINDLES ACROSS CELL

Metaphase:

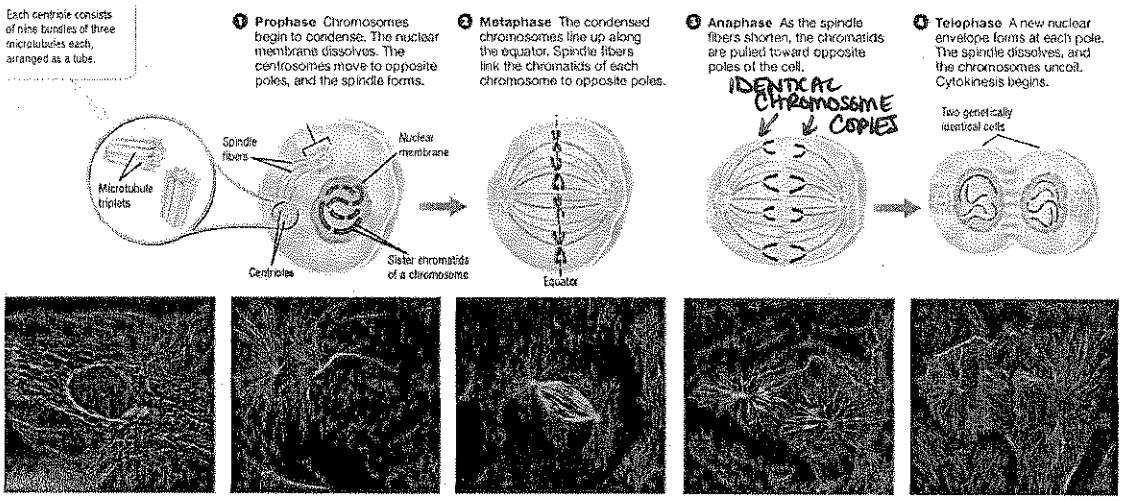
CHROMOSOMES LINE UP DOWN THE MIDDLE OF THE CELL & ATTACH TO SPINDLE AT CENTROMERE.

Anaphase:

SISTER CHROMATIDS ARE PULLED TO OPPOSITE ENDS OF THE CELL BY THE SPINDLES

Telophase:

TWO NEW NUCLEAR MEMBRANES FORM AROUND EACH SET OF CHROMOSOMES; SPINDLES DISSOLVE




Cytokinesis

1. During cytokinesis, the CELL MEMBRANE grows into the center of the cell and DIVIDES into two DAUGHTER cells of equal size. Each daughter cell has about half of the parent's CYTOPLASM and ORGANELLES. The end result is TWO genetically IDENTICAL cells in place of the original cell.

HUMAN MITOSIS → 46 → 46, 46

2. ANIMAL cells perform cytokinesis by pinching from the outside in.
3. PLANT cells perform cytokinesis by forming a cell plate and dividing from the inside out.
4. After cytokinesis, each daughter cell enters the G1 stage of INTERPHASE.

***Section 3: Regulation***

Controls

1. Cell growth and division depend on PROTEIN SIGNALS and other ENVIRONMENTAL signals.

Checkpoints

1. Feedback SIGNALS at key checkpoints in the cell cycle can DELAY or TRIGGER the next phase of the cell cycle.

Cancer

1. Cancer is a group of severe and sometimes fatal diseases that are caused by UNCONTROLLED CELL GROWTH.
2. Damage to cell's DNA can cause the cell to respond improperly or to STOP responding. The defective cell DIVIDES ~~the~~ AND produces more DEFECTIVE cells that eventually can form masses called TUMORS.
3. What is one way that cancer can be prevented? AVOID ULTRAVIOLET RADIATION, CIGARETTE SMOKE.