# Binary Fission

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#### Prokaryotes vs. Eukaryotes

#### PROKARYOTES

- Use Binary Fission
- Have no nucleus
- Chromosome in a single loop

#### **EUKARYOTES**

- Use Cell Cycle (Mitosis)
- Have nucleus
- Linear Chromosome





# Prokaryotes vs. Eukaryotes



Both prokaryotes and eukaryotes use a type a cellular reproduction known as asexual reproduction



# Asexual Reproduction

#### PROS:

- Fast!
- Easy!

#### CONS:

 No genetic diversity (offspring are essentially clones)









 Process of cell division that produces identical offspring in prokaryotic cells like bacteria.





### Binary Fission Step #1

 Circular DNA unzips and copies itself according to base pairing rules of each complementary strand







### Binary Fission Step #2

# Cell Splits



### Bacteria need to multiply quickly:



## **Binary Fission**



Binary Fission in prokaryotes is fast, because they have no nucleus to break down or organelles to copy.





## The Cell Cycle

- Living things (like you) are often made of trillions of cells.
- These cells are often:
  - Dying
  - Being worn away
  - The organism may be growing and need more cells.





## Cell Cycle



The repeated sequence of growth and division required to strategically maneuver the nucleus, chromosomes and organelles before the cell can properly divide.

# Different forms of DNA

- 1) Chromosomes
- 2) Chromatin
- 3) Chromatids





- Definition: Supercoiled DNA
- Structure:
   a single coiled DNA molecule;

#### OR

After DNA replication it may be two coiled DNA molecules held together at a centromere.

## <u>Chromosomes</u>







## **Chromatin**

– DNA in the nucleus that is loose, "spaghetti-like" structure present only during **Interphase** of the cell cycle. -DNA before it is supercoiled into chromosomes



#### Chromatin vs. Chromosomes

Chromosomes

## <u>Chromatids</u>

- Each DNA strand in the chromosome ...therefore, each replicated chromosome has 2 chromatids.
- Since the DNA in each replicated chromatid is identical, they are referred to as sister chromatids.
- Sister chromatids are held together by a centromere.





NOTE: Chromosomes, Chromatin and Chromatids are all made of the same DNA, it's just different shapes at different times of the cell cycle.

### Interphase:

(Time in between cell divisions)

**Consists of:** 

- G1 (Gap/Growth 1):
- S (Synthesis):
- G2 (Gap/Growth 2):



- G1 (Gap 1 or Growth 1):
  - Cell growth All routine functions of the cell. "Cell is doing what it is meant to be doing."
  - DNA in the form of chromatin.



S (Synthesis):
– DNA Replication
• Amount of chromatin in the nucleus doubles.



### • G2 (Gap 2 or Growth 2): – Growth and Preparation for Mitosis

- Organelles (in particular centrioles) duplicate.
- Cell growth reaches a point where Mitosis is triggered.
- DNA in the form of chromatin.

## **Phases of the Cell Cycle Mitosis and Cytokinesis** are not part of Interphase, because the cell is actively dividing here.

- . M Mitosis:
  - DNA forms into chromosomes.
     Nucleus divides.
- . C Cytokinesis:
  - Cytoplasm divides into 2 cells each with its own nucleus.
    DNA turns back into chromatin.



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  - Cell growth
    - All routine functions of the cell. "Cell is doing what it is meant to be doing."
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  - DNA Replication
    - Amount of chromatin in the nucleus duplicates.
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    - Organelles (in particular centrioles) duplicate. Cell growth reaches a point where Mitosis is triggered.
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