Eukaryotic Cell Division - Advanced

Douglas Wilkin, Ph.D.

AUTHOR
Douglas Wilkin, Ph.D.

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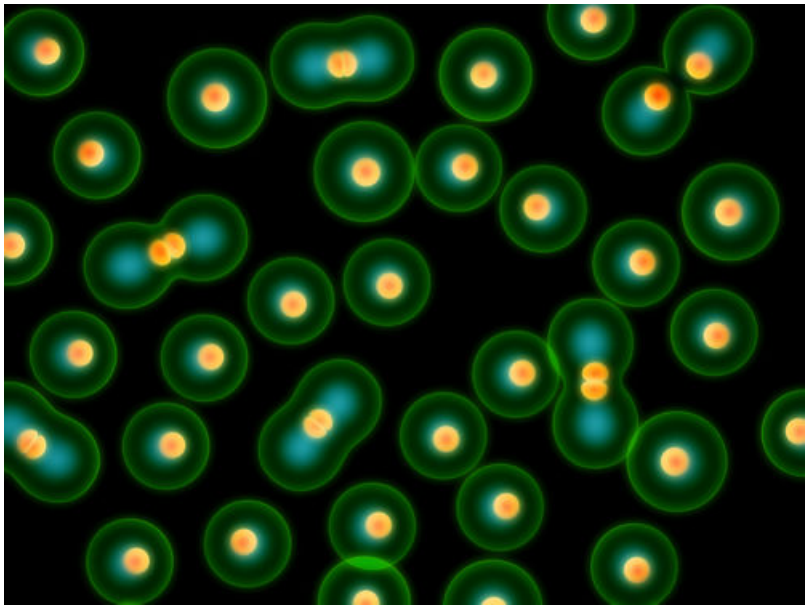
CHAPTER 1

Eukaryotic Cell Division - Advanced

- Describe cell division in eukaryotes.
- Explain the main differences between cell division in prokaryotic and eukaryotic cells.



Are these cells prokaryotic or eukaryotic?

Notice the nucleus. Eukaryotic cell division is more complicated than prokaryotic division because of this organelle. Having more than one chromosome and ensuring that all daughter cells receive a full compliment of chromosomes is no easy task.

Cell Division in Eukaryotes

Though cell division in all cells results in one cell becoming two cells, cell division in **eukaryotic** organisms is very different from that in prokaryotes, mainly because of the many **chromosomes** in the nuclei of **eukaryotic cells**. Cell division in eukaryotic organisms is necessary for development, growth, and repair of the organism. Just as in binary fission, eukaryotic cell division ensures that each resulting daughter cell receives a complete copy of the organism's entire genome. Remember that all of an organism's DNA must be present in each somatic, or body, cell. This DNA contains the information necessary for that cell to perform its functions, and to give that organism its traits. Therefore, prior to cell division, the eukaryotic cell's complete genome must be copied, a process known as **DNA replication**, ensuring that each daughter cell receives a complete set of the genome. Prior to cell division, the cell's organelles are also duplicated. Now the cell is ready to divide. Cell division occurs at the end of an eukaryotic cell's **cell cycle**.

Eukaryotic cell division occurs in two major steps:

1. The first step is **mitosis**, a multi-phase process in which the nucleus of the cell divides. During mitosis, the nuclear membrane breaks down and later reforms. The chromosomes are also sorted and separated to ensure

that each daughter cell receives a **diploid** number of chromosomes. In humans, that number of chromosomes is 46 (23 pairs). Mitosis is described in greater detail in *Cell Cycle: Mitosis (Advanced)*. Because the DNA has replicated prior to mitosis, the two nuclei that result from mitosis are genetically identical.

2. The second major step is **cytokinesis**. As in prokaryotic cells, the cytoplasm must divide. Cytokinesis is the division of the cytoplasm in eukaryotic cells, resulting in two genetically identical daughter cells.

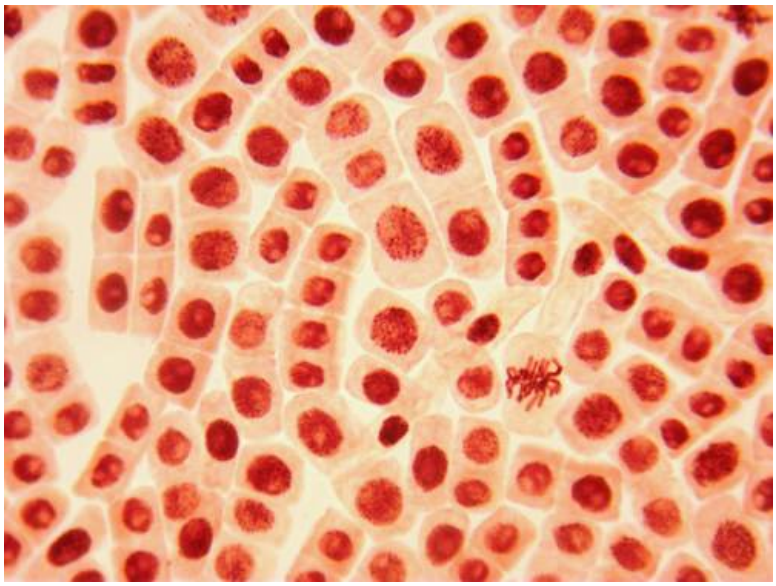


FIGURE 1.1

Shown are cells in various stages of their cell cycle. Numerous dividing cells are evident.

The formation of **gametes**, an organism's reproductive cells, such as sperm and egg cells, involves a completely different method of cell division, called **meiosis**. This cell division ensures that each gamete receives a **haploid** number (half the amount) of chromosomes.

Summary

- Eukaryotic cell division involves mitosis and cytokinesis.
- Eukaryotic cell division occurs at the end of the cell cycle.

Review

1. What is cell division?
2. What is cytokinesis and when does it occur?
3. Describe eukaryotic cell division.
4. When does cell division occur?
5. How many chromosomes do humans have?

References

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