Adriana Mercedes

Scientific Lit. Essay

Bio 293

9/17/2022

Scientific Literacy Essay pt. 1

Mitosis is one of the multiple steps in the cell cycle; the step allows the copied DNA to separate forming two new cells; humans as well as most organisms are multicellular but life begins with one cell that is formed from two gametes.

The zygote has all the necessary DNA to give rise to a fully functioning organism but there is still not a large number of cells.

Mitosis allows our cells to double up and, after some time, there are finally enough cells to carry out different tasks within the body.

Mitosis is needed for development; it is also necessary to replace damaged tissues.

Mitosis is the process of cell duplication and chromosome duplication. While this four-step process occurs; one cell is duplicated into two new cells called daughter cells that are genetically identical.

This process has 4 stages- Interphase which also consists of the G1, S, and G2 phases; prophase, metaphase, anaphase, and telophase. This entire process takes 24 hours. During interphase, microtubules extend from these centrosomes. The DNA in the cell is duplicated for the preparation of the cell cycle, this results in two full sets of chromosomes. During prophase, each chromosome is made of the two sister chromatids, that have identical genetic information. During this phase, the mitotic spindles that consist of the microtubules and other proteins extend across the cell; between the centrioles as they move to opposite sides of the cell.

During metaphase, the mitotic spindle fibers connect to each of the sister chromatids. During anaphase, the sister chromatids are pulled apart by the mitotic spindle causing them to pull the chromatids to opposite sides of the cell. Finally; during telophase, a membrane is formed around the sets of chromosomes to make two new nuclei. The cell cleaves in the middle to form two new cells that are completely identical; this process is known as cytokinesis *(Raven, Johnson and Mason ., et al).*

There are multiple steps a cell must go through in order to become its own independent cell. Before a cell is ready for mitosis it must go through Interphase; during which the cell grows and creates its necessary proteins. During interphase in the S -phase is where the cell copies its chromosomes and where DNA replication occurs.

DNA replication is regulated so that it is only replicated once before cell division begins. DNA replication takes about 60 minutes or less depending on the speed of DNA replication, the amount of DNA within the cell, and the number of replication origins on each DNA molecule *(Eric.,2019).*

Cell division is the copying of a parent cell into two daughter cells which results in 2 genomic copies or 2 diploids of that replicated DNA. To make sure there are no errors in the newly copied DNA. One of these checkpoints in the cell cycle is the DNA replication fork *(Bobby and Russell,2001)* or the G1/S and G2/M checkpoints *(Willis and Rhind,2009)* occur to ensure that the DNA had been replicated correctly before it goes into mitosis. These checkpoints have several processes to control how DNA is replicated and delay the onset of mitosis while DNA synthesis is occurring.

Works Cited

Bank, Eric. “How Much Time Does It Take for a DNA Molecule to Replicate?” *Sciencing*, Sciencing, 30 July 2019, https://sciencing.com/much-time-dna-molecule-replicate-21660.html.

Boddy, Michael, and Paul Russell. “DNA Replication Checkpoint - Current Biology.” *Current Biology*, Current Biology, 27 Nov. 2001, https://www.cell.com/current-biology/fulltext/S0960-9822(01)00572-3.

Bozeman. “Cell Division & DNA Replication.” *University of New Hampshire*, University of New Hampshire, 27 June 2019, https://www.unh.edu/cfar/cell-division-dna-replication.

Liao, Eric C., and Leonard I. Zon. “Chapter 10 Simple Sequence-Length Polymorphism Analysis.” *Methods in Cell Biology*, Academic Press, 10 Apr. 2008, https://www.sciencedirect.com/science/article/abs/pii/S0091679X08619007.

Loata, Gloria. “Mitosis.” *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., <https://www.britannica.com/science/mitosis>.

OpenStax College, Biology. (2016, May 27). The cell cycle. In *OpenStax CNX*. Retrieved from <http://cnx.org/contents/GFy_h8cu@10.53:1tJ55Ot6@7/The-Cell-Cycle>.

Raven, P. H., Johnson, G. B., Mason, K. A., Losos, J. B., and Singer, S. R. (2014). How cells divide. In *Biology* (10th ed., AP ed., pp. 187-206). New York, NY: McGraw-Hill.

Willis, Nicholas, and Nicholas Rhind. “Regulation of DNA Replication by the S-Phase DNA Damage Checkpoint - Cell Division.” *BioMed Central*, BioMed Central, 3 July 2009, https://celldiv.biomedcentral.com/articles/10.1186/1747-1028-4-13.