



Cell Division in Bio-Chemistry

Rosa María Bermúdez-Cruz*

Department of Genetics and Molecular Biology, Center for Research and Advanced Studies of the National Polytechnic Institute, Mexico, USA

***Corresponding author:** Rosa María Bermúdez-Cruz, Department of Genetics and Molecular Biology, Center for Research and Advanced Studies of the National Polytechnic Institute, Mexico, USA, E-mail: roberm@cinvestav.mx

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INTRODUCTION

Cell division is the process by which a parent cell divides into two or more daughter cells. Cell division usually occurs as part of a larger cell cycle. In eukaryotes, there are two distinct types of cell division; a vegetative division, whereby each daughter cell is genetically identical to the parent cell (mitosis), and a reproductive cell division, whereby the number of chromosomes in the daughter cells is reduced by half to produce haploid gametes (meiosis). In cell biology, mitosis is a part of the cell cycle, in which, replicated chromosomes are separated into two new nuclei. Cell division gives rise to genetically identical cells in which the total number of chromosomes is maintained. In general, mitosis (division of the nucleus) is preceded by the S stage of interphase (during which the DNA is replicated) and is often followed by telophase and cytokinesis; which divides the cytoplasm, organelles and cell membrane of one cell into two new cells containing roughly equal shares of these cellular components. The different stages of Mitosis all together define the mitotic (M) phase of an animal cell cycle—the division of the mother cell into two genetically identical daughter cells. Meiosis results in four haploid daughter cells by undergoing one round of DNA replication followed by two divisions. Homologous chromosomes are separated in the first division, and sister chromatids are separated in the second division. Both of these cell division cycles are used in the process of sexual reproduction at some point in their life cycle. Both are believed to be present in the last eukaryotic common ancestor. Prokaryotes (bacteria and archaea) usually undergo a vegetative cell division known as binary fission, where their genetic material is segregated equally into two daughter cells. While binary fission may be the means of division by most prokaryotes, there are alternative manners of division, such as budding, that have been observed. All cell divisions, regardless of organism, are preceded by a single round of DNA replication. For simple unicellular microorganisms such as the amoeba, one cell division is equivalent to reproduction – an entire new organism is

created. On a larger scale, mitotic cell division can create progeny from multicellular organisms, such as plants that grow from cuttings. Mitotic cell division enables sexually reproducing organisms to develop from the one-celled zygote, which itself was produced by meiotic cell division from gametes. After growth, cell division by mitosis allows for continual construction and repair of the organism. The human body experiences about 10 quadrillion cell divisions in a lifetime. The primary concern of cell division is the maintenance of the original cell's genome. Before division can occur, the genomic information that is stored in chromosomes must be replicated, and the duplicated genome must be separated cleanly between cells. A great deal of cellular infrastructure is involved in keeping genomic information consistent between generations. Cell division is the process in which a parent cell divides, giving rise to two or more daughter cells. It is an essential biological process in many organisms. It is the means used by multicellular organisms in order to grow, replenish (repair), and reproduce. In unicellular organisms, a cell division is equivalent to reproduction. There are two forms of cell division: (1) Direct cell division and (2) Indirect cell division. The direct cell division is one in which the nucleus and the cytoplasm of the cell divide directly into two parts. This form of cell division is also referred to as amitosis. In contrast, the indirect cell division involves complicated changes within the cell, e.g. formation of chromosomes, before the parent cell divides and produce daughter cells. Mitosis is a cell division that involves an indirect method of producing daughter cells. Cell division is commonly used interchangeably with mitosis, a process comprised of karyokinesis and cytokinesis resulting in two genetically identical cells. Nevertheless, cell division is not exclusive to mitosis; it is also happening in meiosis, which, in comparison, is a process giving rise to cells with non-identical genetic material. Thus, cell division is a biological process involved in growth and reproduction of various organisms. It is part of the organism's cell cycle.