

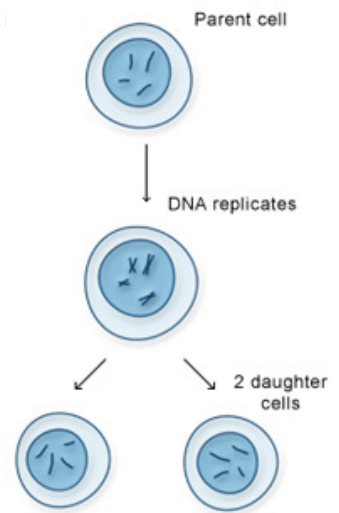
Biology Top-Up

Cell division

Mitosis

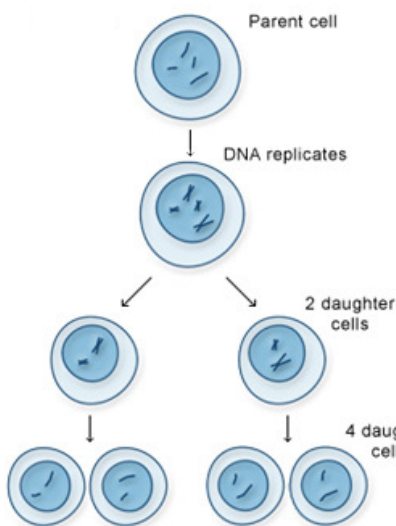
This is the process by which normal body cells are made for growth or repair. It is also the process used in asexual reproduction. In order to divide, the cells first have to copy their genetic material - because of this, the resulting daughter cells are genetically identical (clones).

Once the DNA has been replicated (copied), the chromosomes become supercoiled and compact enough to see with a light microscope. They appear in the traditional X shape - two chromatids joined at the centromere. The nuclear membrane breaks down, and the chromosomes align along the equator of the cell. Fibres form which attach to the centromeres and pull the chromatids to opposite poles of the cell. A new nuclear membrane forms around each set of chromatids, the cytoplasm divides and the cell membrane pinches inwards to give two daughter cells.



Meiosis

This is the process that forms the gametes (sex cells) necessary for sexual reproduction. Sexual reproduction gives variation within a species due to the random mixing of genetic information - half from each parent. Gametes are said to be haploid because they contain half a set of chromosomes. The zygote formed at fertilisation is diploid, with a full set of genetic information. The ovaries and testes contain the only cells in the human body which divide by meiosis.



The first stage of meiosis is DNA replication, but rather than lining up singly, the chromosomes arrange themselves as 23 homologous pairs (chromosomes that contain genes for the same chromosomes, but different alleles). One chromosome from each pair moves to either end of the cell, and the cytoplasm divides. The 2 daughter cells formed contain 23 chromosomes each.

The second stage of meiosis is similar to mitosis, but without the DNA replication. The 23 chromosomes align along the equator of the cell and fibres form which split the centromeres and pull one chromatid from each chromosome towards each pole. A new nuclear membrane forms, the cytoplasm divides and the cell membrane pinches. Four daughter cells are formed at the end of this process.