Why do cells need to divide?

Cells divide for many reasons, such as growth and development for the organism, tissue repair, reproduction, and to maintain cell size for the keep the cell functioning most efficiently. The first few reasons we talked about earlier when we covered what life is and the different types of cells. Now we will discuss cell size.

Cell size: Most cells are in the range of .1 to 100 micrometers. Cells cannot get too large or they will not be able to move things in and out fast enough for the cell to function. The main way for cells to transport molecules between the cell and its environment is by diffusion (slow mixing of molecules by random motion) which is a passive transport method. The bigger the cell the farther the molecules have to travel. Surface area is the limiting variable. Cell volume can increase faster than the cell's surface area. A small surface area to volume ratio (SA:V) means that it will take longer to bring in needed material to the interior of the cell. (SA:V) 6:1 is good, but 6:5 is not.

**These are not true cell sizes but only used as mathematical examples:

Size of cell	1cm X 1cm X 1cm	3cm X 3cm X 3cm	5cm X 5cm X 5cm
Surface area Lx W x #side	1 x 1 x 6 = 6 cm2	3 x 3 x 6 = 54 cm2	5 x 5 x 6 = 150 cm2
Volume area (l x w x h)	1 x 1 x 1 = 1 cm3	3 x 3 x 3 = 27 cm3	5 x 5 x 5 = 125 cm3
Ratio surface area to vol	6/1 OR 6:1	54/27 OR 2:1	150/125 OR 6:5

Regulating cell division:

Cells have ways of adjusting the timing of their cell cycle so that more or less cells will be made. The cells can respond to internal or external signals. If an organism or part of an organism is injured, the cells near that area can begin dividing quicker to repair the damage. Once the cells come in contact with other cells on all sides, they will slow their rate of division and return to normal. The cell contains proteins called CYCLINS which regulate the timing of cell division.

Internal regulators allow the cell to proceed in the cell cycle only when certain processes have been completed. For example, the chromosomes will not continue on into Anaphase and begin to move away from each other until all chromosomes have attached to the spindle fibers.

External regulators direct the cell to speed up or slow down cell division based on events outside the cell, such as the injury from earlier. There are molecules on the surface of cells that will signal the cell to divide or stop dividing depending on the need of the organism. These needs could be growth which could be signaled to happen by a growth hormone, or to stop growing when they are touched on all sides. This regulation helps prevent the overgrowth of tissues.

This overgrowth can occur sometimes when cells are damaged, experience a mutation so that the regulators no longer work correctly, or the cell fails to respond to regulators. This abnormality can then lead to the overgrowth of cells which is called a tumor. These can be benign (harmless), or cancerous.