

How Do Bacteria Grow?

Bacteria (and many other microorganisms) grow by dividing into two new bacteria. This process is known as binary fission. One bacterium duplicates everything inside itself and then builds a wall down the middle and separates into two new bacteria. E. coli is an example of this, and it can do this as often as once in every twenty minutes. That is, 3 times per hour. So if we start with one bacterium, and it divides to form two new bacteria in twenty minutes, then each of the two new bacteria divide into two new bacteria by the end of the next twenty minutes, we have a total of 4 bacteria after 40 minutes. If each of the 4 bacteria divides to form two new bacteria in the next twenty minutes then we will have a total of 8 bacteria at the end of the first hour. This process continues until the bacteria run out of food or die.

You can see how this works in the table below. You can do it yourself on a calculator by entering the number 1 then multiplying by 2, then multiplying your result by 2, then multiplying that result by 2, and repeating this once for each generation of bacterial growth.

Time (Minutes)	Time (Hours)	Division Number	$2^n = \text{Number of Bacteria}$
0	0	0	$2^0 = 1$
20	1/3	1	$2^1 = 2$
40	2/3	2	$2^2 = 4$
60	1	3	$2^3 = 8$
80	1 1/3	4	$2^4 = 16$
100	1 2/3	5	$2^5 = 32$
120	2	6	$2^6 = 64$
360	6	18	$2^{18} = 262,144$
600	10	30	$2^{30} = 1,073,741,824$
840	14	42	$2^{42} = 4,398,046,000,000$

Note that starting with 1 E. coli cell, after 6 hours we have over 262 thousand cells, after 10 hours we have over 1 billion E. coli cells and after just 14 hours (less than one day under ideal conditions) we have over 4 trillion cells. Imagine what it will be in several days!! Imagine what happens if you start with more than one bacterium.

This is why it is important to catch an infection early, and why it is important to test for contamination of our water supply regularly, and why adding nutrients (human waste, chemicals etc) to clean water can cause massive algal and bacterial blooms and become health hazards so quickly.