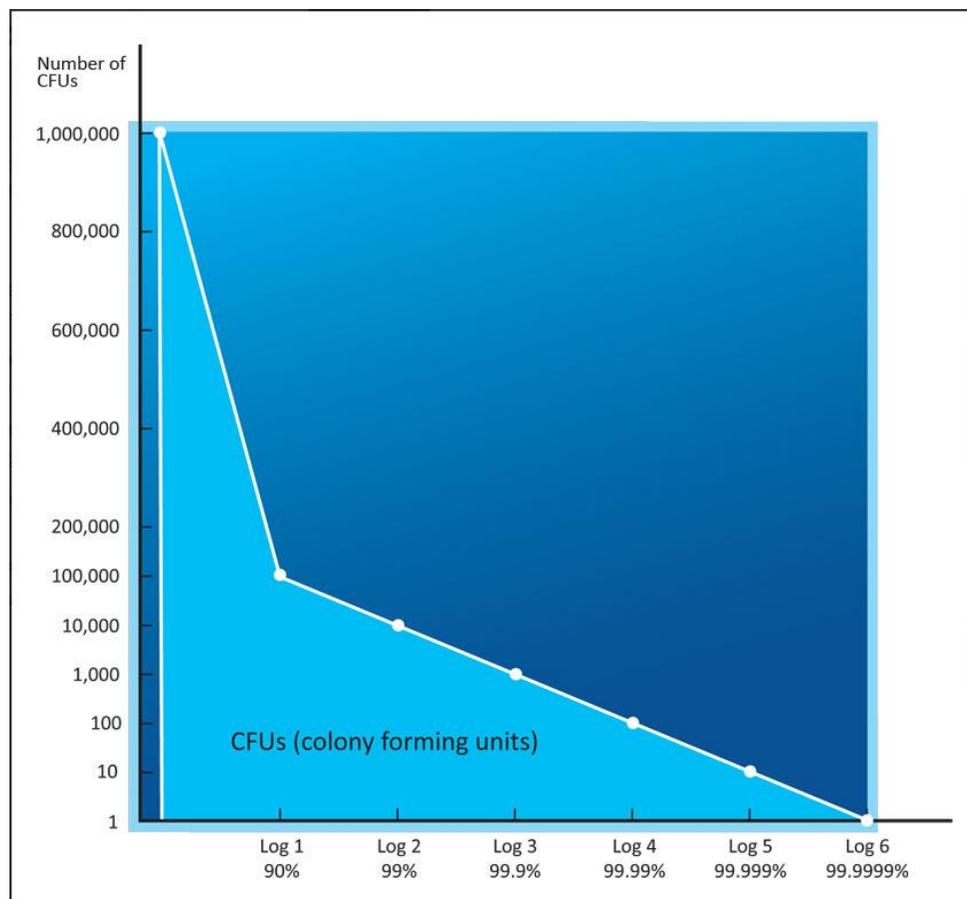# What Is Log Reduction or Log Kill?

It is important to understand what Log Reduction is and why it is important to the process of surface disinfection, surface sterilization, and surface decontamination. *Scientists, engineers, and other professionals who are responsible, or even legally responsible, for preventing illness and contamination, are concerned with Log Reduction or elimination of pathogenic bio-burden.*

The term Log is short for logarithm, a mathematical term for a power to which a number can be raised. For example, using 10 as the given number, a Log 2 increase can be shown as 10^2 or 10 x 10 = 100.

Alternatively, a Log Reduction is taking the power in the opposite direction. For example, a Log Reduction of 1.0 Log is equivalent to a 10 fold reduction or, stated another way, moving down one decimal place, or a 90% reduction.

Product efficacy testing is done by counting the number of "colony forming units" (CFU) of the given pathogen / bacteria at the start of the treatment, and then performing a count again after the required treatment time. The result of the difference between the start and end numbers is then expressed as a Log Reduction.

For example, if the number of bacteria or bacterial colony forming units (CFU) in the beginning was one million or 1,000,000 (or 10^6), and the end result after the treatment was 1,000 (or 10^3) survivors, that would be a 3.0 Log Reduction (Log 3 reduction) or a reduction of 99.9%.

As a rule of thumb, for every additional Log Reduction number, you add the number 9 to the percentage reduction, so a Log Reduction of 3.0 Log is a 99.9% reduction compared with a Log Reduction of 6.0 Log which is equivalent to a 99.9999% reduction.

Below is an example of Log Reduction values using a starting point of one (1) million bacteria or 1,000,000 CFU's on a surface (ie: under bed rails in a hospital), as outlined below:

Log Reduction Number of cfu's Percent Reduction

Log Reduction	Number of cfu's	Percent Reduction
0 log (Log 0)	1,000,000	0%
1 log (Log 1)	100,000	90%
2 log (Log 2)	10,000	99%
3 log (Log 3)	1,000	99.9%
4 log (Log 4)	100	99.99%
5 log (Log 5)	10	99.999%
6 log (Log 6)	1	99.9999%

WHY UNDERSTANDING LOG REDUCTION IS IMPORTANT:

Hospital surfaces can be contaminated with pathogenic organisms (bio-burden), and only achieving a Log Reduction below 6.0 Log means dangerous viruses, bacteria, fungus, and Clostridium difficile (C-diff) spores, can or will be left behind to proliferate and repopulate surfaces within the treated area. The literature has shown that bio-burden can be spread around to contaminate patients and/or grow new bacterial and fungal colonies on new surfaces. (1)

The number of bacterial survivors is very important because they can quickly increase their populations exponentially / logarithmically. For example, Staphylococcus aureus or (S. aureus) (under ideal conditions) doubles in 24-30 minutes (Generation Time, G), this means 1,000 or 10^3 or Log 3, bacterial survivors would increase to 2,000 after 30 minutes, after 60 minutes they would increase to 4,000, and after two hours to 16,000 and then increase to over one million or 1,024,000 after 5 hours or more, if the growing environment is optimal.