Let's Get Growing

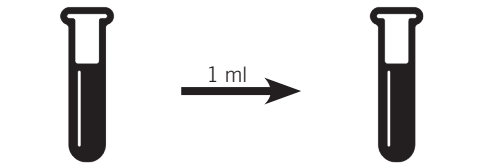
Microbiologics Dilutions Guide

This document outlines how to perform dilutions when using Microbiologics products. **Dilution is the process of making a solution weaker or less concentrated.** In microbiology, serial dilutions (log dilutions) are used to decrease a bacterial concentration to a required concentration for a specific test method, or to a concentration which is easier to count when plated to an agar plate. This document was created to provide a better understanding of dilutions and should be used as a guideline, not a replacement for laboratory procedures.

Log Dilutions

A log dilution is a tenfold dilution, meaning the concentration is decreased by a multiple of ten. To complete a tenfold dilution, the ratio must be 1:10. The 1 represents the amount of sample added. The 10 represents the total size of the final sample. For example, a sample size of 1 ml is added to 9 ml of diluent to equal a total of 10 ml.

Example: 1:10 dilution - if the concentration is 1,000 CFU, a one log dilution will drop the concentration to 100 CFU.



Initial sample
1.0×10^3
(1,000 CFU/ml)

9 ml dilution tube
9 ml + 1 ml = 10 ml
1.0×10^2
(100 CFU/ml)

Decimal Numbers vs Scientific Notation

Decimal numbers can be converted to scientific notations by moving the decimal place the same number of places as the exponential number.

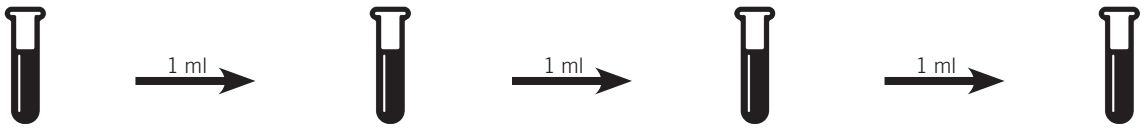
$100.0 = 1.0 \times 10^2$ $\quad$ $1.\overset{\curvearrowright}{0}\,\overset{\curvearrowright}{0} = 100$

$350.0 = 3.5 \times 10^2$ $\quad$ $3.\overset{\curvearrowright}{5}\,\overset{\curvearrowright}{0} = 350$

Decimal Number	1	10	100	1,000	10,000	100,000	1,000,000
Scientific Notation	10^0	10^1	10^2	10^3	10^4	10^5	10^6

Multiple Dilutions

Multiple dilutions are required to decrease the sample concentration by multiple logs. If the concentration is 35,000 CFU/ml (10^4), and 35 CFU/ml is the target concentration, the following serial dilutions can be performed.



Initial sample
3.5×10^4 CFU/ml
(35,000 CFU/ml)

9 ml
3.5×10^3 CFU/ml
(3,500 CFU/ml)

9 ml
3.5×10^2 CFU/ml
(350 CFU/ml)

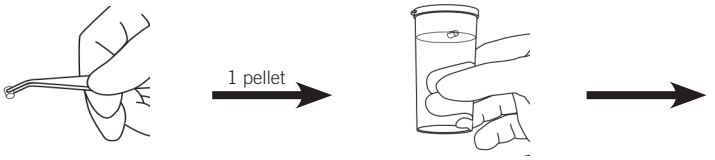
9 ml
3.5×10^1 CFU/ml
(35 CFU/ml)

Larger Dilutions

Decreasing the concentration using fewer dilutions is possible with the use of large volume dilutions. This can be done by performing a 1:100 dilution instead of 1:10. An example of this can be observed in the Epower™ instructions for membrane filtration using Microbiologics E3 Epower™ product.

The E3 Epower™ product provides 10^3 CFU per pellet which equates to 1 pellet in 1 ml equaling 10^3 CFU/ml. Placing a 10^3 Epower™ pellet in 10 ml will drop the concentration to 10^2 – this is a one log dilution.

A 1:100 dilution can be created by placing 1 pellet in 99 ml as instructed in the membrane filtration instructions. This will drop the concentration two logs from 10^3 to 10^1 CFU/ml.



1 pellet
3.5×10^3
(3,500 CFU/ml)

99 ml
3.5×10^1
(35 CFU/ml)

1 ml from the 99 ml solution will provide 35 CFU/ml. 1 ml could be plated to an agar plate or placed in 99 ml of buffer and then filtered.

EZ-CFU™ Dilution Example

When EZ-CFU™ is used according to directions, the following dilutions are conducted to reach a desired concentration of 10-100 CFU/0.1 ml.

1. Two pellets are placed in 2 ml of hydrating fluid = 1,000 - 10,000 CFU/ml.
2. 1:10 dilution is performed by placing 1 ml of the re-hydrated pellet solution into 9 ml of buffer = 100 - 1,000 CFU/ml.
3. 0.1 ml of the organism suspension plated to an agar = 10 - 100 CFU per 0.1 ml.