

## Laboratory Exercise 18: Environmental effects on microbial growth

Each microbial species can tolerate a range of environmental condition that affects microbial enzymes, membranes and other components. You will examine the growth of several bacteria in varying pH, salt, and temperature conditions.

Water is essential to all forms of life. It is not only the principal component of cytoplasm, but also an essential source of electrons and hydrogen ions. Organisms, like plants, require water to maintain cellular turgor pressure. Whereas water in prokaryotes requires it to prevent shrinking of the cell resulting in separation of the membrane from the cell wall, a condition called plasmolysis.

Bacteria constitute a diverse group of organisms that have developed many adaptations for survival. For example, some bacteria halophiles grow optimally in NaCl concentrations 3% or higher. Extreme halophiles are organisms with specialized cell membrane and enzymes that require salt concentrations from 15% up to about 25% and will not survive where salinity is lower. Except for a few osmotolerant bacteria, which will grow over a wide range of salinities, most bacteria live where NaCl concentrations are less than 3%.

### Bacterial Cultures:

*Escherichia coli*

*Staphylococcus aureus*

*Bacillus cereus*

### pH Test Materials:

3 pH 3 tubes

3 pH 7 tubes

3 pH 9 tubes

### Procedure:

#### pH Effects on Microbial Growth

1. Obtain 3 tubes of pH 3, 7, 9. Label them with the organism's name, and group name. Example: pH 3, 7, 9 tubes will be labeled with *E. coli*.
2. Inoculate the pH broths with the test organisms.
3. Incubate tubes at 37°C for 48 hours.

### Second Lab Day:

1. Record the growth you observe as - (no growth), +, ++, +++, and ++++ (lots of growth).

### Bacterial Cultures:

*Escherichia coli*

*Staphylococcus aureus*

*Bacillus cereus*

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