MICROORGANISM GROWTH REQUIREMENTS

To support microorganism growth in the laboratory, it is necessary to establish conditions that will permit organism reproduction. All microorganisms require the following to remain viable and grow on culture media:

Complex Nutrients

Microorganisms utilize nitrogen and carbon through the addition of peptones, beef extract, and yeast extract to culture media. Specific nutritional requirements for different microorganisms vary greatly, but every microorganism requires sources of carbon, nitrogen, inorganic phosphate, sulfur, trace metals, water, and vitamins. These requirements also comprise a satisfactory microbiological culture medium. Buffering agents, indicators of pH change, selective agents, and agar also are added.

Proper pH

A large number of culture media are prepared with a final neutral pH of 7.2 ± 2. The microorganisms that prefer a neutral pH are referred to as neutrophiles, or neutral-loving microorganisms. The bulk of human pathogens fall into this group. Acidophiles, or acid-loving microorganisms, prefer a pH of 0.0–5.4.Yeast and molds are acidophiles. Alkalinophiles, or alkali-loving microorganisms, are viable in a pH of 7.0–11.5. *Vibrio cholerae* is an alkalinophile.

Appropriate Temperature

Mesophilic bacteria and fungi have optimal growth at temperatures of 25–40°C. The vast majority of human pathogens are mesophilic because they prefer body temperature. Thermophilic microorganisms, or heat-loving, grow at temperatures greater than 45°C. *Bacillus stearothermophilus* is an example of a thermophilic microorganism, and can be found in hot spring beds. Psychrophilic microorganisms grow at temperatures below 20°C. *Listeria spp.* are psychrophilic microorganisms, and can be isolated from ice cream and other dairy products.

Gasses

Obligate aerobes require the presence of oxygen to grow, where as anaerobes only grow in the absence of oxygen. Microaerophiles prefer partial anaerobic conditions, and facultative anaerobes are capable of growing in the presence or absence of oxygen. Many microorganisms require an environment of 5–10% CO_2.

Moisture

Appropriate moisture conditions are important for proper microorganism growth. Water must be able to freely flow in and out of cells for the transfer of nutrients and waste products. Evaporation during incubation or storage results in loss of water and a reduction in the number of microorganisms.