Practical Principles of Microbial Physiology // 4th Stage **Lab 3**
Control of Microbial Growth **3 pages**

Methods to Control Microbial Growth

- Physical Methods
- Chemical Methods
- Biological Methods

Effect of temperature on microbial growth

- Temperature probably is a major environmental factor controlling the growth and survival of microorganisms.
- If temperature is too hot or too cold microorganisms will not grow and may even die.
- Bacteria have been discovered living in habitats ranging from -10^{o} C to more than 110^{o} C.

Temperature affects living organisms in two opposing ways:

1. As temperature rises, chemical and enzymatic reactions precede at a faster rate and the growth rate increases.
2. Above a certain temperature, proteins are irreversibly damaged

Each microorganism thus has:

Each microorganism species is characterized by a minimum, maximum, and optimum temperatures collectively known as its **Cardinal Temperatures**.

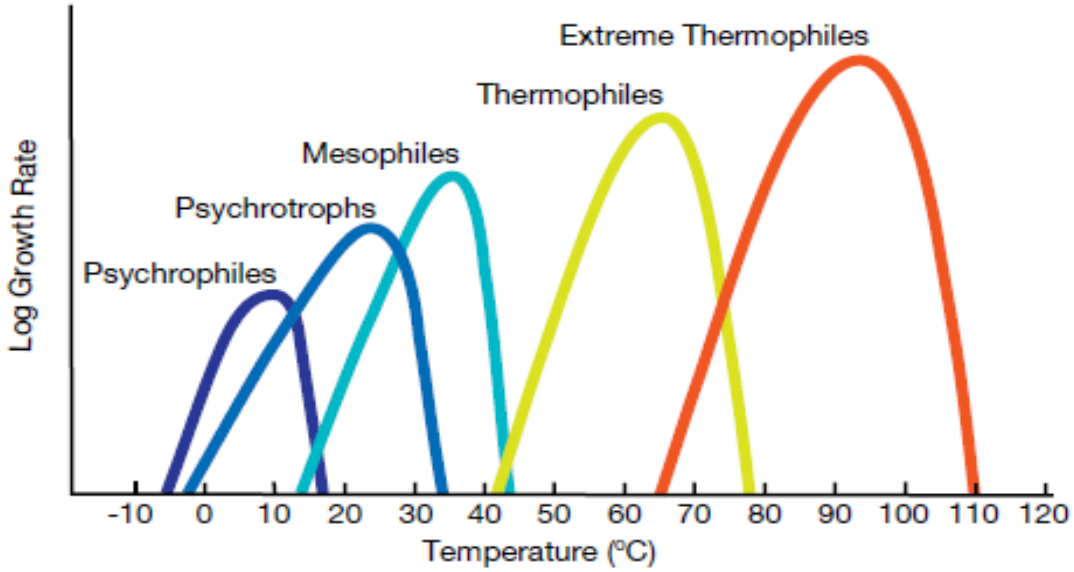
- Minimum Temperature: is lowest temperature at which microbes will grow, or temperature below which no growth occurs.
- Optimum Temperature: Temperature at which its growth rate is the fastest.
- Maximum Temperature: is highest temperature at which microbes will grow, or temperature above which growth is not possible.

At high temperature:

1. Denature enzymes, transport carries, and other proteins.
2. Microbial membranes are also disrupted.
3. The lipid bilayer melts and disintegrates.

Microorganisms are classified into categories based on their optimal growth temperature.

1. Psychrophiles: Optimal growth between (-5) - 20° C, usually found in super cooled water, such as *Flavobacterium* and *Polaromonas vacoulata.*
2. Mesophiles: Optimal growth between 15 - 45° C, most bacteria found in this class for example most pathogens grow between 35 - 40° C.
3. Thermophiles: Optimal growth between 40 - 70° C, found in hot springs and in soil, such as *Bacillus stearothermophilus.*
4. Hyperthermophiles: Optimal growth between 65 - 120° C, found in thermal vent within deep ocean floor and from volcano, such *as Thermococcus celer* and *Thermus aquaticus.*



Thermal classification of microorganisms

Materials

1. Nutrient broth culture of bacteria cultures
   - *Bacterial Sample 1*
   - *Bacterial Sample 2*
   - *Bacterial Sample 3*
   - *Bacterial Sample 4*
2. Nutrient agar plates.
3. Micropipette.
4. Swabs.

Procedure

1. Label each nutrient agar plate with bacterial sample no. and one of the following temperatures (4° C, 25° C, 37° C, 42° C, 60° C).
2. Inoculate each of nutrient agar plate with 0.05 ml of the appropriate microorganisms.
3. Place each nutrient agar plate in one of the five baskets that is labeled according to incubation temperature for 24 - 48 hours.
4. After incubation period, detect the effect of temperature on microbial growth by presence or absence of growth.

Results

Observations and Interpretations

Microorganisms	Temperatures					Classification
	4° C	25° C	37° C	42° C	60° C	
Bacterial sample 1						
Bacterial sample 2						
Bacterial sample 3						
Bacterial sample 4						