LECTURE THREE(THEORETICAL)
MICROBIOLOGY

Bacterial spores

Round or oval structure produce by some bacteria in many species of bacteria spore formation occur under unsuitable condition one spore from bacterial cell wall . Example (bacillus , clostridium).

Endospores: from inside the bacteria cells . The shape and site of the spore different according to the species of bacteria ((**A-** Centrally located **B –** Terminally located **C-** Sub terminally))

The endospores has highly resistance for (*dry , dyes , radiation , temperature and boiling*) because :

1- Low content of water .

2- High content of Dipicolinic acid (DPA).

Sporulation : converting vegetative cell to a spore .

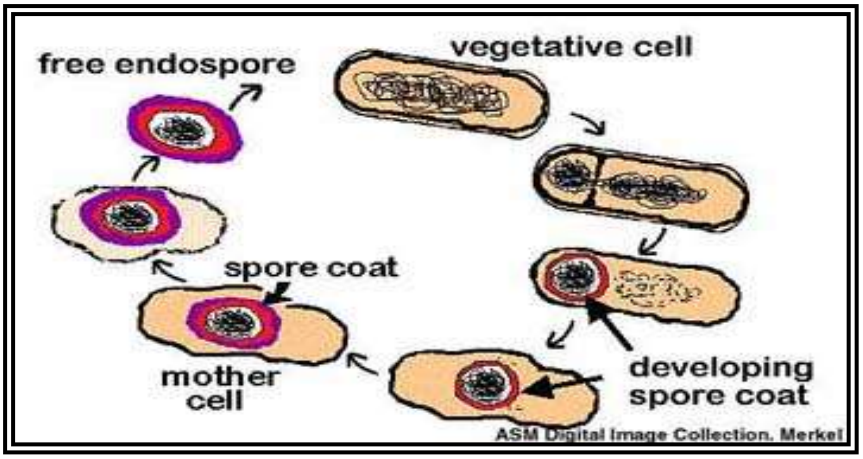
- The process of spore formation
- A copy of the bacterial chromosome is surrounded by a thick, durable spore coat
- This forms an endospore within a vegetative cell
- When the vegetative cell dies and ruptures, the free spore is released

Spore Germination converting a spore to vegetative cell.

- When a spore encounters good growth conditions
- Spore coat ruptures and a new vegetative cell is formed

Resistance of the spore due to :

1. Impermeability of the spore cortex and coat .
2. Low water content .
3. Low metabolic activity .
4. High content of calcium and dipicolinic acid .



((Environmental factors that influence on microbial growth))

1. **1- temperature** :- **Temperature :** the temperature at which an organism grows best called **optimum temperature .** in human parasitic organism the optimum temperature range between 30 – 37 C . There are three groups of bacteria as regards to temperature of growth :
   A. **Psychrophilic bacteria :**grow between 0 – 25 C they are mostly soil and water bacteria .
   B. **Mesophilic bacteria :** grow between 20 – 44 C , include bacteria production disease .
   C. **Thermophilic bacteria :** some organism grow between 50 – 60 C .

2- Gas requirements (oxygen and carbon dioxide): -

1-**Oxygen :** bacteria are classified according to its need to oxygen :

a-**Obligate aerobes :** need oxygen to grow .**e.g.** mycobacterium

b-Obligate anaerobes : can not grow in the presence of oxygen .
.Example: Clostridium
c-Facultative aerobes : can grow in the presence or absence of oxygen.
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D- Microaerophilic :- microorganism cant grow at normal atmospheric tensions of oxygen but requires a small amount of it in metabolism .e.g

Corynebacterium

F- Canophilic :- grow best at a higher co2 tension than normally in the atmosphere.

3- Light:- Darkness is favorable condition for growth of bacteria and direct sun light cause injury and killing of bacteria and another factor sun light such as ultra violet ray (U.V. Rays).

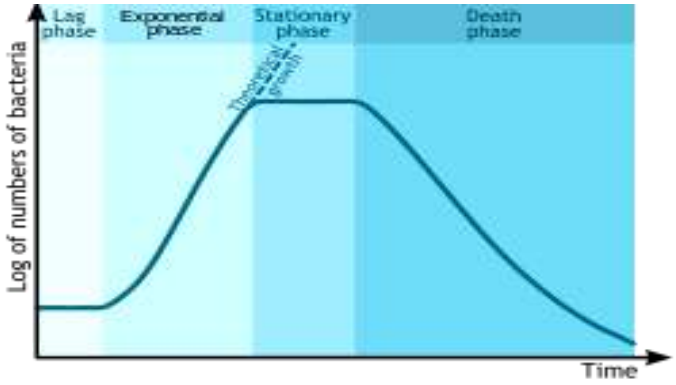
4- moisture :- Bacteria require water for their growth, dehydration may kill most of bacteria because the water is very important for bacterial metabolism .

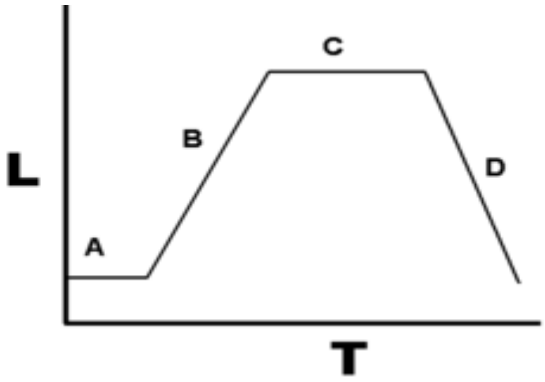
5- Osmotic pressure :- bacteria are usually resistant to change of osmotic pressure but it can't resist to highly concentrated media such as ,Jam, salted meat .

6- Suitable PH:- bacteria vary widely in their tolerance of acidic or alkaline condition ranging from PH 4-9 human pathogens generally prefer PH with in the rang 7.2- 7.6 . but there are exception Vibrio cholera grow best at PH 9.

Bacterial growth

Bacterial growth : is the division of one bacterium into two daughter cells in a process called binary fission.





Bacterial growth curve

1. lag phase:

   - increase the size of bacteria .
   - no multiplication of bacteria .

2. Exponential phase (sometimes called the log phase or the logarithmic phase)

   - Bacteria have high rate of metabolism.
   - Multiplication of cells and increase in the number of bacteria .
   - Bacteria are more sensitive to antibiotics .

3. The stationary phase

   - No change in the number of viable cells .
   - Rate of multiplication = rate of death .

4. Decline phase :

   - Decrease in the number of viable cells until all organism die.