

Preview:

Q1. How do the microbes grow?

Q2. What's the requirement for microbial growth ?

Q3. How to control the growth of microbes?



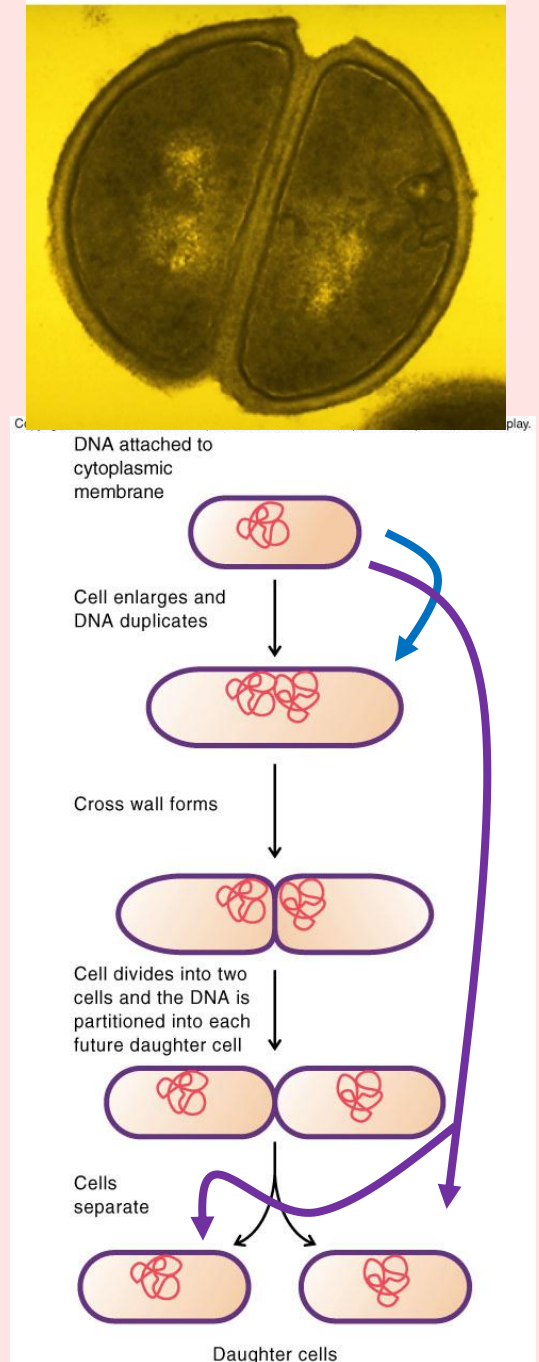
GROWTH AND DIVISION

Bacteria growth:

<http://www.youtube.com/watch?v=gEwzDydcIWc&NR=1>

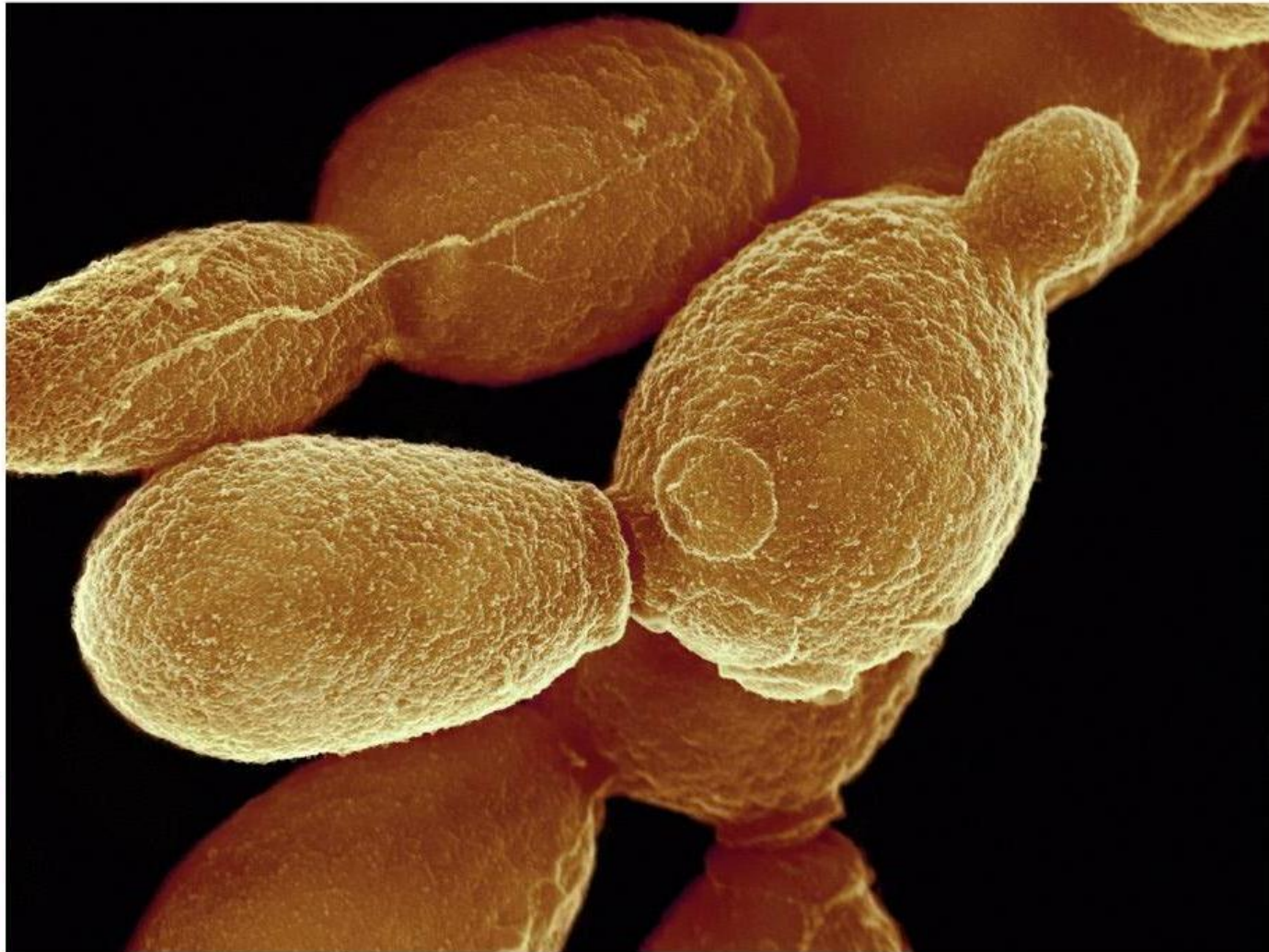
Prokaryotic cells divide by **binary fission**

- One cell divides into two
 - Two into four etc.
- Cell growth is exponential
 - Doubling of population with each cell division
 - Exponential growth has important health consequences
- **Generation time**
 - Time it takes for population to double
 - a.k.a doubling time
 - Varies among species



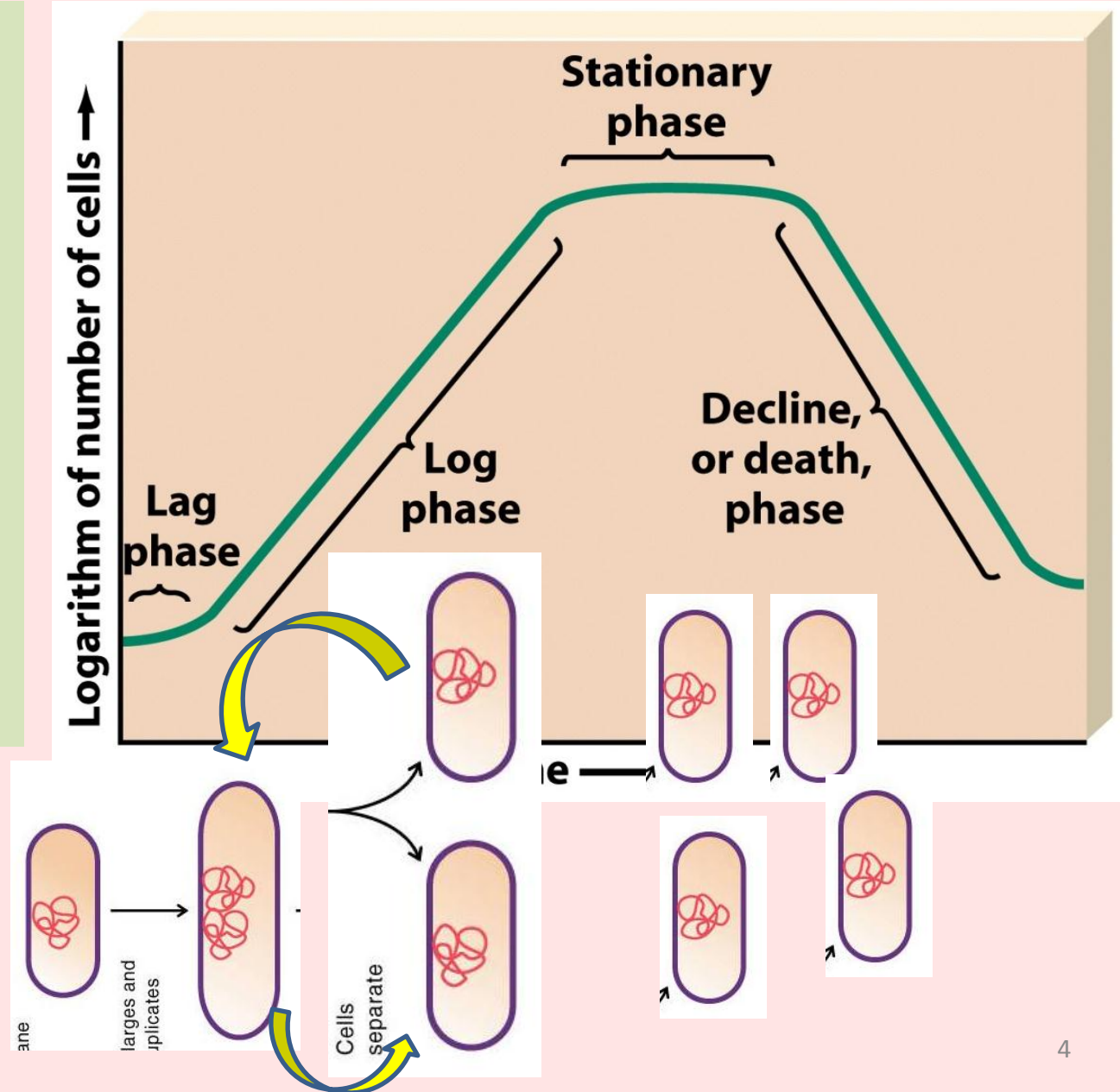
Yeast Cell Division

- Budding: http://www.youtube.com/watch?v=5ruXdbUI_TE&feature=related



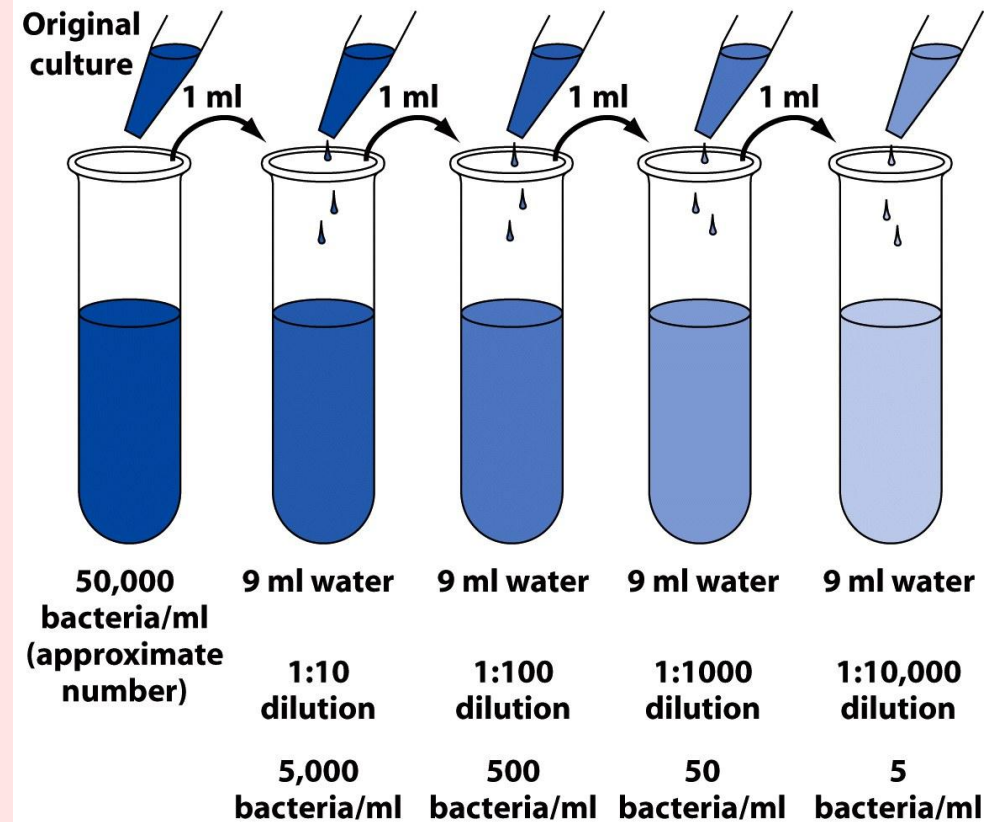
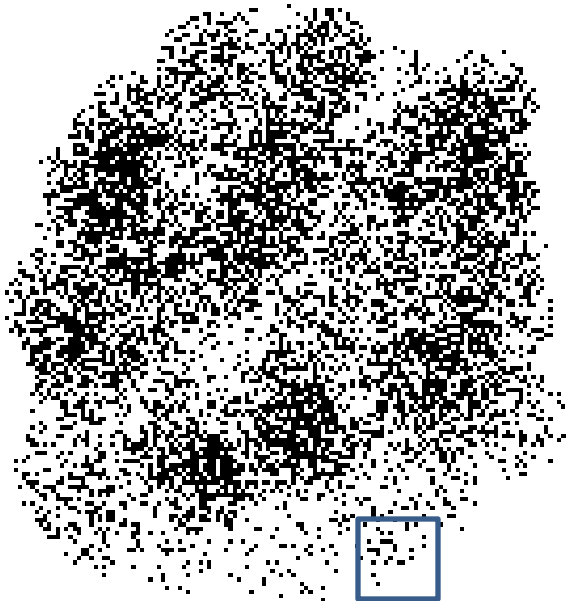
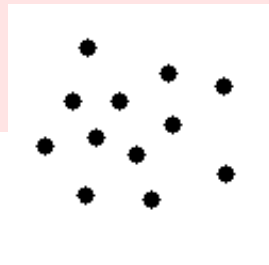
Bacterial Growth Curve

- Lag phase
- Log phase
- Stationary phase
- Decline phase



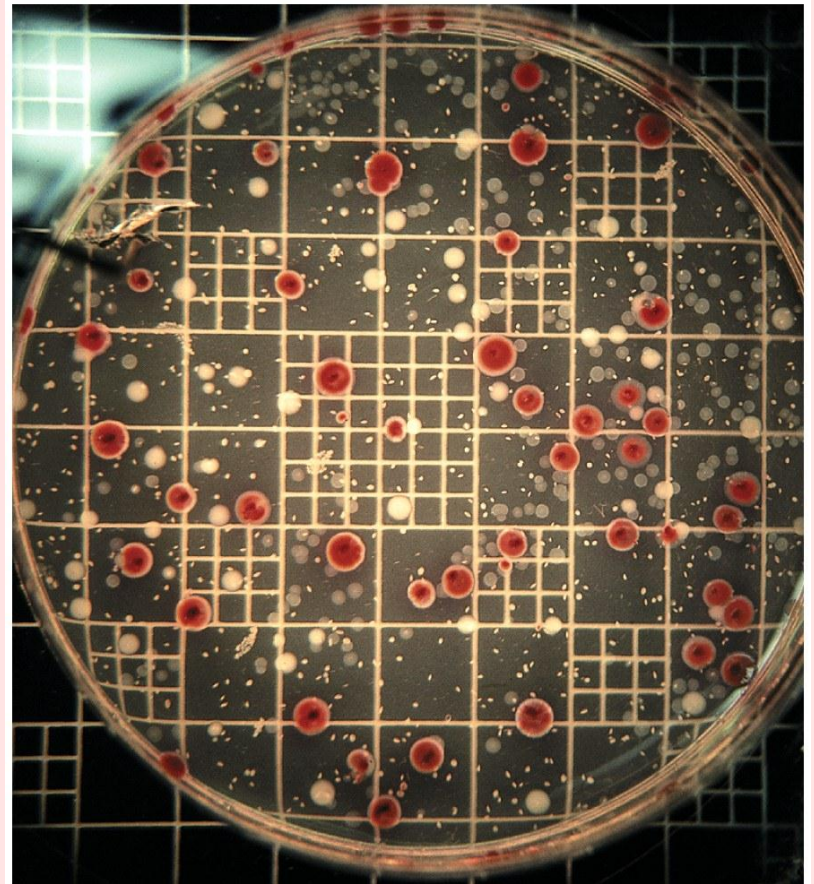
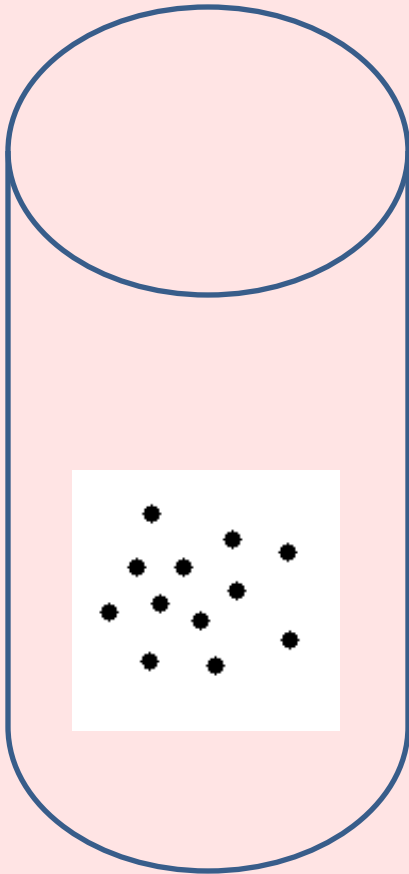
Measuring Bacterial Growth

- Serial dilution/
Standard plate counts



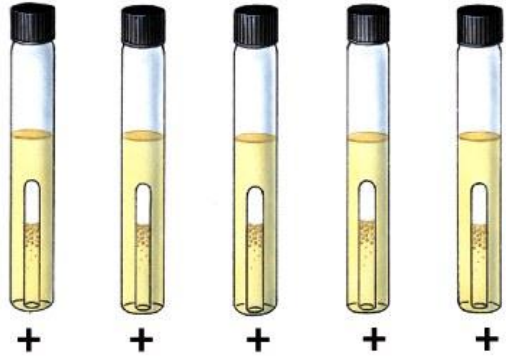
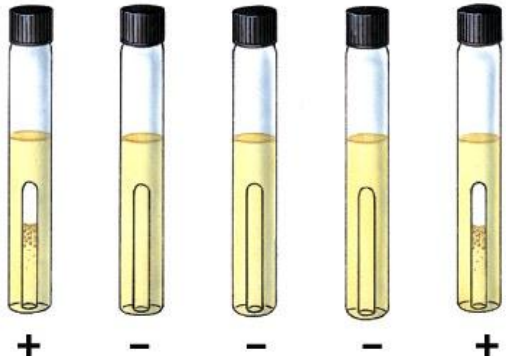
Measuring Bacterial Growth

- Direct microscopic counts



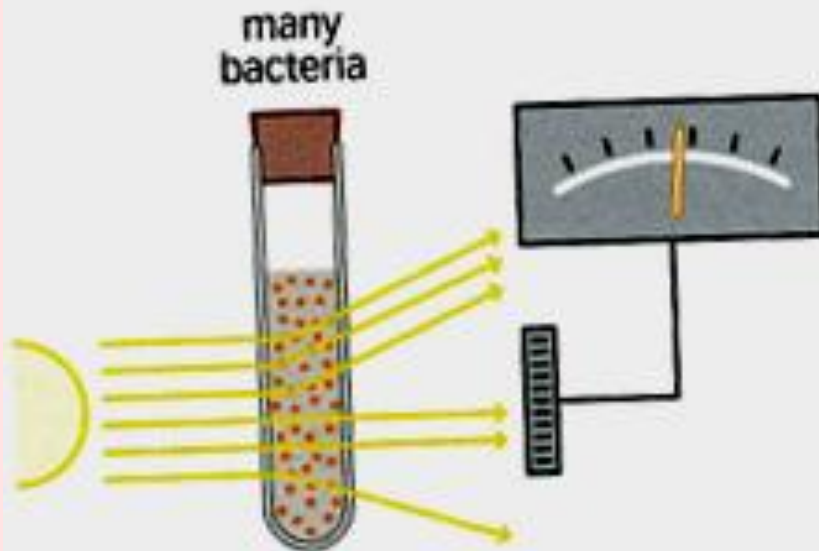
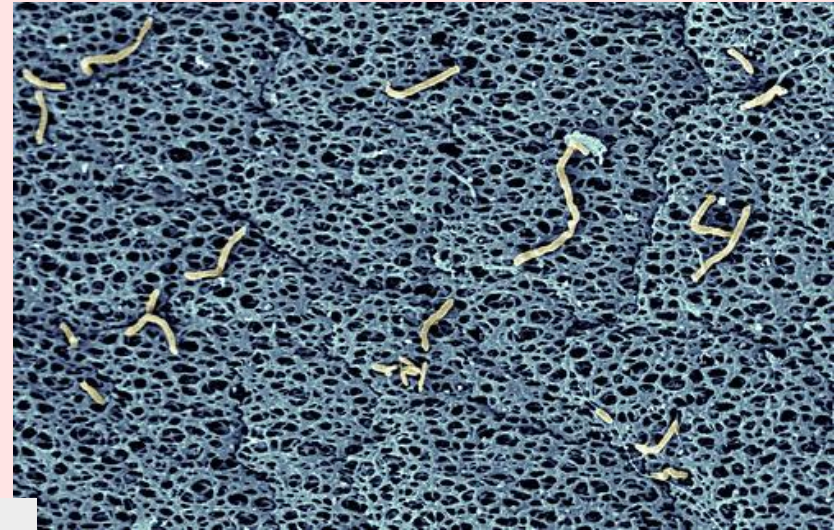
Measuring Bacterial Growth

- Most probable number

Volume of Dilution Added	Culture Results	Number of Positive Tubes
10 ml	 + + + + +	5
1 ml	 + - - - +	2
0.1 ml	 - - - - -	0

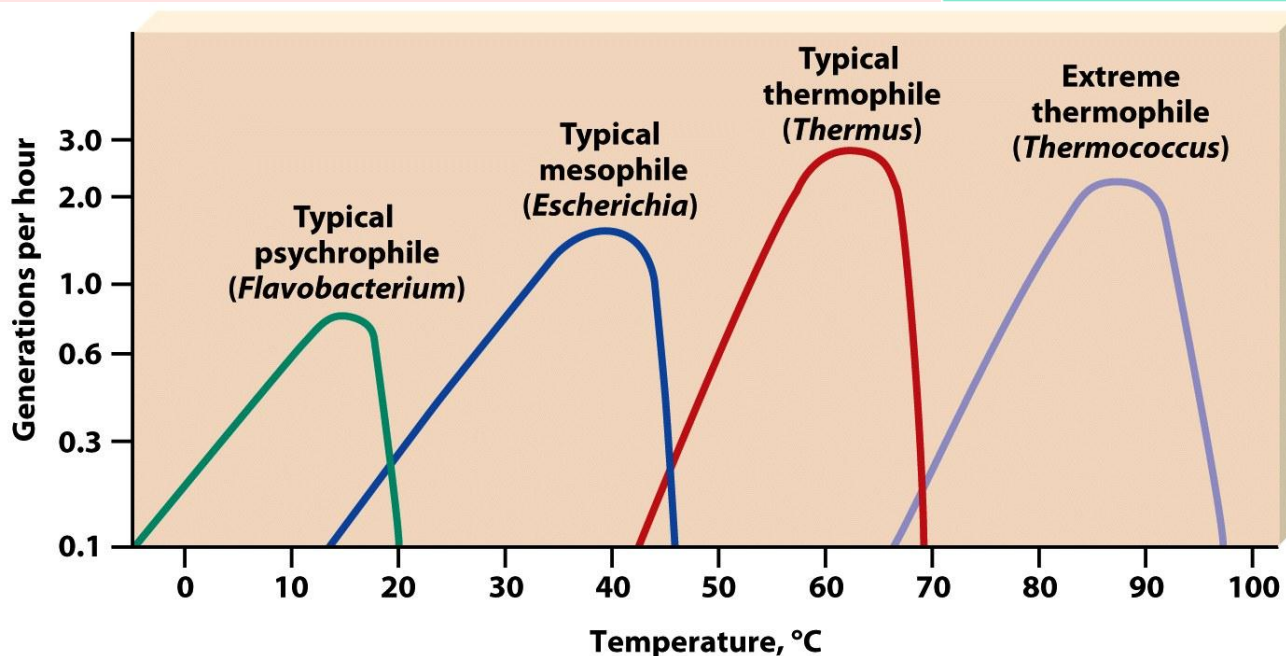
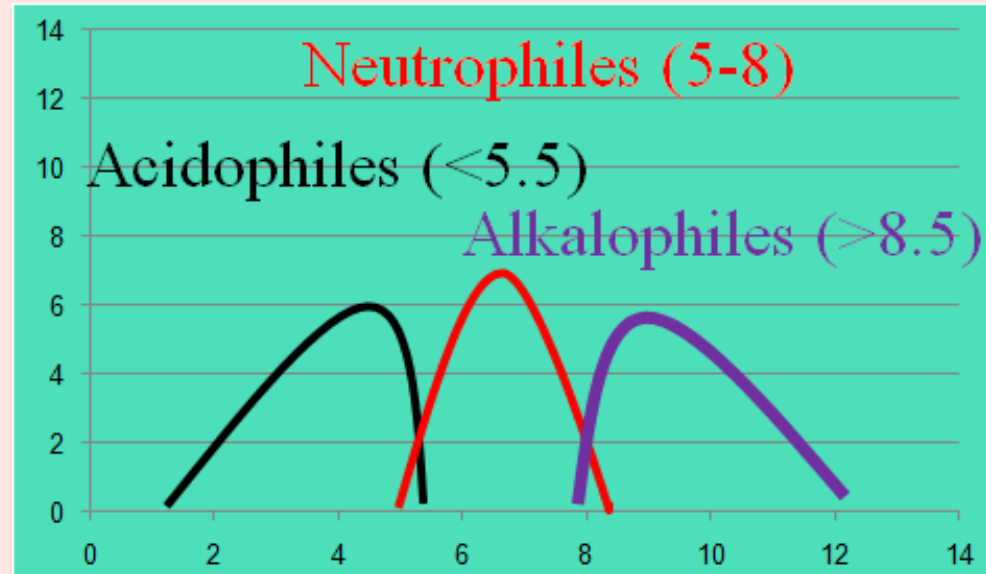
Measuring Bacterial Growth

- Filtration
- Turbidity: **the cloudiness or haziness a fluid caused by suspended articles.** (Spectrophotometric)



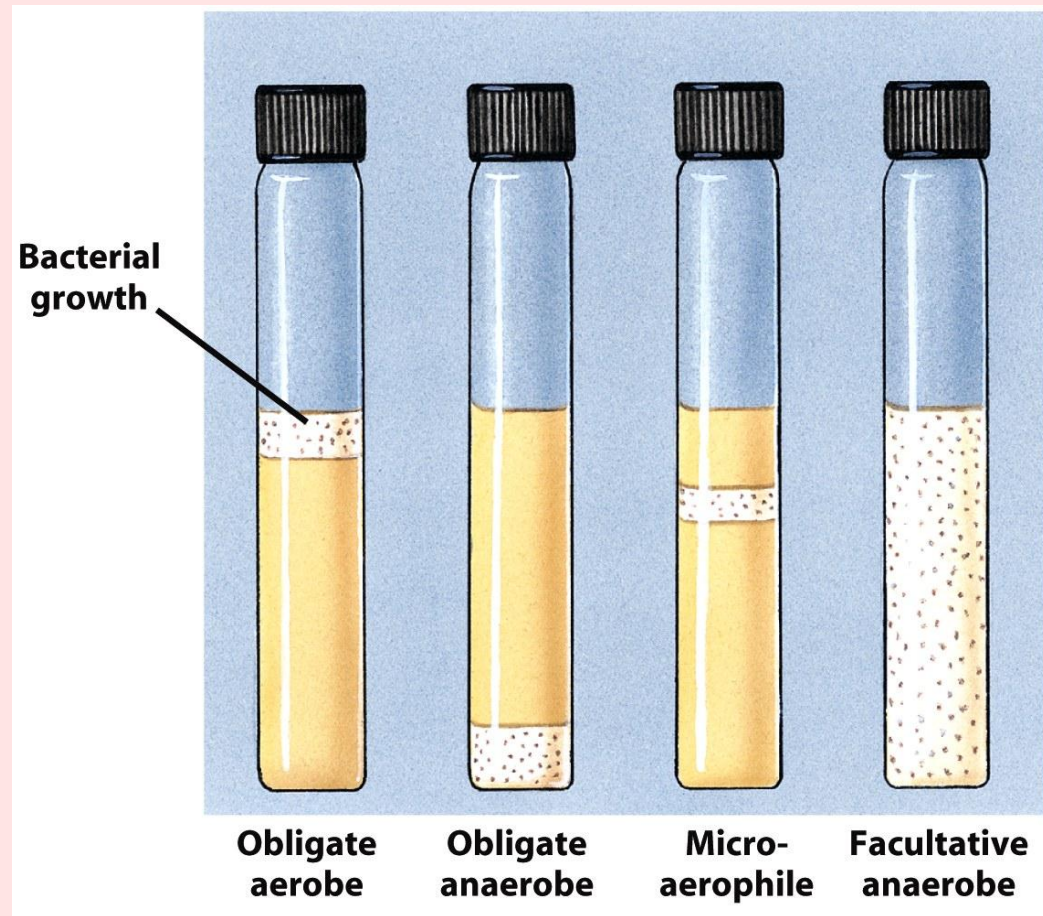
Physical Factors Affecting Bacterial Growth

- pH
- Temperature



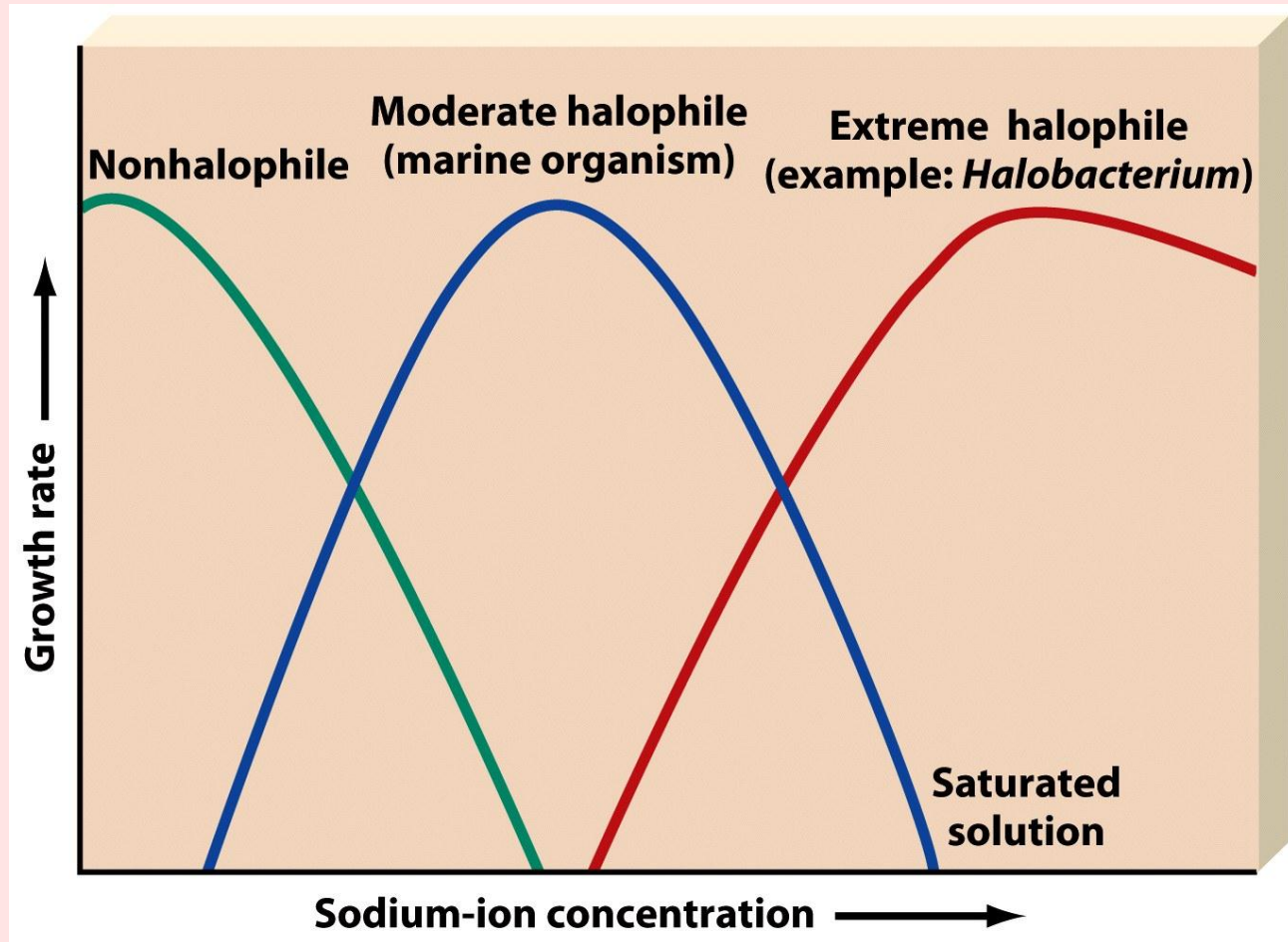
Physical Factors Affecting Bacterial Growth

- Oxygen
- Moisture



Physical Factors Affecting Bacterial Growth

- Hydrostatic pressure
- Osmotic pressure
- Radiation

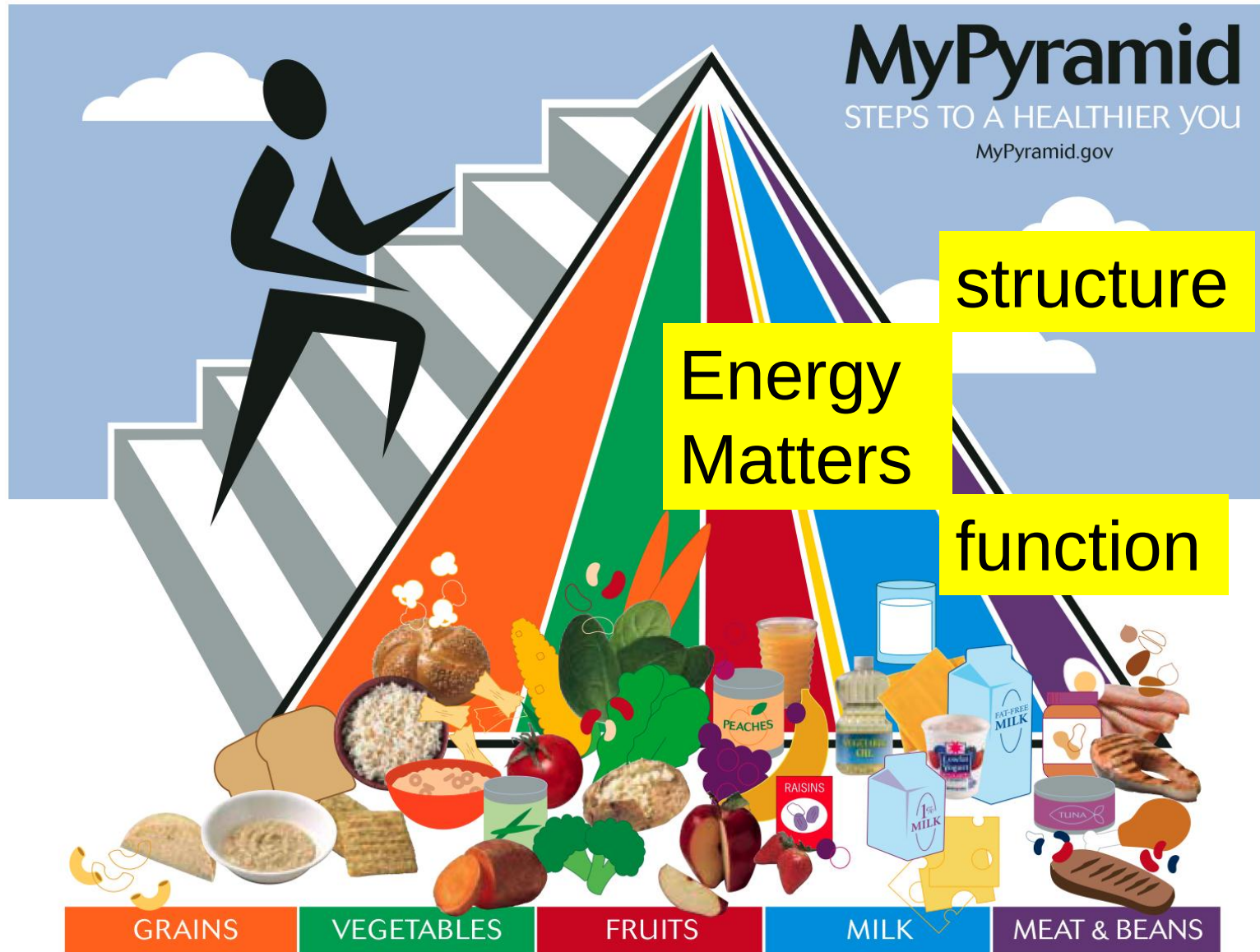


Q: About halophile, psychrophile, mesophile and thermophile :

- A. They are all extremophile**
- B. They are organisms thriving in salty, low, high and moderate temperature respectively**
- C. They are organisms thriving in salty, low, moderate and high temperature respectively**
- D. They are organisms thriving in salty, moderate, low and high temperature respectively**

Nutritional Factors Affecting Bacterial Growth

- Carbon
- H₂
- A₂
- Essential
- Trace el
mangan
- Growth
- Nutritio
for the



Locations of Enzymes

- Extracellular
- Periplasmic
- Cytoplasmic

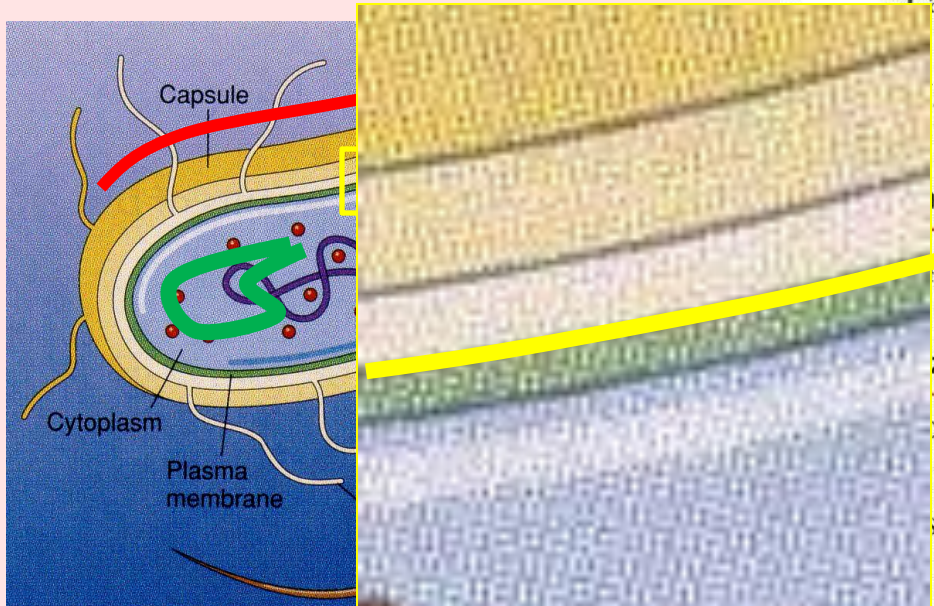
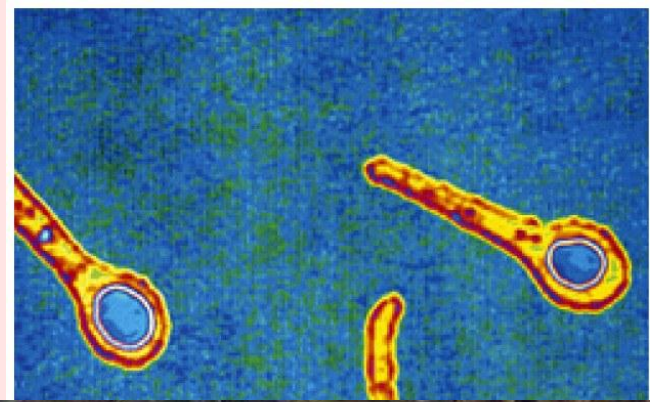


TABLE 6.2

Examples of Exoenzymes

Enzyme	Action
Enzymes That Act on Complex Carbohydrates	
Carbohydrases	Break down large carbohydrate molecules into smaller ones
Amylase	Breaks down starch to maltose
Cellulase	Breaks down cellulose to cellobiose
Enzymes That Act on Sugars	
Sucrase	Breaks down sucrose to glucose and fructose
Lactase	Breaks down lactose to glucose and galactose
Maltase	Breaks down maltose to two glucose molecules
Enzymes That Act on Lipids	
Lipase	Breaks down fats to glycerol and fatty acids
Enzymes That Act on Proteins	
Proteases	Break down proteins to peptides and amino acids
Caseinase	Breaks down milk protein to amino acids and peptides
Gelatinase	Breaks down gelatin to amino acids and peptides

Sporulation: the process to form spores or endospores.



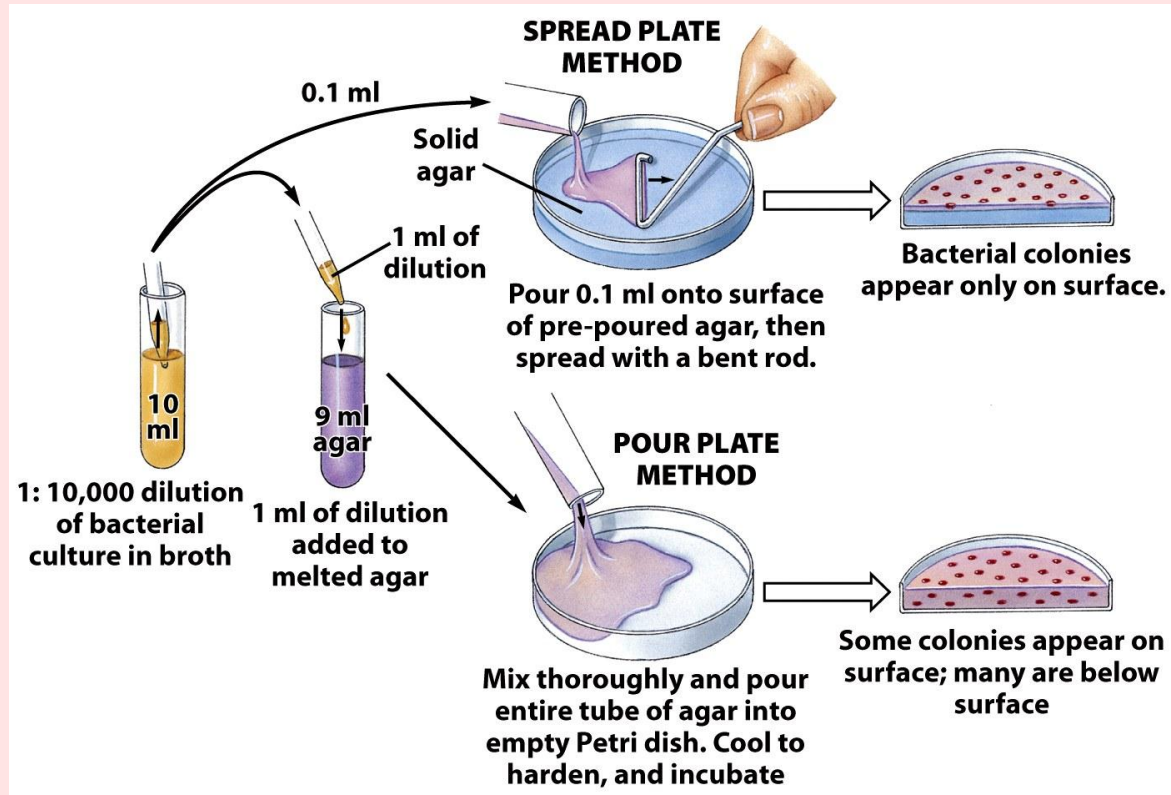
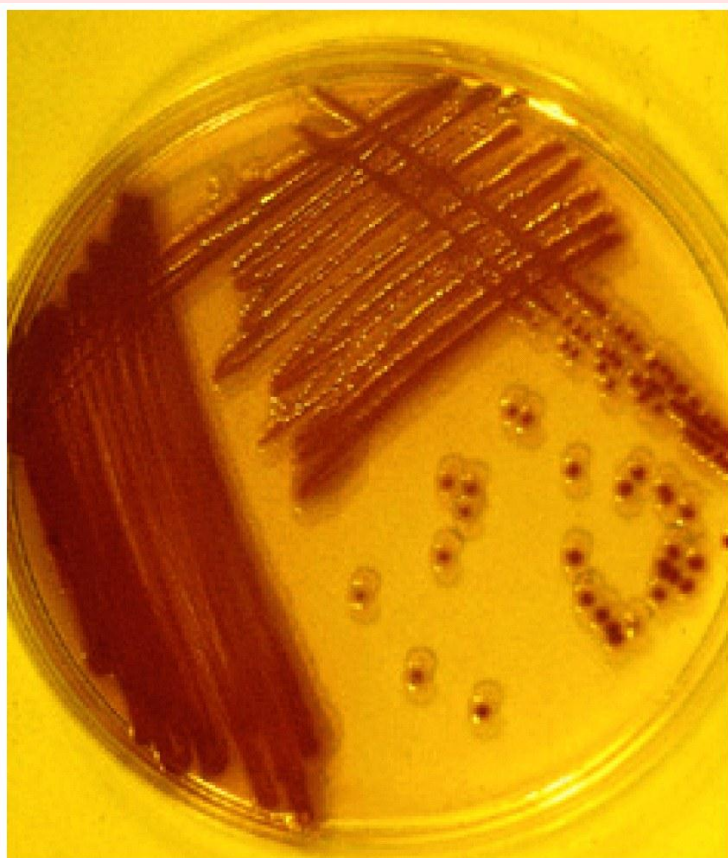
- Endospores
- Other sporelike bacterial structures



Morchella elata

Culturing Bacteria —

- Plate Streaking: for separation and pure culture



- Plate spreading: for colony growth and/or
 - colony counting

Culture Media Purposes

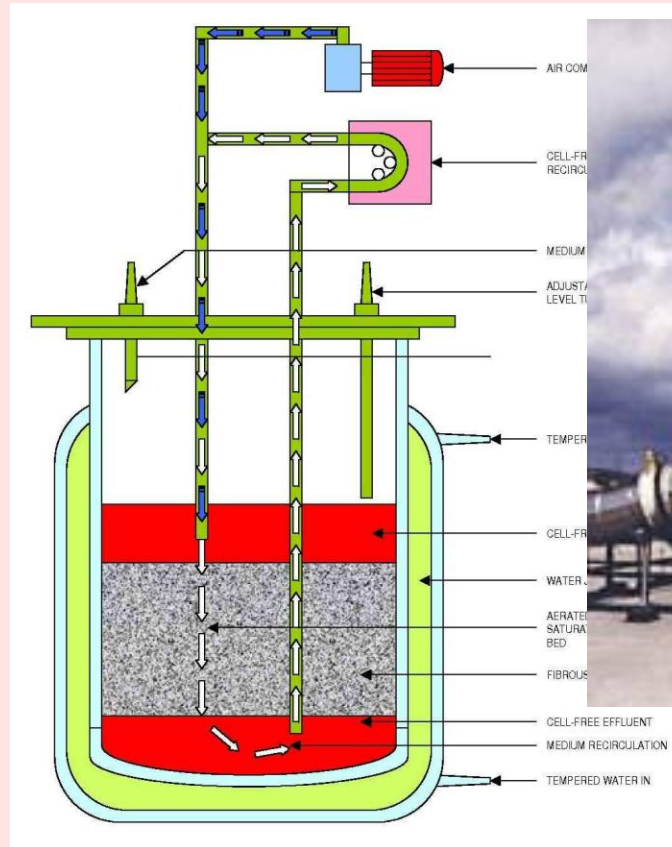
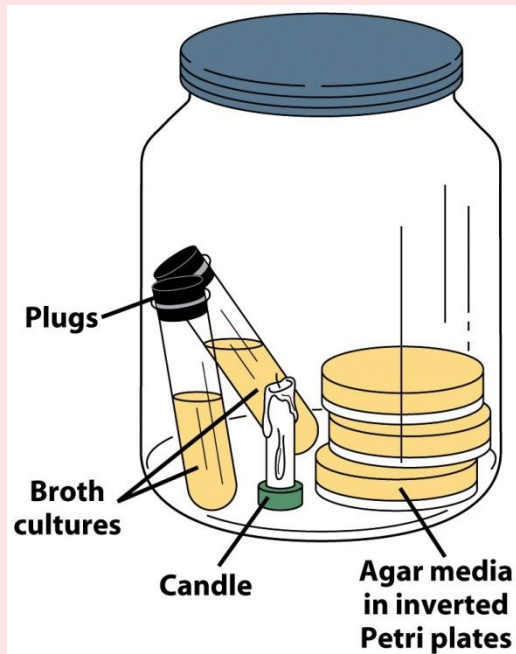
- Selective media
 - Limit/provide special factors to allow certain microbe grow only
- Differential media
 - (*indicator media*) to distinguish one microorganism type from another growing on the same media
- Enrichment media
 - media contain the nutrients required to support the growth of a wide variety of organisms, including some of the more fastidious ones.



Culture Conditions — O₂

- Controlling oxygen content

bioreactor



Culture conditions

- Maintaining cultures
- Preserved cultures
- Diagnostic tests
- Limitations: the majority of microbes can't be cultured



Review:

Q1. How do the microbes grow? **Enlarge & division**

Q2. What's the requirement for microbial

Nutrients and physical elements, O_2 , Temp, H_2O etc.

Q3. How to adjust growth? **Adjust nutrients and physical elements, O_2 , Temp, H_2O etc.**

