Microbial Nutrition

Chapter 6

I. Microbial Nutrition
  A. Essential nutrients
    1. macronutrients
    2. micronutrients = trace elements
  B. C & E sources
    1. carbon source
      a. heterotrophs
      b. autotrophs
    2. energy source
      a. phototrophs
      b. chemotrophs
    3. combine terms
      a. lithoautotrophs

II. Movement Across Membrane
  A. Passive
    1. simple diffusion
    2. facilitated diffusion
    3. osmosis
      a. aqua porin
      b. osmotic solutions
        a)isotonic, hypotonic, hypertonic
  B. Active processes
    1. active transport
    2. group translocation
  C. Endocytosis
    1. pinocytosis
    2. phagocytosis

III. Environmental Factors
  A. Temperature
    1. range
      a. optimum growth temperature
    2. groups
      a. psychrophils
      b. psychrotolerant
      c. mesophiles
      d. thermophiles
      e. extreme thermophiles
  B. pH
      a. neutrophiles
      b. acidophiles
      c. alkalinophiles
  C. Osmotic pressure
        1)plasmolysis
      a. halophiles
      b. extreme halophiles
      c. facultative halophiles
  D. Oxygen
    1. obligate aerobes
    2. obligate anaerobes
    3. facultative anaerobes
    4. microaerophiles
    5. aerotolerant anaerobes

E. Carbon dioxide
1. capnophiles - grow best at ↑ CO_2

IV. Relationships
A. Microbial antagonism
B. Symbiosis
1. commensalism
2. mutualism
3. parasitism

V. Biofilms
A. quorum sensing
B. Advantages

VI. Bacterial Growth
A. Bacterial division
1. binary fission
a. logarithmic / exponential
2. microbial growth
B. Generation time or doubling time
C. Phases of growth
1. closed system
a. growth curve
1)lag phase
2)log phase
3)stationary phase
4)death phase
b. colony growth
2. continuous culture

VII. Measurement
A. Direct cell count
1. spread plate counts
1)colony forming units
2. filtration
3. direct cell count
B. Indirect
a. turbidity
b. metabolic activity
c. dry wt.