Microbiology (Bio 206) #6: Bacterial Growth and Nutrition

Terms you should know:

- nutrition
- carbon source
- reactive oxygen species
- catalase
- superoxide dismutase
- obligate aerobic
- facultative anaerobe
- obligate anaerobe
- microaerophile
- aerotolerant anaerobe
- trace elements
- minimal medium
- rich medium
- growth factors

Questions you should be able to answer:

- What are the major elements bacteria need to grow?
- How do bacteria protect themselves against the toxicity of oxygen?
- How can bacteria be classified according to their oxygen requirements?
- What is the difference between rich and minimal medium?
- Why is the minimal medium different for different kinds of bacteria?

Lecture outline:

I. Transport across the cell membrane (see previous outline)

II. Bacterial nutrition

  A. Carbon and energy
  
  B. Oxygen
   
   1. Defenses against reactive oxygen species: catalase, peroxidase, superoxide dismutase
   2. Obligate aerobes
   3. Obligate anaerobes
   4. Facultative anaerobes
   5. Microaerophiles
   6. Aerotolerant anaerobes

C. Nitrogen
   
   1. Nitrogen fixation from the atmosphere
   2. Nitrate or ammonia

D. Sulfur and phosphorous

E. Trace elements: K, Mg, Ca, Fe, Mn, Cu, Zn, Mb, Co

F. Growth factors
   
   1. Minimal medium
   2. Rich medium

Problem of the day: Bacteria multiply by dividing (try that in math class!) so that one cell becomes two. Some bacteria can divide as often as once every 20 minutes! Suppose a bacterial cell weighs $5 \times 10^{-18}$ grams (that’s 0.0000000000005 grams!), divides every 20 minutes and never runs out of nutrients. How long will it take before the weight of all the bacteria is equal to the mass (weight) of the earth??