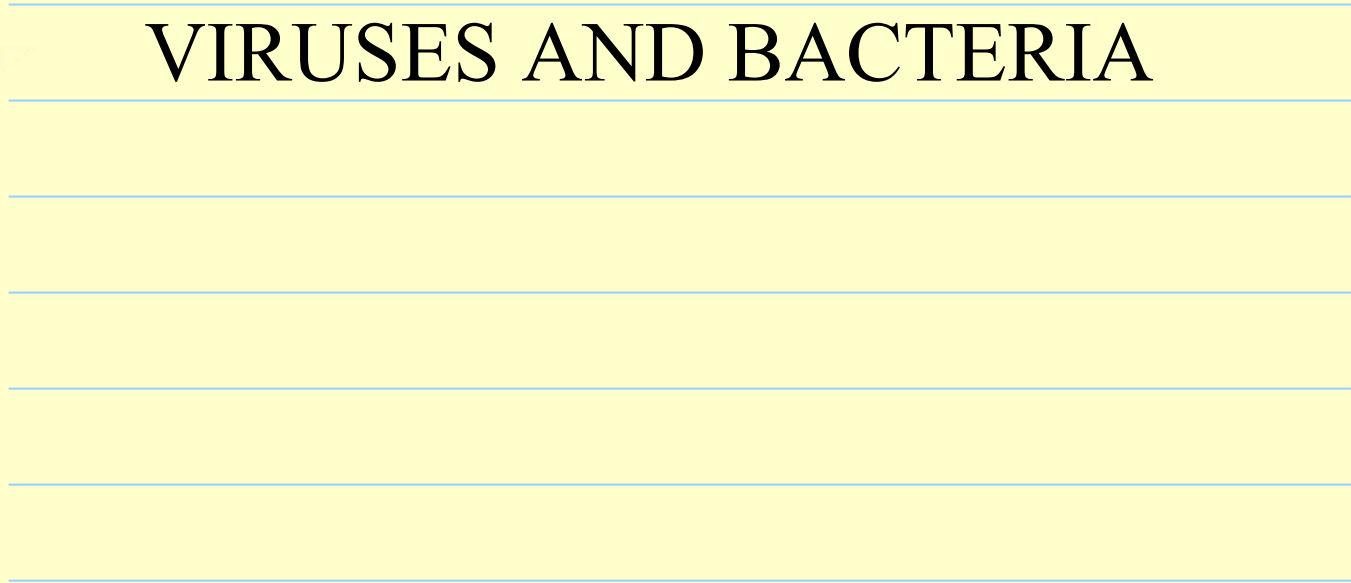


# MICROBIOLOGY



VIRUSES AND BACTERIA





# VIRUSES

- ◆ “POISONOUS FLUID”
- ◆ no nucleus
- ◆ no cytoplasm
- ◆ no cell structures
- ◆ no cell membrane
- ◆ extremely small; can’t be seen with a light microscope; only with an electron microscope




# Viruses Cont.

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- ◆ Some retroviruses cause cancer
  - ◆ They convert or transform normal cells to tumor cells (tumor viruses)
- ◆ Plant viruses
  - ◆ More than 400 viruses that can cause more than 1000 plant diseases



# Size and Shape

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- ◆ Various shapes and sizes
  - ◆ typical shape consists of a head, collar, core, and end plate
    - ◆ head: contains a protein coat (capsid) and nuclear material (either DNA or RNA)
  - ◆ typical size = 15nm to 200nm
    - ◆ smaller than most cells



# REPRODUCTION

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- ◆ Needs to be injected into a cell to multiply
  - ◆ acts like a parasite; but not for food
  - ◆ atypical reproduction (not sexual or asexual)
- 
- ◆ LYTIC CYCLE OR LYSOGENIC CYCLE



# CLASSIFICATION

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- ◆ VIRUSES ARE NOT ALIVE
  - ◆ THEY DO NOT FIT INTO A KINGDOM
  - ◆ THEY ARE GROUPED ACCORDING TO SIZE, TYPE, SHAPE

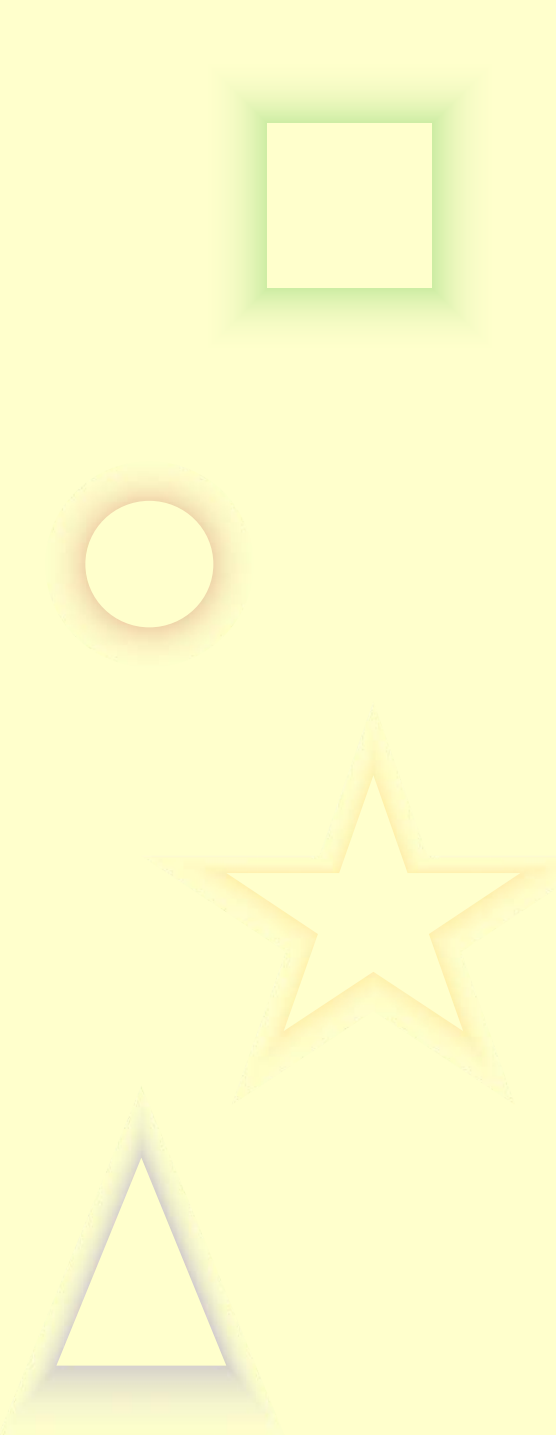


# BACTERIA

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- ◆ Oldest living form discovered around 3.5 billion years ago
- ◆ placed in the Kingdom Monera
  - ◆ unicellular prokaryotes
- ◆ there are over 5,000 species that have been identified





# 4 classes within the phylum Schizophyta

- ◆ Rickettsia: rod shaped or spherical; usually nonmotile parasites; cause damage to humans (Typhus fever); insect transferred
- ◆ Spirochetes: cylindrical; motile (rotation/flexing); many cause human disease (syphilis)
- ◆ Actinomycota: rod shaped with branched filaments; live in soils; aerobic and anaerobic; decomposers; can be harmful (tuberculosis and leprosy); or can be helpful (nasal passage, intestines)
- ◆ Eubacteria: true bacteria, most common



# STRUCTURE

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- ◆ Typical structure contains:
  - ◆ flagellum (movement)
  - ◆ capsule (protection)
  - ◆ cell wall (all bacteria)
  - ◆ ribosomes (protein synthesis)
  - ◆ plastid (contains genes)
  - ◆ nuclear area (DNA)
  - ◆ cell membrane



# NUTRITION

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- ◆ Most bacteria are heterotrophic: they use organic food or compounds from other organisms
  - ◆ saprophytic: eat dead organisms
- ◆ some are symbiotic or parasitic or mutualistic
- ◆ some bacteria are autotrophic: make food
- ◆ others are chemosynthetic: oxidize inorganic substances

# Terms to know

- ◆ Heterotrophs:
  - ◆ energy from organic matter
- ◆ Saprophytes:
  - ◆ live on dead material
- ◆ Independent Heterotrophs:
  - ◆ can live on live or dead organisms
- ◆ Dependent Heterotrophs:
  - ◆ must have food provided by living cells
- ◆ Autotrophs:
  - ◆ energy from inorganic compounds
- ◆ Photosynthetic autotrophs:
  - ◆ energy from the sun
- ◆ Chemoautotrophs:
  - ◆ energy from inorganics
- ◆ Mutualism:
  - ◆ both partners benefit
- ◆ Commensulism:
  - ◆ neither benefit or harm
- ◆ Parasitism:
  - ◆ one member benefits while the other is harmed





# Aerobic Respiration

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- ◆ Glucose being converted to energy in the presence of oxygen
- ◆ obligate aerobes: require oxygen
  - ◆ found in water, soil



# ANAEROBIC RESPIRATION

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- ◆ NO oxygen required
- ◆ obligate anaerobes: have to have no oxygen present
  - ◆ example: Tetanus



# FACULTATIVE BACTERIA

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- ◆ CAN EITHER LIVE WITH OR WITHOUT OXYGEN
- ◆ EXAMPLE: E. COLI



# REPRODUCTION & GROWTH

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- ◆ **BINARY FISSION:** splitting in  
two
- ◆ **REPRODUCTIVE SPORES**
  - ◆ **BUDDING**



# SHAPES OF BACTERIA

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◆ Bacillus - rod shaped

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◆ Coccus - spherical shaped

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◆ Spirillum - spiral shaped

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# Cynobacteria- blue green bacteria

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- ◆ Contain chlorophyll and can carry out photosynthesis
- ◆ At one time they were thought to be algae
- ◆ prokaryotic and very small



# Importance of Monerans

- ◆ Nitrogen fixation:

- ◆ bacteria that live on roots of plants

- ◆ nitrogen gas  $\Rightarrow$   $\text{NH}_4$   $\Rightarrow$  nitrates  $\Rightarrow$  plant amino acids

- ◆ amino acids  $\Rightarrow$   $\text{NH}_4$   $\Rightarrow$  nitrates in plants  $\Rightarrow$  plant a.a.

- ◆ Food production:

- ◆ dairy products: buttermilk, cottage cheese, yogurt, cheese

- ◆ vinegar



# Importance of Monerans cont.

## ◆ Food spoilage:

- ◆ bacteria cause food to spoil
- ◆ low temperatures slows down the process
- ◆ freezing stops it
- ◆ high temperatures kill most bacteria
  - ◆ exception: *Clostridium botulinum*
    - ◆ anaerobic and basic environment
    - ◆ extremely deadly
- ◆ drying - decreases moisture; kills bacteria
- ◆ salting (brining): kills bacteria
- ◆ Pasteurization: slow heating
- ◆ Radiation
- ◆ Alcohol