

## Microbial Interactions

### Symbioses

Symbiotic Relationships	<u>Organism A</u>	<u>Organism B</u>
• commensalism		0
• <b>mutualism</b>		
• Antagonisms		
• parasitism	+	
• predation		-

### Commensalism

- one organism benefits, other unaffected
- example - Intestinal tract
  - facultative anaerobes consume available oxygen producing ideal environment for strict anaerobes to grow
  - presence or absence of strict anaerobes irrelevant to facultative anaerobes

### Mutualism

- both benefit
- 1) between bacteria – bacterial communities
  - metabolism by one species produces nutrients or enzymes used by second species and vice-versa
  - biofilms –
- 2) lichens - fungus + cyanobacterium
  - cyanobacterium makes oxygen and carbs
  - fungus absorbs water and minerals
  - 3 main types – crustose, fruiticose, foliose
- 3) endosymbionts
  - a) zooxanthellae and zoochlorellae
    - live inside reef building corals, anemones, hydra (\_\_\_\_\_), certain clams and sponges
  - What do the algae get?
  - What do the hosts get?
  - b) gut microbes
    - “digestive tract” flora of all mammals and some insects
    - herbivores and ruminants
      - cows, horses, termites
      - flora (\_\_\_\_\_) break down cellulose releasing carbs

- flora themselves are consumed - provides proteins and amino acids
- gut flora produce vitamins and compete with pathogens
- 4) Biofilms
  - in nature most bacteria grow in biofilms or aggregates not free floating cultures as in lab
  - bacteria, algae form slime layers on natural and artificial substrates
  - environment of biofilm relatively stable compared to “free floating” environment
  - “film” can protect bacteria from toxic chemicals (\_\_\_\_\_)
  - most familiar biofilm -
- 5) Plant Mutualisms
  - N fixation (\_\_\_\_\_)
  - bacteria (\_\_\_\_\_) infect roots, nodules form
    - Rhizobium lose cell walls →
    - What do plants get?
    - What do bacteria get?
- Antagonism Among Bacteria and Fungi
  - competition -
  - fungi produce antibiotics that inhibit bacteria
    - some bacteria produce bacteriocins - proteins that act against closely related species or strains
    - *Bdellovibrio* preys upon and parasitizes other bacteria
- Animal Parasites (many)
  - Rickettsias and Chlamydias
    - all but one must be cultured in tissue culture
  - Rickettsia - Rocky Mountain Spotted fever
    - Chlamydia - *C. psittaci* - psittacosis in birds, pneumonia in humans
    - *C. trachomatis* - blindness (\_\_\_\_\_)
    - STD -

### Study Objectives

1. Describe the symbiotic relationships: commensalism and mutualism? Give an example of each.
2. Describe how endosymbionts benefit their hosts and give an example. What do the endosymbionts get in return?
3. How do biofilms aid the proliferation of bacteria?
4. How do N-fixing bacteria and plants benefit each other?
5. Give examples of antagonism between bacteria and fungi?