Protists

Chapter 20

Domain: Eukarya

- Protists are single cell organisms like bacteria and archaea.
  - But they are EUKARYOTIC organisms.
- Classifications are still difficult due to the huge variations of traits in Protista.

“Kingdom” Protista

- Protists are “any eukaryote that is not a plant, animal or fungus.”
  - Most are single cells, or colonies of a single cell type...

“Kingdom” Protista

- Most protists reproduce by simple cell division (mitosis)
- Some protists also exchange genetic material across cytoplasmic bridges

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- Diatoms!
  - Key feature: encased in silica (glass) shells
  - A key type of phytoplankton
    - Important primary producers in aquatic ecosystems
      - Phytoplankton is responsible for >50% of all primary production on earth!
  - One coastal species, Pseudonitzschia, produces domoic acid (a toxin)
    - Filter-feeders concentrate toxin, making them toxic to their predators and animals higher on food web.

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- Dinoflagellates
  - Key feature: two whip-like flagella
  - Some are phytoplanton
  - Some are mutualistic symbionts within marine organisms
  - Some cause toxic blooms that kill fish and poison seafood.
“Kingdom” Protista

- Dinoflagellates (cont.)
  - Some cause red tides
  - Some red-tide causing dinoflagellates are highly toxic
  - Like the diatom *Pseudonitzschia*, render filter-feeders toxic to vertebrates.
  - Increased temperatures increase the chances of red tides and their harmful impacts.
  - People used to avoid seafood in June, July and August.

- Apicomplexans (sporozoans)
  - Parasitic; form infectious “spores”
  - Example: *Plasmodium*
    - Malaria is becoming resistant to traditional medications.

Malaria life cycle

- *Plasmodium* Gametocytes develop into gametes and unite in mosquito (*sexual reproduction*)
  - Larvae develop
  - *Plasmodium* larvae injected into humans via mosquito saliva
  - Larvae reproduce asexually in humans → “spores”
    - One spore → millions of spores
    - Causes bursting of liver and red blood cells
    - Some gametocytes produced
  - Mosquito gain gametocytes by biting a host

Paramecium

- **Contractile vacuole:** control of water balance
  - kidney-like

- Oral groove and food vacuole:
  - food intake, digestion

- Ciliates
  - Possess many cilia (short, hairlike outgrowths) used for movement
  - Example: *Paramecium*
    - Note how it carries out key functions of an animal, even though it is not one!

- Ciliates
  - Some ciliates prey on other ciliates!
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• Slime molds
  ❖ Key decomposers
  ❖ Dry conditions/lack of food → development of “fruiting bodies” that produce spores
    ➢ Spores disperse; some will end up in favorable conditions

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• Euglenoids
  • Example: Euglena
    ❖ No cell wall;
    ❖ highly motile
  • Has plant & animal characteristics.

euglenoids

• Use flagellum for movement
• Many are photosynthetic
  ❖ Note chloroplasts
• Notice “eyespot” for detecting light direction

Zooflagellates

• Zoo- => animal like
• Flagellum used for propulsion and/or food capture
  ❖ Giardia:
    ➢ causes intestinal disorders
    ➢ Found in unfiltered freshwater
    ➢ Affects 2.5 million people each year in the US

Trypanosoma

• Causes African sleeping sickness
  ❖ Transmitted by tse-tse flies
  ❖ Infects blood
  ❖ Will lead to death if untreated
  ❖ One symptom is excessive daytime sleeping; also causes other physical/neurological problems
  ❖ No vaccine
  ❖ Treatment in later stages not always successful

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• Brown algae
  ❖ Algae superficially resemble plants, but lack key plant features.
  ❖ Brown color: Pigments that absorb colors of light that penetrate water (green/blue)
    ➢ Chlorophyll reflects green!
  • Example: giant kelp!
    ➢ Entire ecosystem thrives due to giant kelp.
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• Red algae
  ◦ Multicellular
  ◦ Multiple cell types
  ◦ Red color: Like brown algae, have pigments that absorb colors of light that penetrate water (i.e. green/blue)
    ▶ More effective than chlorophyll or pigments in brown algae at absorbing green/blue light
    ▶ Can be found relatively deep in ocean

• Green algae
  ◦ Contain the same photosynthetic pigments as plants
    ▶ No additional pigments for better absorption through water
    ▶ Found in shallow water
  ◦ Some are multicellular (unusual for Protista)
  ◦ Some green algae are ancestors to Kingdom Plantae

Edible Red Algae

• Nori
  ◦ Used as wraps in sushi.

• Agar
  ◦ Delicacy in the Philippines and Japan

“Kingdom” Protista

• Some Protista move with pseudopods
  ◦ Flexible plasma membranes allow extension of cell in all directions
    ▶ Amoebas
    ▶ Heliozoans
    ▶ Foraminifera & Radiolaria
      – Construct elaborate “shells”