

## Sponges

- 1) Phylum: Porifera
  - a) Over 9000 species exist of sponges
- 2) Multicellular organisms may have loosely defined associated cells or distinct tissue layers
  - a) Cells in a tissue layer are connected by a **basal lamina**
    - i) The basal lamina allows cells to communicate with each other.
- 3) Sponges do not have true tissue layers, their cells are loosely associated with each other. This is the only phylum in the animal kingdom that does not have true tissues.
- 4) Structure of Sponges
  - a) Sponges have many tiny pores and canals
  - b) Most are asymmetrical
  - c) Sponges are **sessile** and create currents to bring in food and oxygen
  - d) Sponges have two layers of cells; between those two layers they are stiffened by a skeleton of carbonate or silica called **Spicules**.
  - e) Most sponges have no organs or tissue layers, and even their cells show a degree of independence.
  - f) With a sessile life they lack nervous systems or sense organs.
  - g) Size:
    - i) Sponges vary in size, the loggerhead sponge grows to over 2 meters, while leucosolenia only grows to at most 2 centimeters
  - h) Colors are dependent on proteins in the outer layer of cells: red, yellow, orange, green, or purple.
- 5) Feeding
  - a) Sponges are unselective particle feeders.
  - b) Types of canals
    - i) **Asconoids**
      - (1) Simplest organization
      - (2) Water enters into microscopic pores and is pumped into a central canal called a **spongocoel**.
      - (3) Special types of flagellated cells move water through the spongocoel and out the **Osculum**.
    - ii) **Syconoid**
      - (1) Have a tube body very similar to Asconoids but the outer layer is folded in on itself to make mini canals called **radial canals**.
        - (a) This increases surface area allowing more water to enter
    - iii) **Leuconoids**
      - (1) Most complex
      - (2) These form the biggest of the sponges with multiple osculum.
      - (3) No spongocoel just an intricate level of canals leading to osculum.
    - iv) These canals are able to pump about 27 litres per day for relatively small sponges
  - c) **Collar cells** are cells that entrap nutrient particles onto cells.

- i) This accounts for about 80% of food intake.
    - ii) The cells along the edge of the canals have the ability to **phagocyte** nutrients into each individual cell.
    - iii) The remaining nutrients are captured by mucus
  - d) \* one exception that we know of.
    - i) In caves trapped by changing sea levels *Cladorhiza* has evolved carnivory
    - ii) They do not have collar cells they move themselves and directly phagocytize other organisms.
- 6) Reproduction
- a) Sponges can reproduce sexually and asexually
    - i) Sexual reproduction
      - (1) Sponges are **Monoecious** (have both male and female sex cells)
      - (2) Both sex cell develop in the internal cell layer.
      - (3) Sperm is released into the water
        - (a) Another sponge takes in the sperm and phagocytizes them into the cell. From there they are packaged and sent internally to where the oocyte was stored.
      - (4) Once fertilized the zygotes develop into flagellated larvae which break loose and are carried away by water currents.
    - ii) Asexual reproduction
      - (1) Sponges accomplish this by **fragmentation**
        - (a) Because cells are fairly individualized if part of them breaks off they can form a new colony where they land.
      - (2) The other way sponges reproduce asexually is by **budding**
        - (a) They form a “bud” and pinch it off to allow a new colony to form.
- 7) Ecology
- a) Sponges represent a significant food source in many coral reefs.
  - b) Many ways sponges mount themselves in place causes erosion of coral reefs.
    - i) Many have been calculated that they remove 1m<sup>2</sup> of calcium for every 100 days.
  - c) For protection many sponges produce chemicals that can prevent grazing by predators as well as prevent other sponges from colonizing immediately nearby.
- 8) Major classes of sponges
- a) The major classes are based on the types spicules used
    - i) **Calcarea**
      - (1) Use calcium carbonate
      - (2) Only marine
    - ii) **Hexactinellida**
      - (1) Six sided (hints hexa) silicon spicules
      - (2) Only marine
    - iii) **Demospongiae**
      - (1) Have non six sided silicon spicules
      - (2) Some freshwater
    - iv) **Homoscleromorpha**

- (1) Marine only
- (2) No spicules