26-2 Sponges

What Is a Sponge?

Sponges are in the phylum Porifera which means "pore-bearers."

Sponges live their entire adult life attached to a single spot.

Sponges are classified as animals because they are:

- **multicellular**
- **heterotrophic**
- **have no cell walls**
- **contain a few specialized cells**

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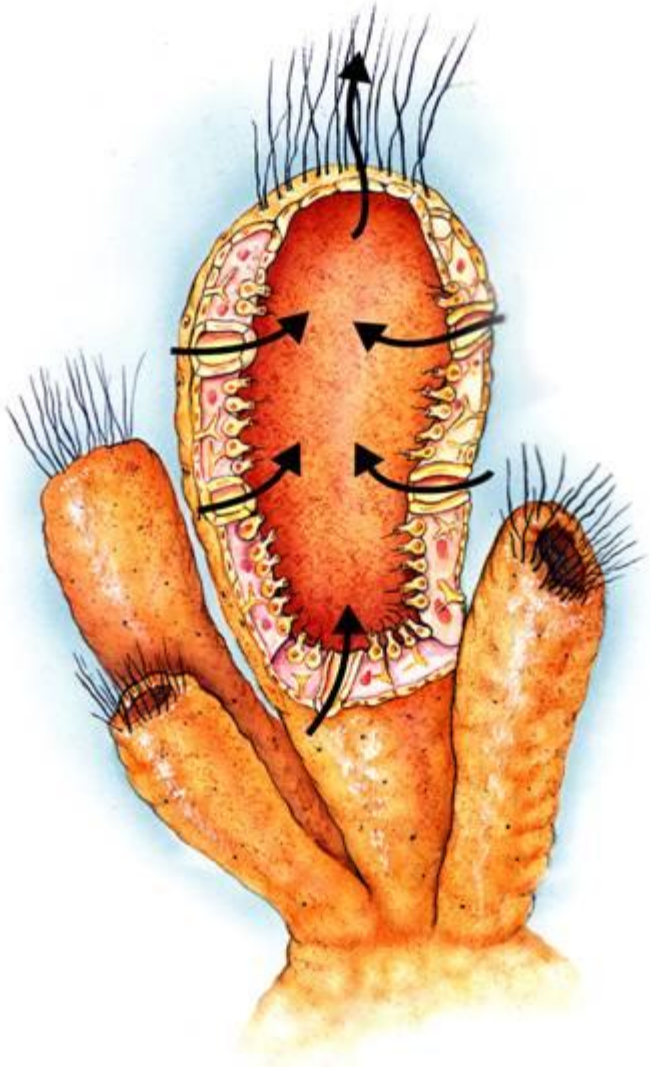
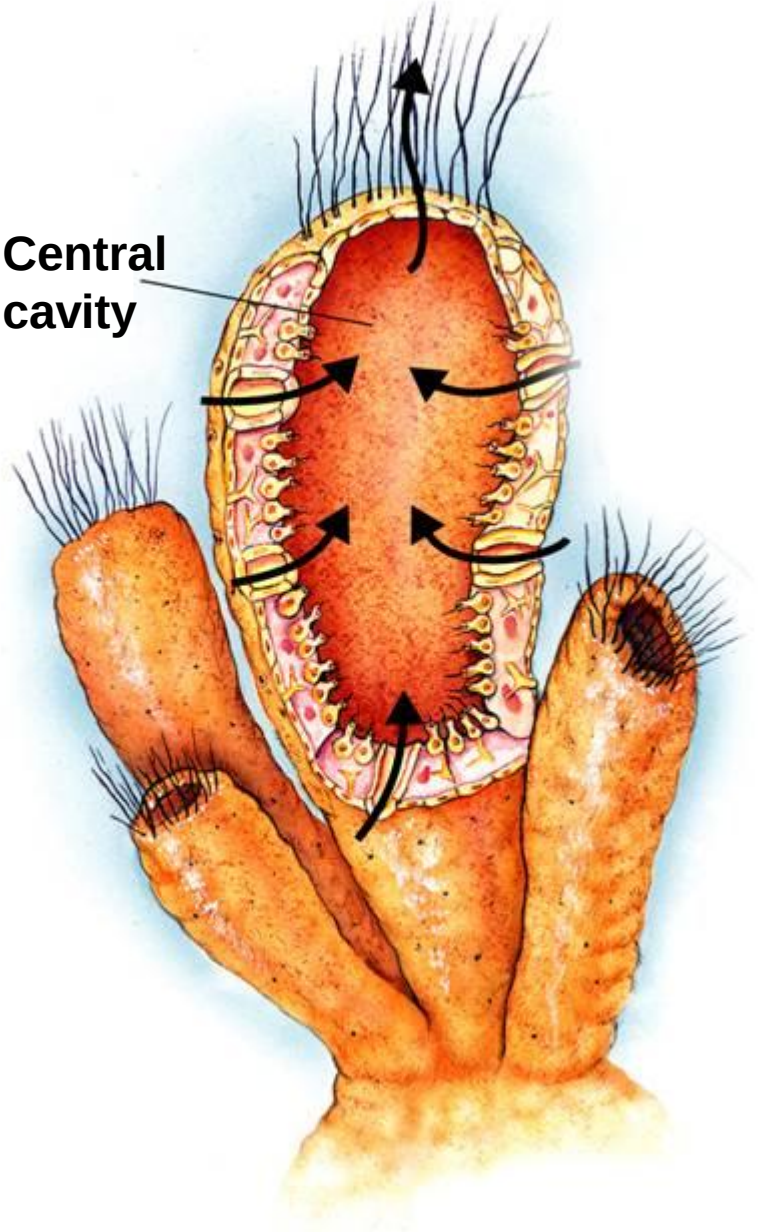
Body Plan

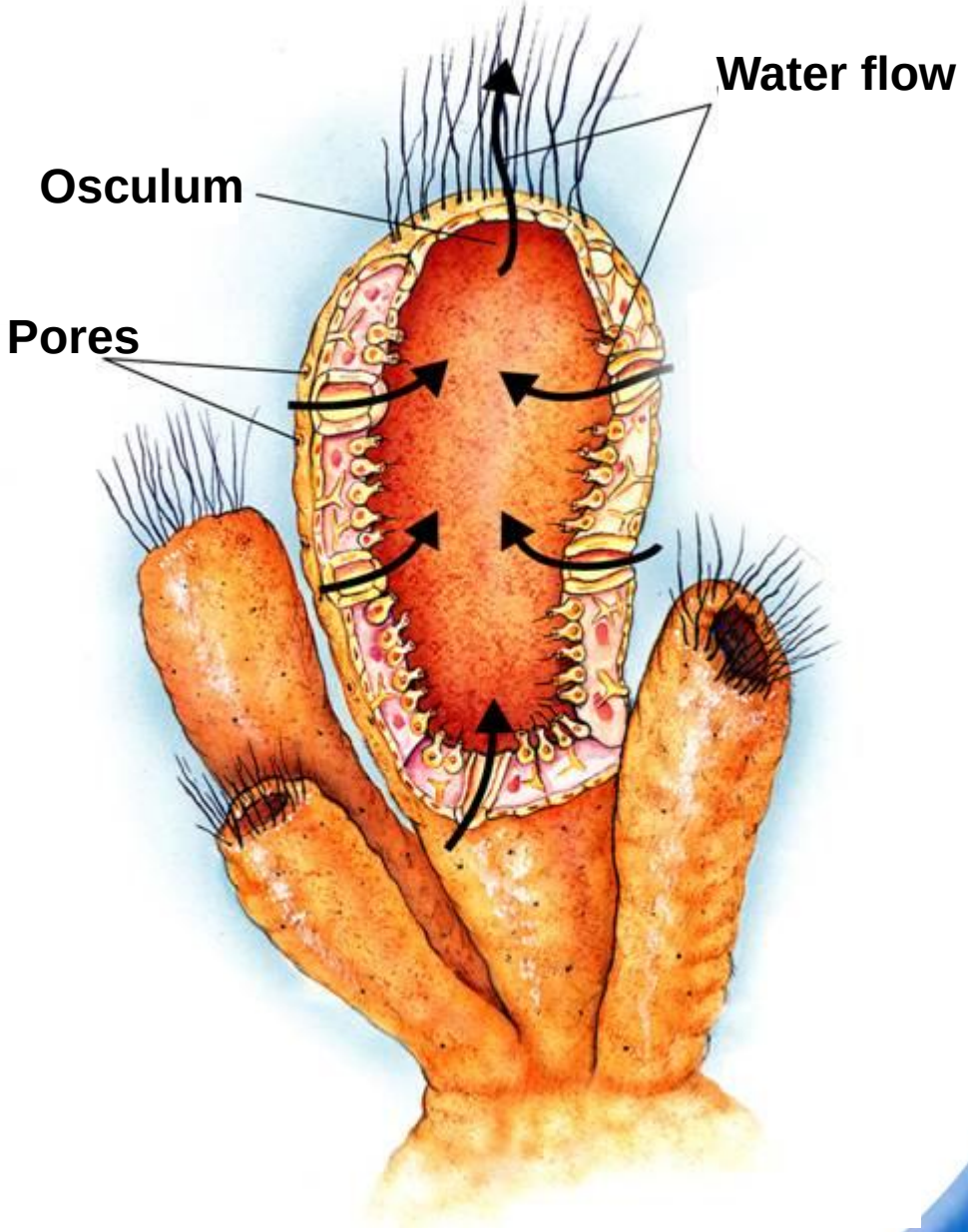
Sponges are asymmetrical; they have no front or back ends, no left or right sides.



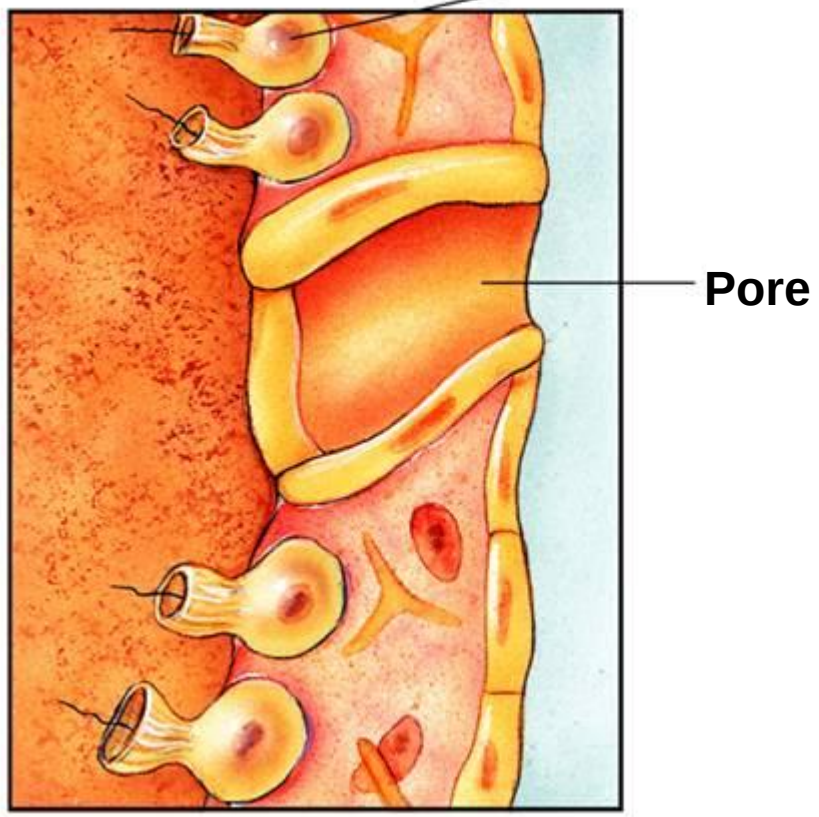
The body of a sponge forms a wall around a large central cavity through which water is circulated continually.



Water enters through pores located in the body wall and leaves through the **osculum**, a large hole at the top of the sponge.



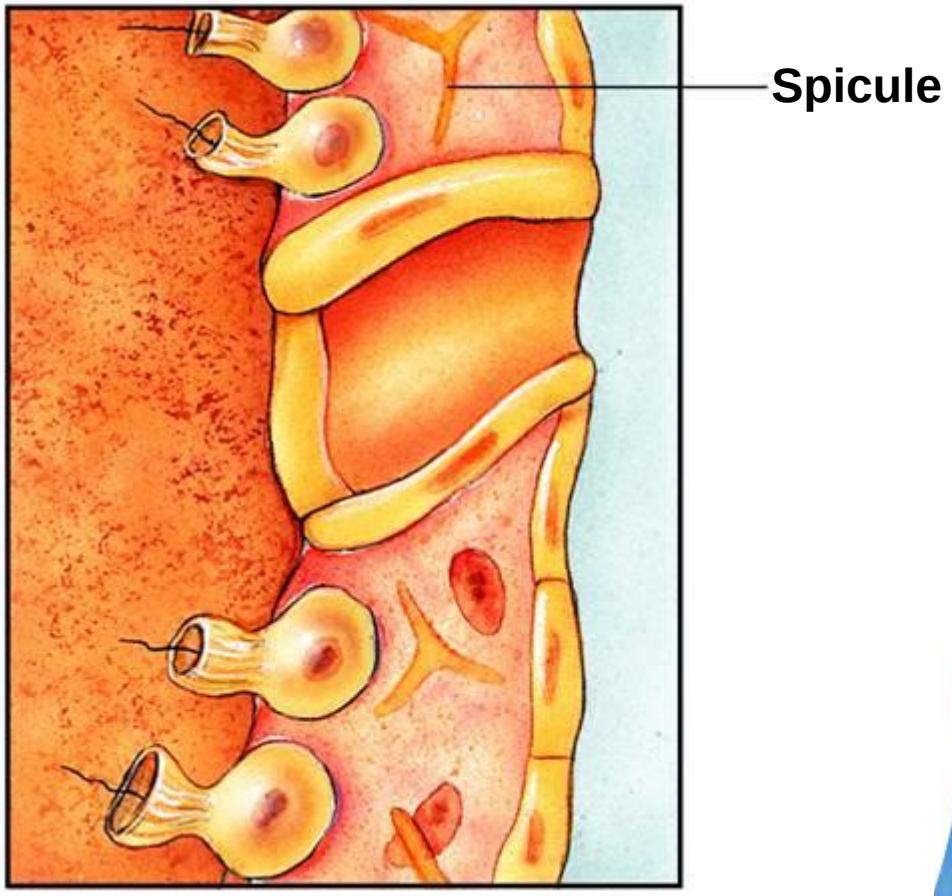
Choanocytes are specialized cells that use flagella to move a steady current of water through the sponge.



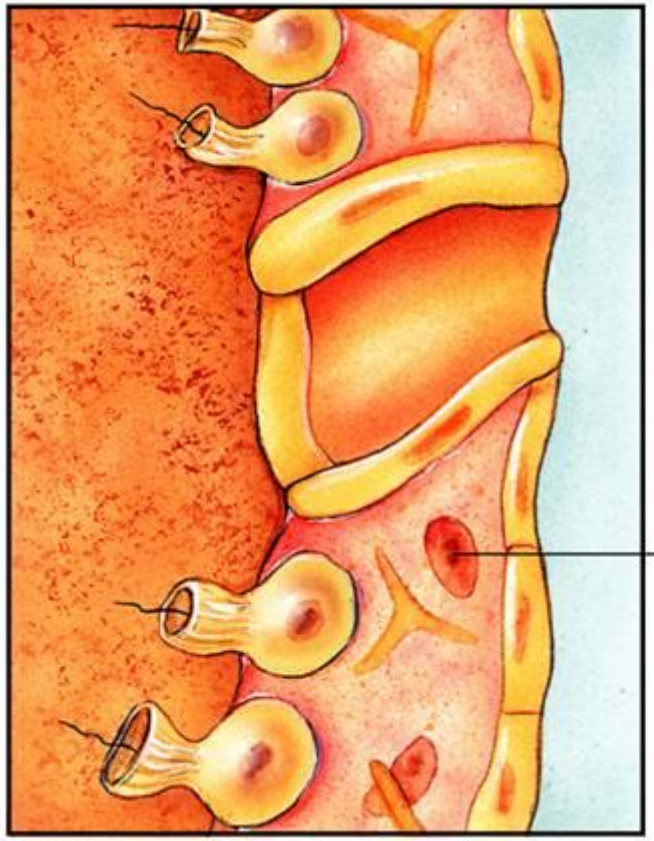
The movement of water through the sponge provides a simple mechanism for feeding, respiration, circulation, and excretion.

Sponges have a simple skeleton. In harder sponges, the skeleton is made of spiny spicules.

A **spicule** is a spike-shaped structure made of calcium carbonate or silica.



Spicules are made by **archaeocytes**, which are specialized cells that move around within the walls of the sponge.



Respiration, Circulation, and Excretion

Sponges rely on movement of water through their bodies to carry out body functions.

Oxygen dissolved in the water diffuses into the surrounding cells.

Carbon dioxide and other wastes, such as ammonia, diffuse into the water and are carried away.

Response

Sponges do not have nervous systems that would allow them to respond to changes in their environment.

However, many sponges protect themselves by producing toxins that make them unpalatable or poisonous to potential predators.

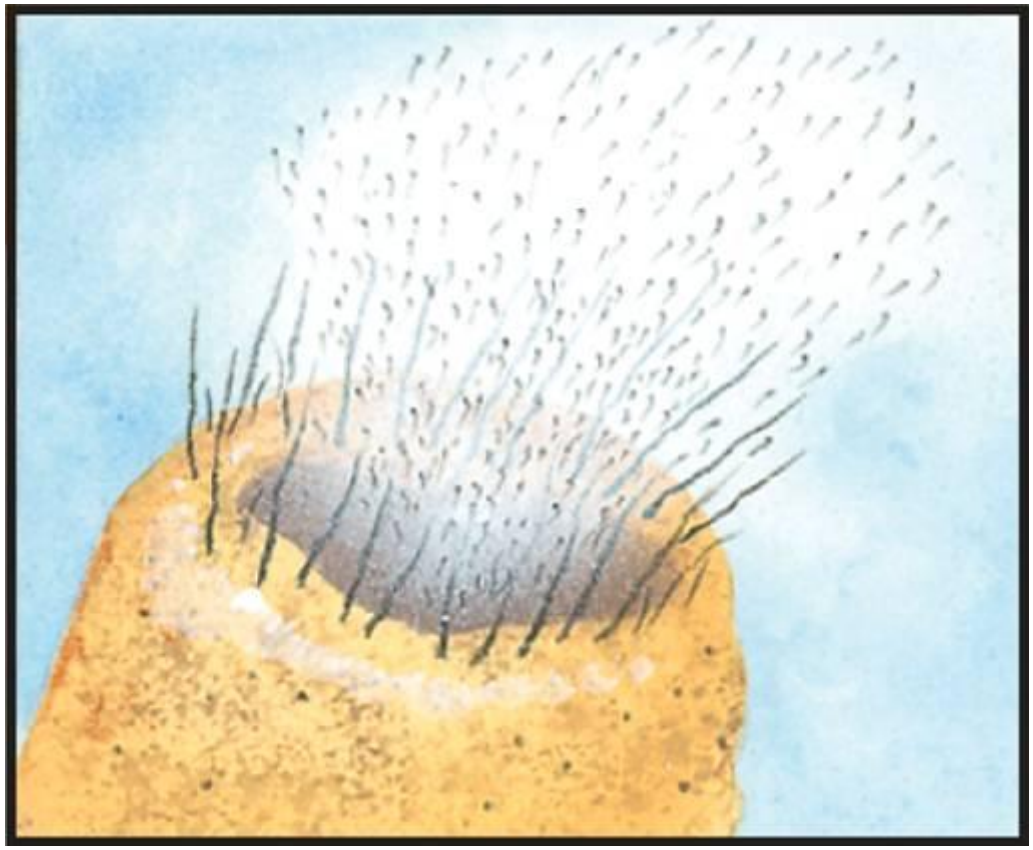
Reproduction

Sponges can reproduce sexually or asexually.

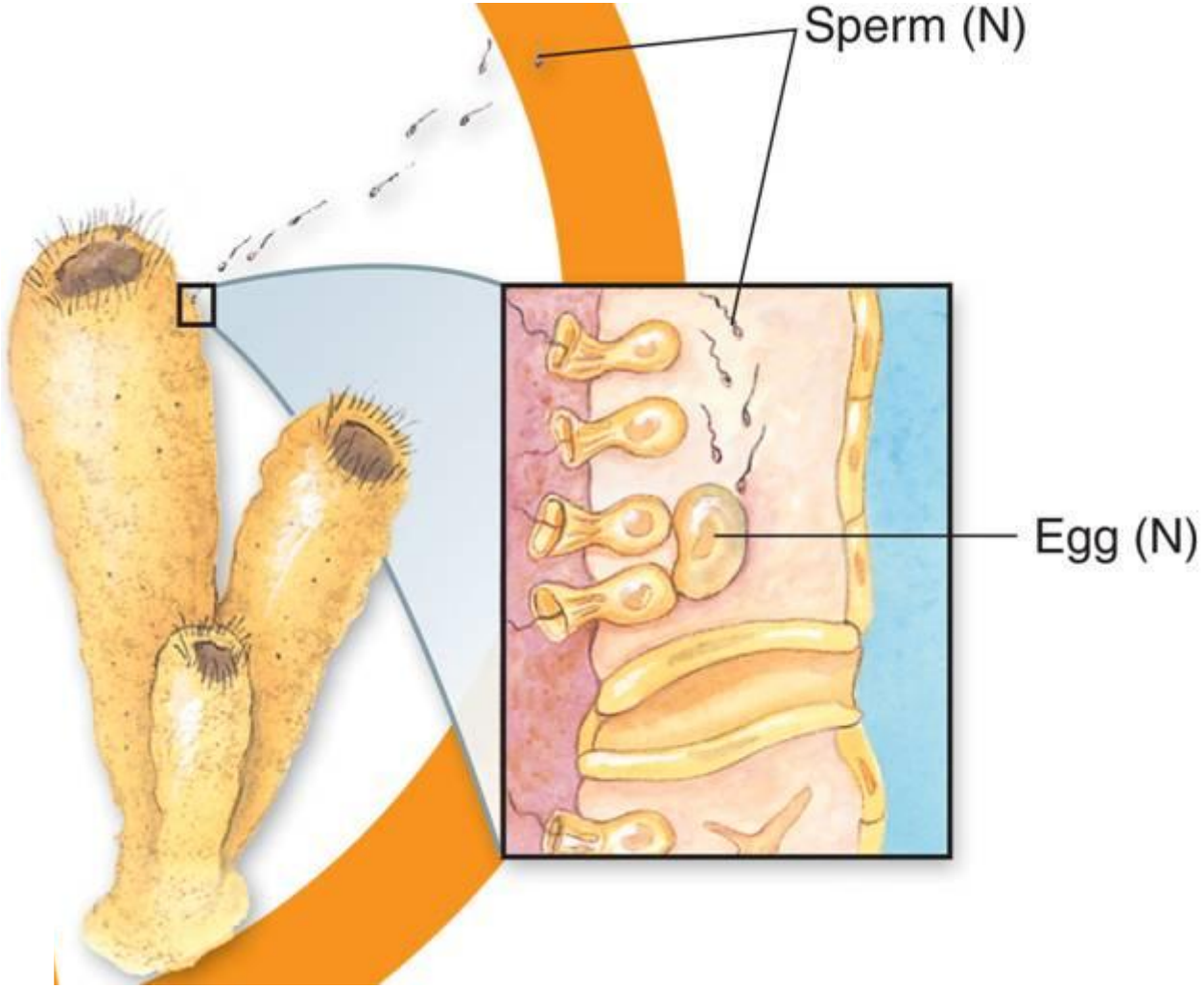
In most sponge species, a single sponge forms both eggs and sperm by meiosis.

The eggs are fertilized inside the sponge's body, in a process called **internal fertilization**.

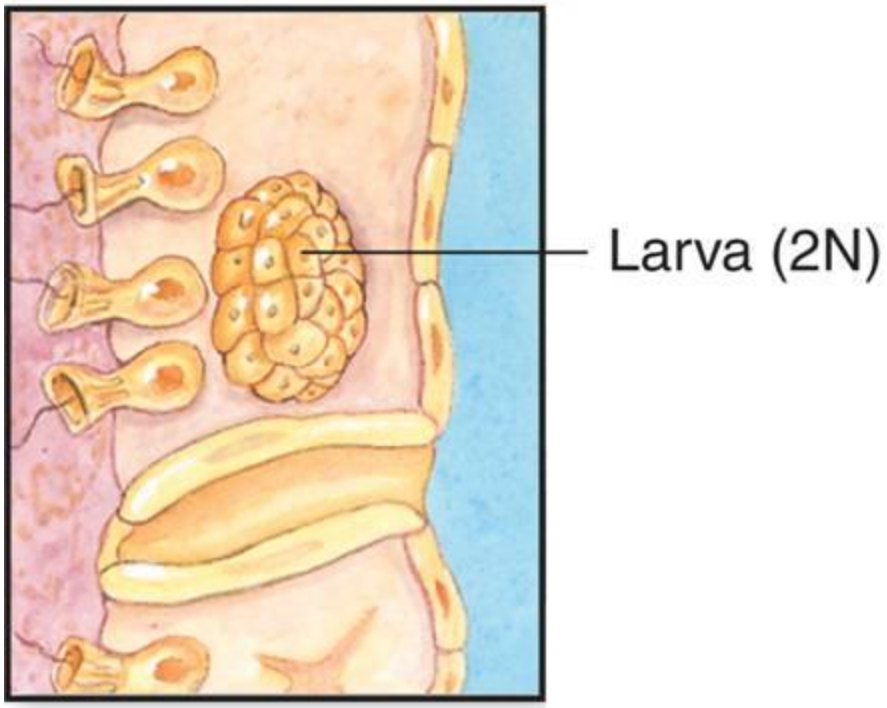
Sperm are released from one sponge and are carried by water currents until they enter the pores of another sponge.



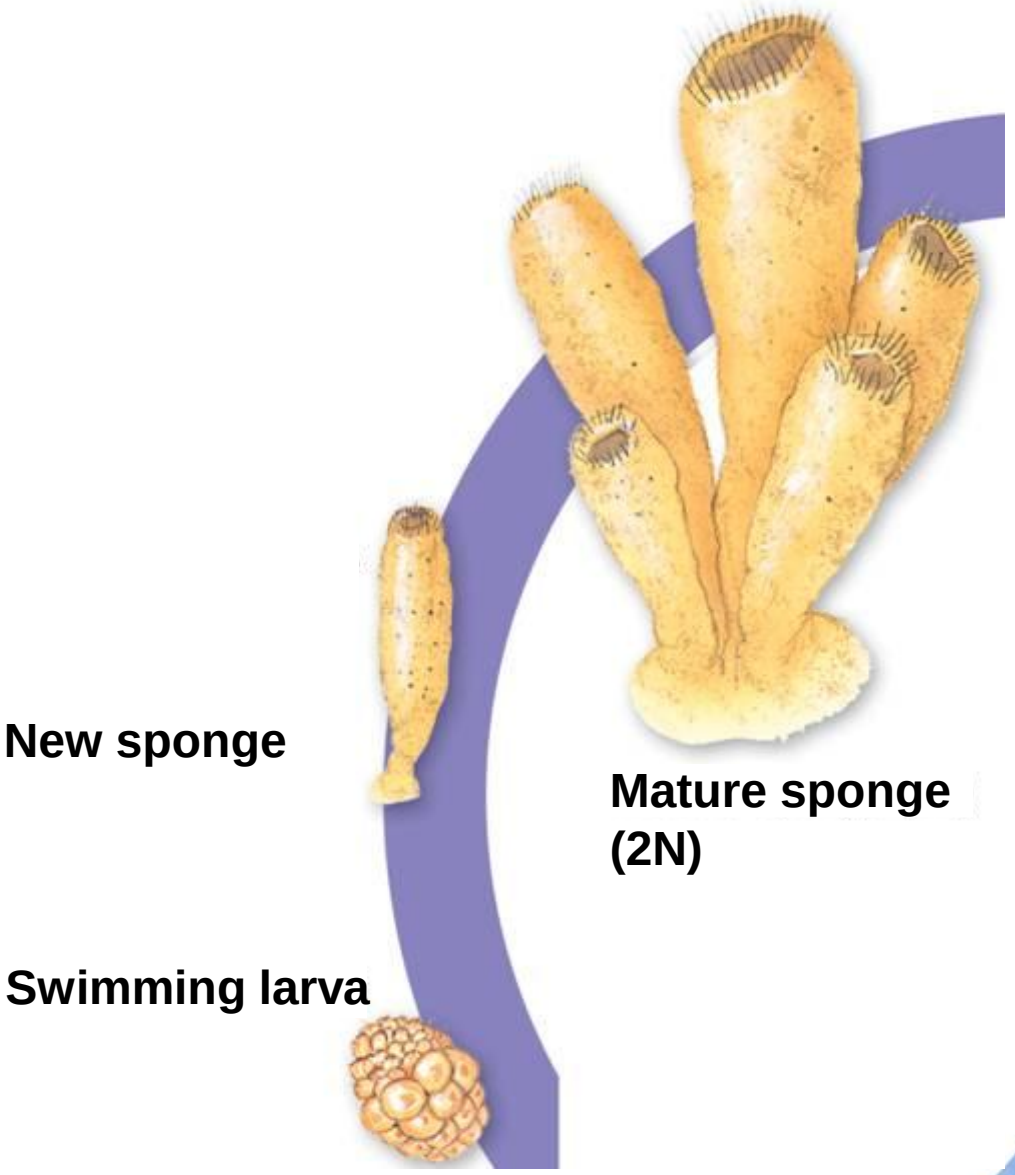
Archaeocytes carry the sperm to an egg.



After fertilization, the zygote develops into a larva. A **larva** is an immature stage of an organism that looks different from the adult form.



The larvae of sponges are motile. Water currents carry the larva until it attaches to a surface and grows into a new sponge.



Sponges can reproduce asexually by budding or by producing gemmules.

In budding, part of a sponge breaks off of the parent sponge, settles to the sea floor, and grows into a new sponge.

In difficult environmental conditions, some sponges produce **gemmules,** which are groups of archaeocytes surrounded by a tough layer of spicules.

Gemmules can survive freezing temperatures and drought. When conditions become favorable, a gemmule grows into a new sponge.

Ecology of Sponges

Sponges are important in aquatic ecology.

They provide habitats for marine animals such as snails, sea stars, and shrimp.

Sponges containing photosynthetic organisms play an important role in the ecology and primary productivity of coral reefs.

The spicules of some sponges look like cross-shaped antennae.

They focus and direct incoming sunlight to cells lying below the surface of the sponge—where symbiotic organisms carry out photosynthesis.

26-2 Sponges

http://www.youtube.com/watch?v=T7E1rq7zHLc

26-2 Section QUIZ

Continue to:

Section QUIZ

- or -

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26-2 Section QUIZ

1 In sponges, a spike-shaped structure made of chalklike calcium carbonate or glasslike silica is a(an)

A a. spicule.

b. archaeocyte.

c. choanocyte.

d. epidermal cell.

2 An immature stage of an organism that looks different from the adult form is a(an)

a. gemmule.

A b. larva.

c. archaeocyte.

d. choanocyte.

3 Specialized cells that use flagella to move water through the sponge are

a. gemmules.

b. pores.

c. spicules.

A d. choanocytes.

4 Sponges are

a. detritivores.

b. carnivores.

A c. filter feeders.

d. herbivores.

5 Sponges can reproduce

a. sexually only.

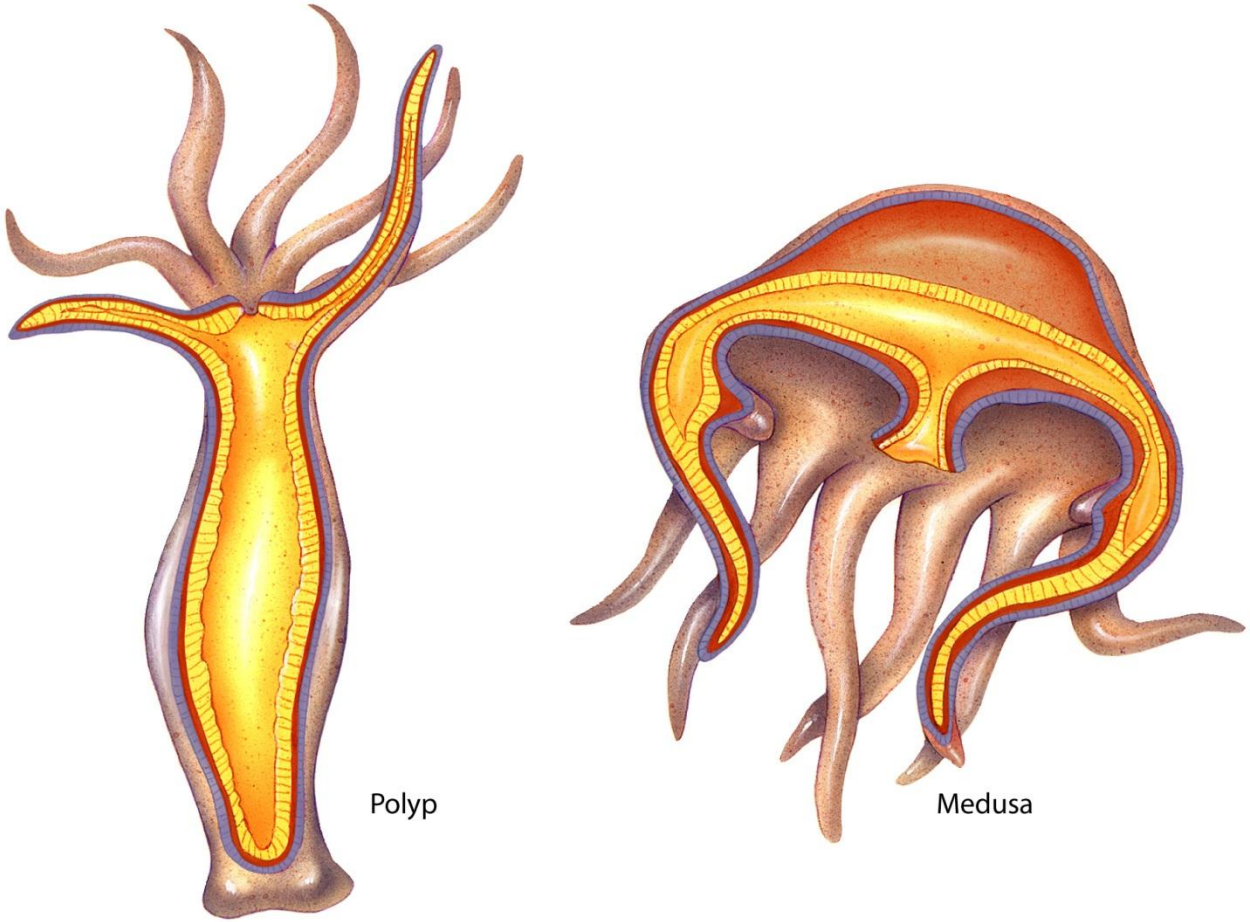
b. asexually only.

A c. both sexually and asexually.

d. by metamorphosis.

END OF SECTION

26-3 Cnidarians



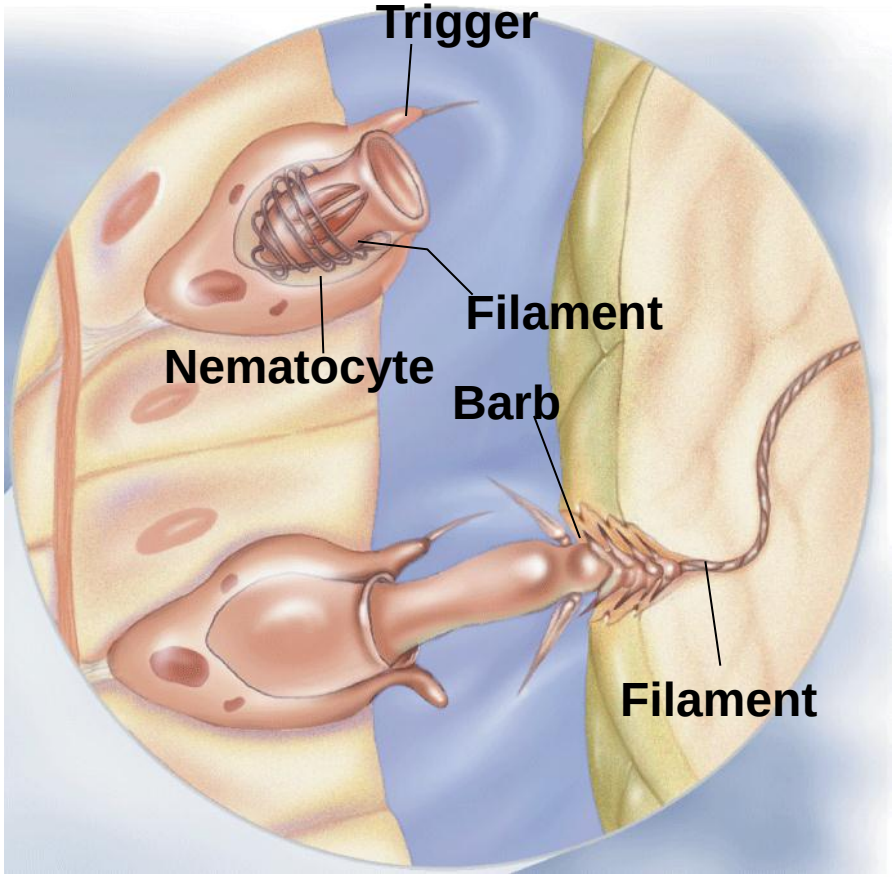
What Is a Cnidarian?

Cnidarians are soft-bodied, carnivorous animals that have stinging tentacles arranged in circles around their mouths. They are the simplest animals to have body symmetry and specialized tissues.

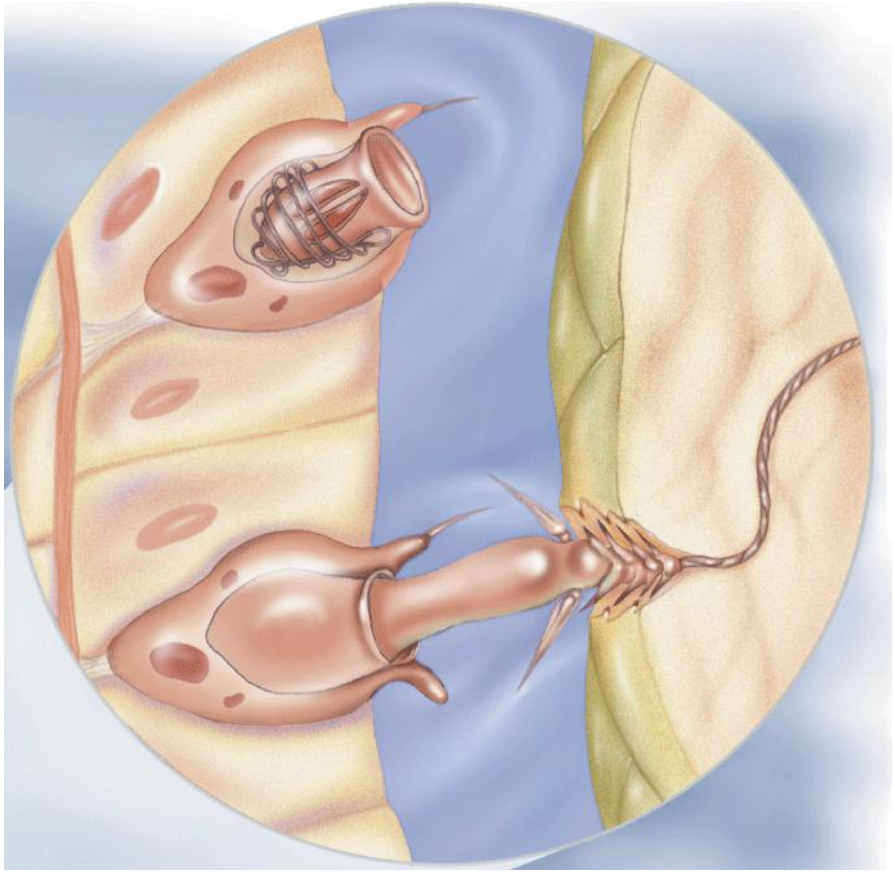
Cnidarians get their name from the **cnidocytes**, or stinging cells, located along their tentacles.

Cnidarians use cnidocytes for defense and to capture prey.

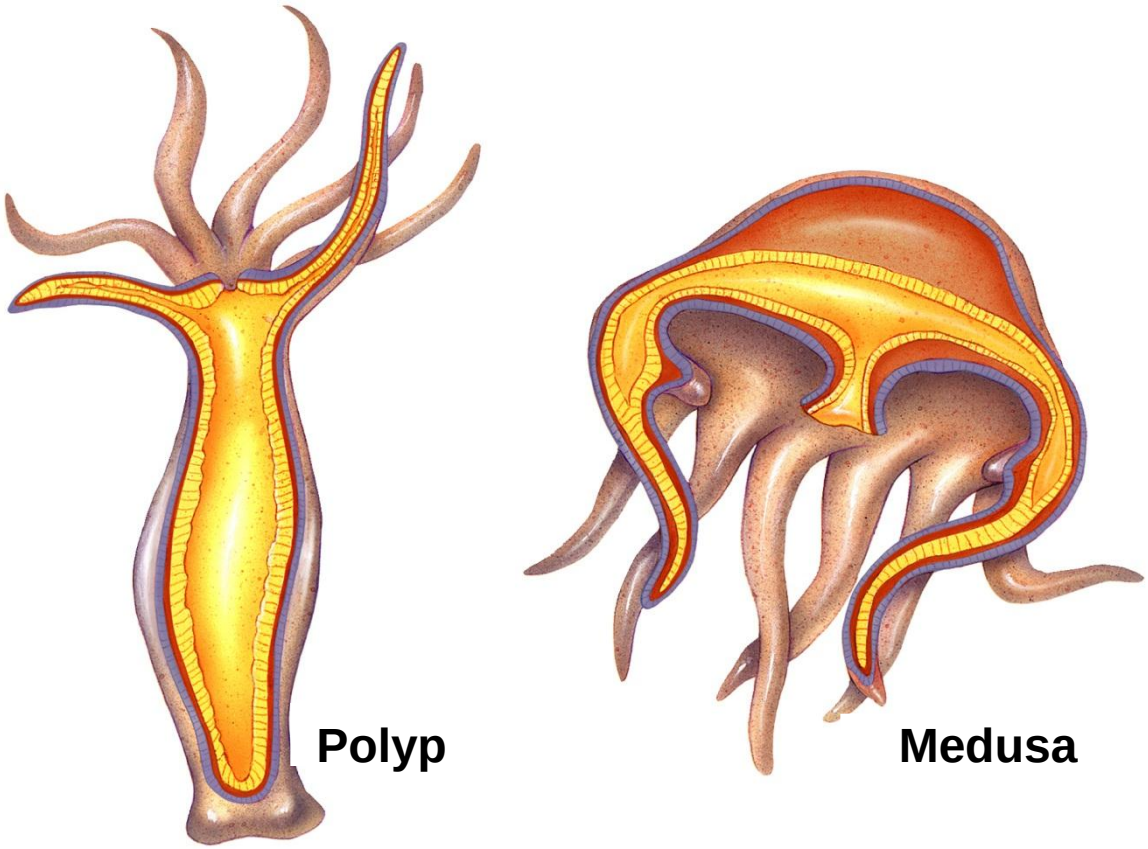
Within each cnidocyte is a **nematocyst**—a poison-filled, stinging structure that contains a tightly coiled dart.



When a shrimp or small fish brushes up against the tentacles, thousands of nematocysts explode, releasing enough poison to paralyze or kill the prey.

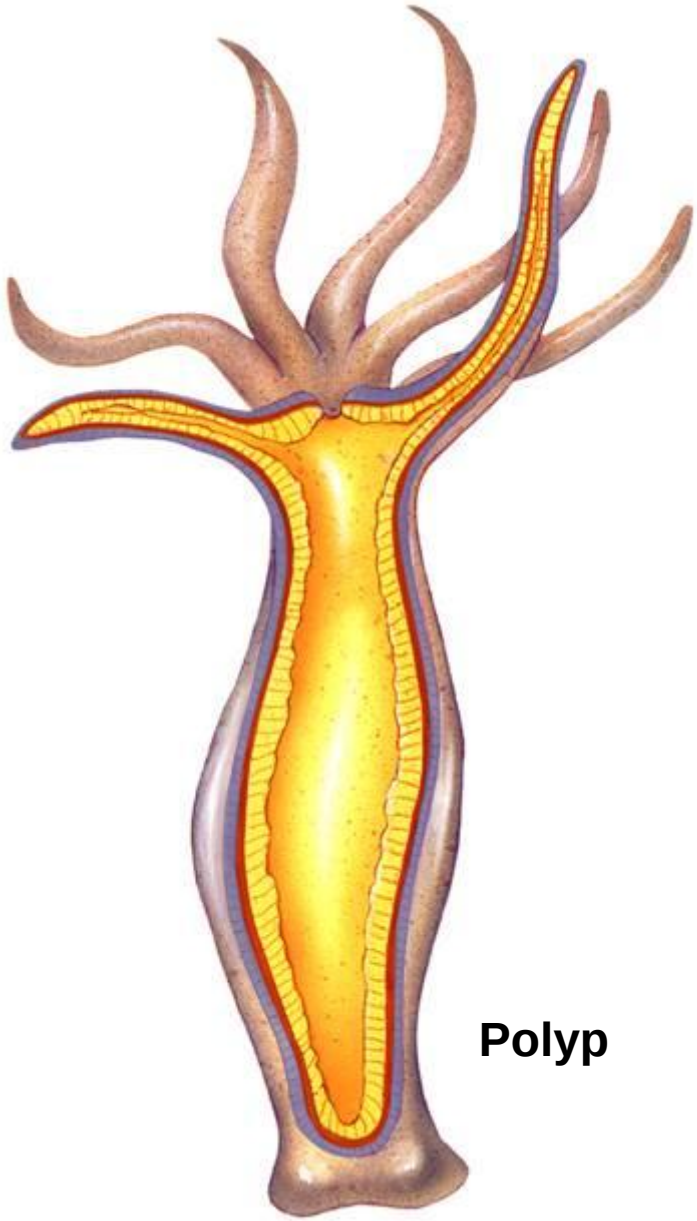


Cnidarians typically have a life cycle that includes two different-looking stages: a polyp and a medusa.



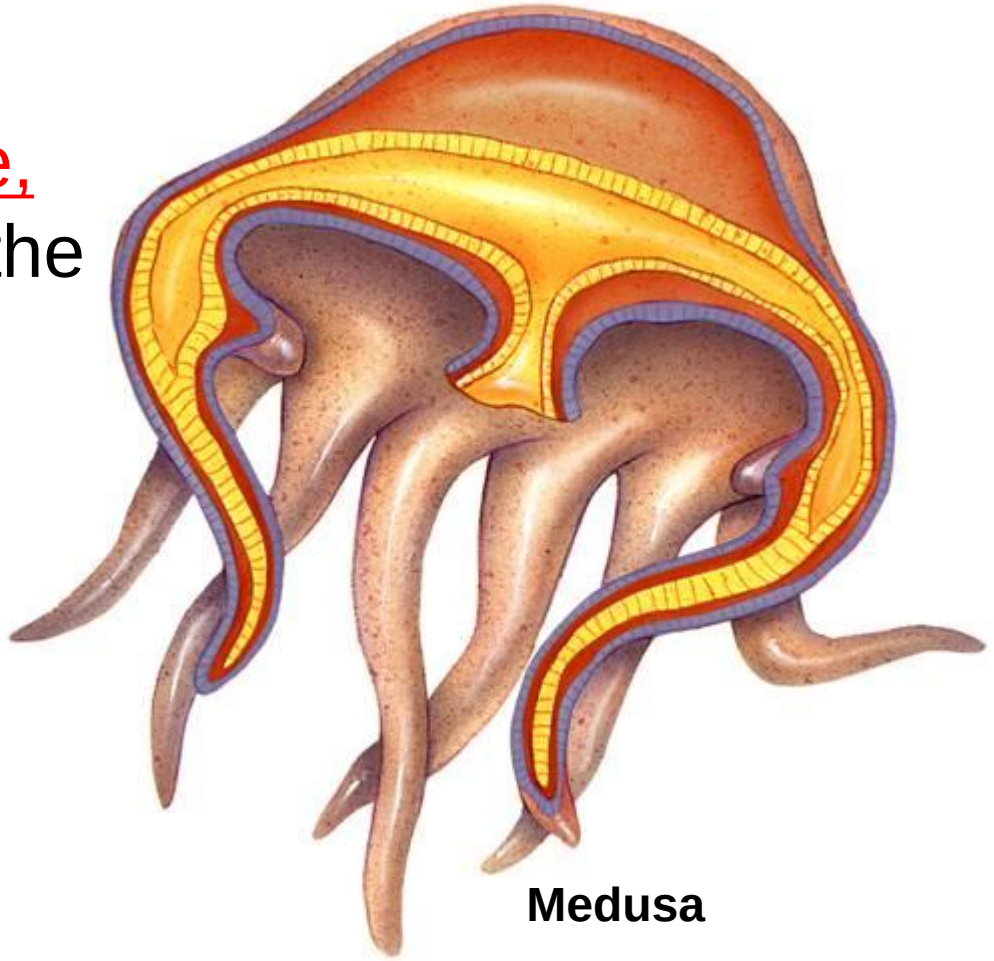
A **polyp** is a cylindrical body with armlike tentacles. In a polyp, the mouth points upward.

Polyps are usually sessile.



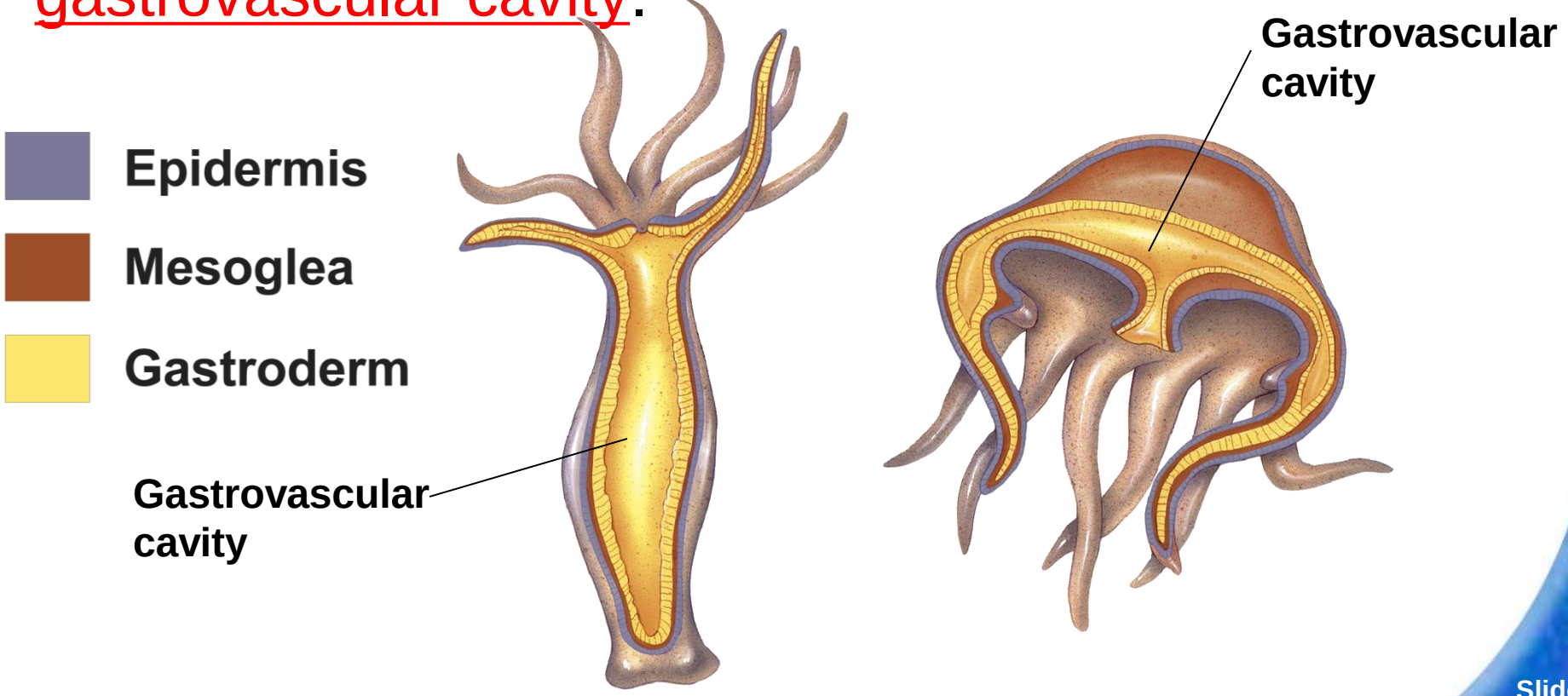
Polyp

A **medusa** has a motile, bell-shaped body with the mouth on the bottom.

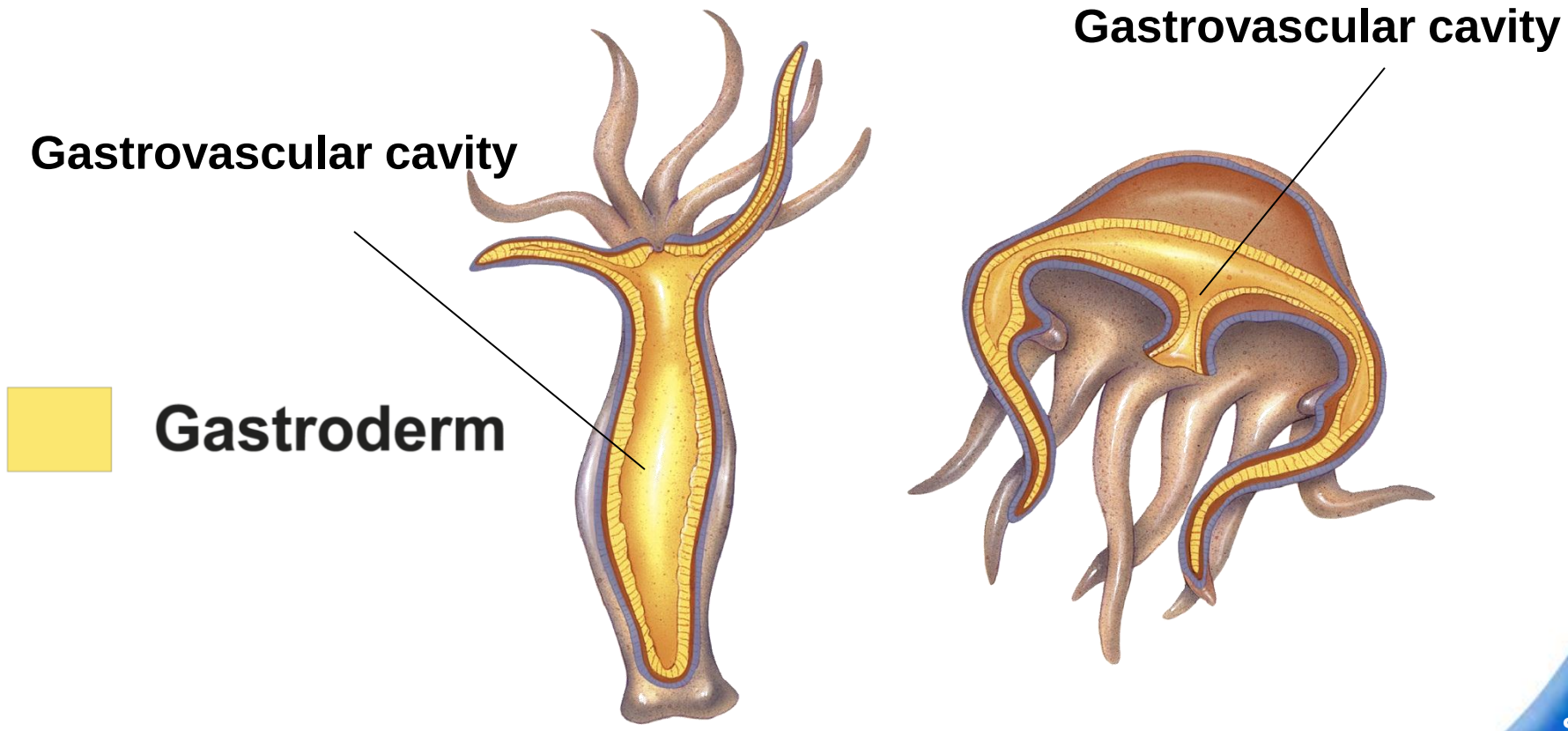


Medusa

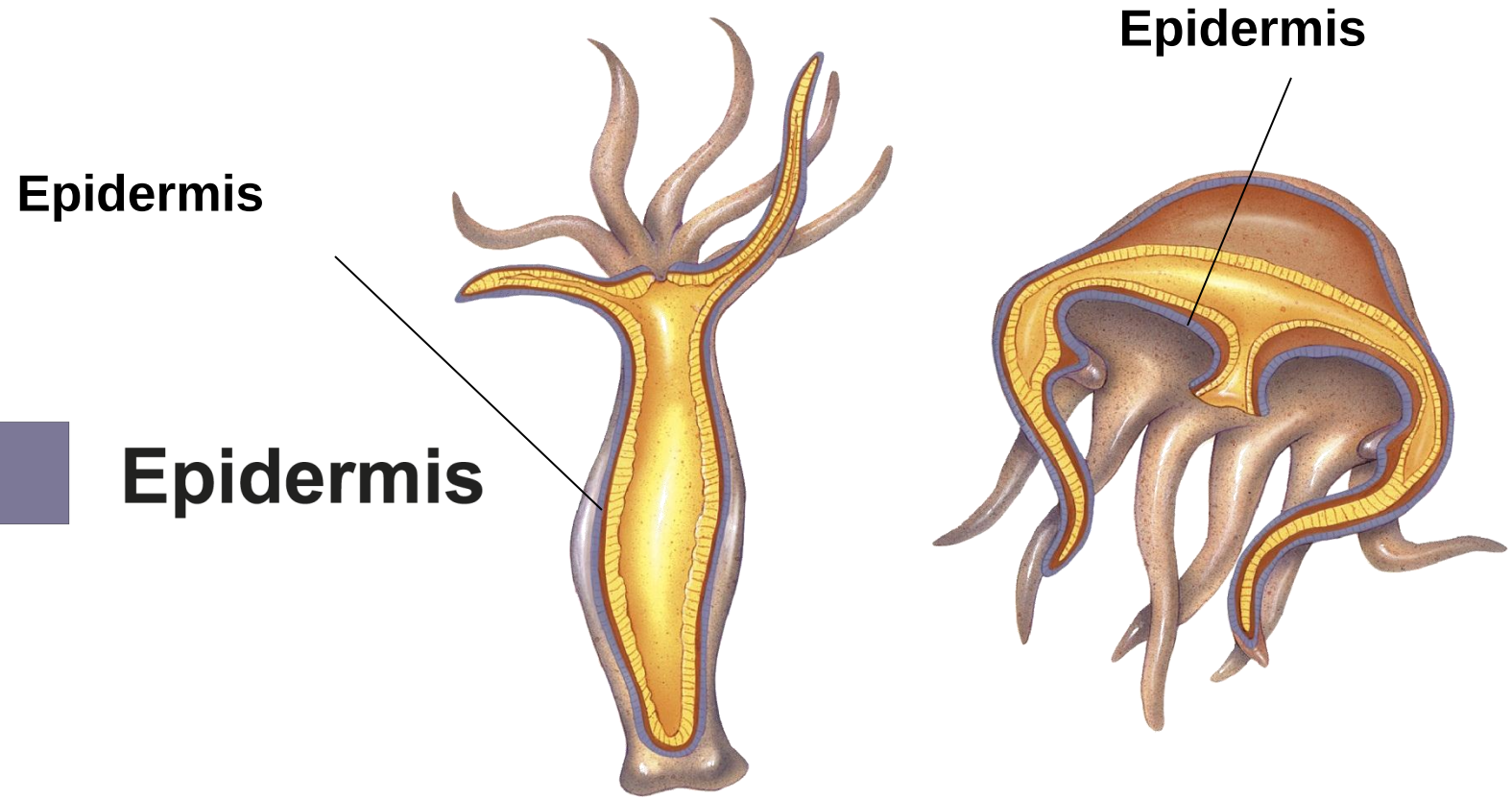
Cnidarian polyps and medusas each have a body wall that surrounds an internal space called a gastrovascular cavity.



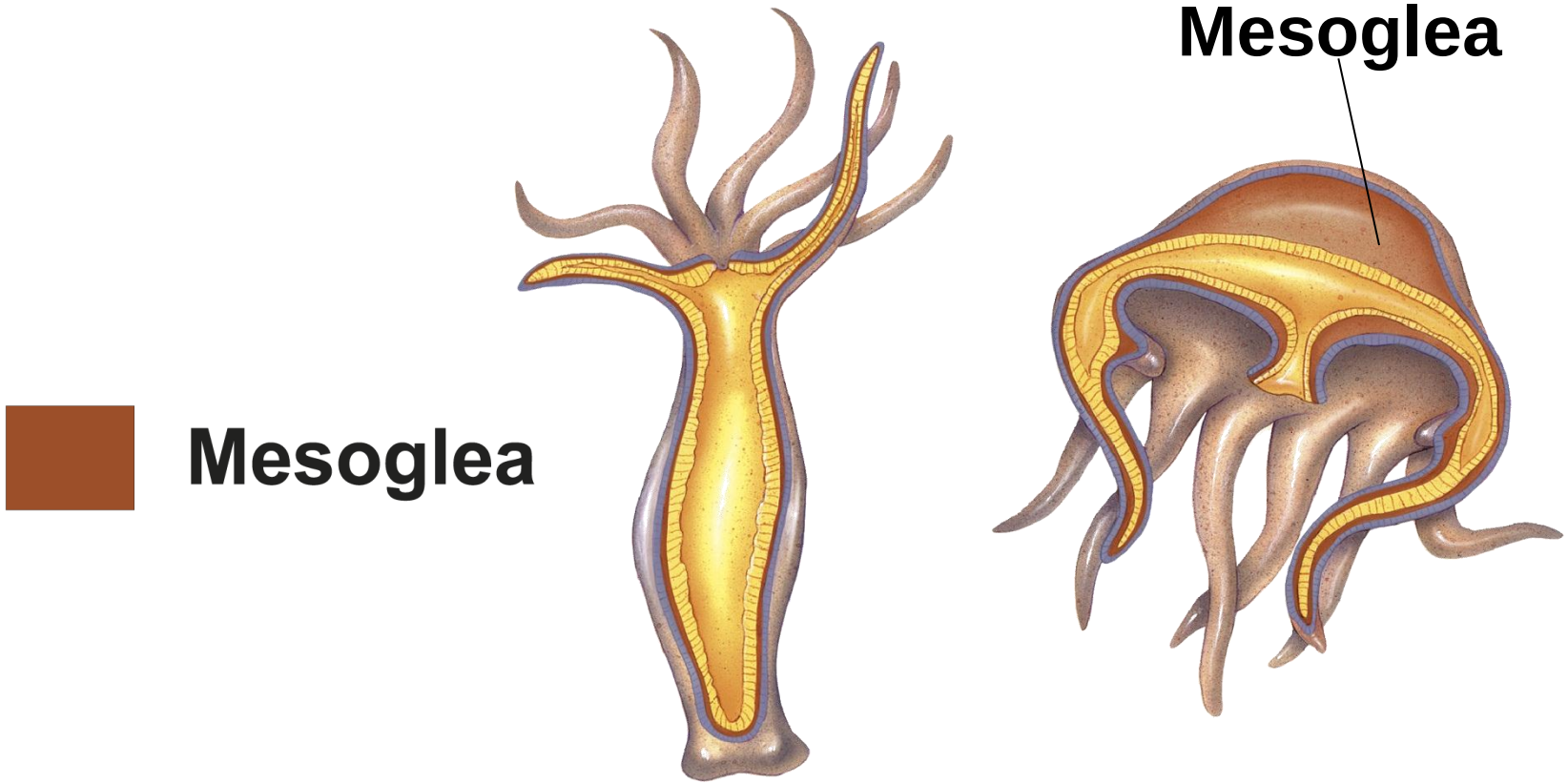
The gastroderm is the inner lining of the gastrovascular cavity, where digestion takes place.



The epidermis is the outer layer of cells.



The mesoglea is a layer that lies between the epidermis and gastroderm.



Feeding

A cnidarian pulls its food through its mouth and into its **gastrovascular cavity**, a digestive chamber with one opening.

Food enters and wastes leave the body through that same opening.

Respiration, Circulation, and Excretion

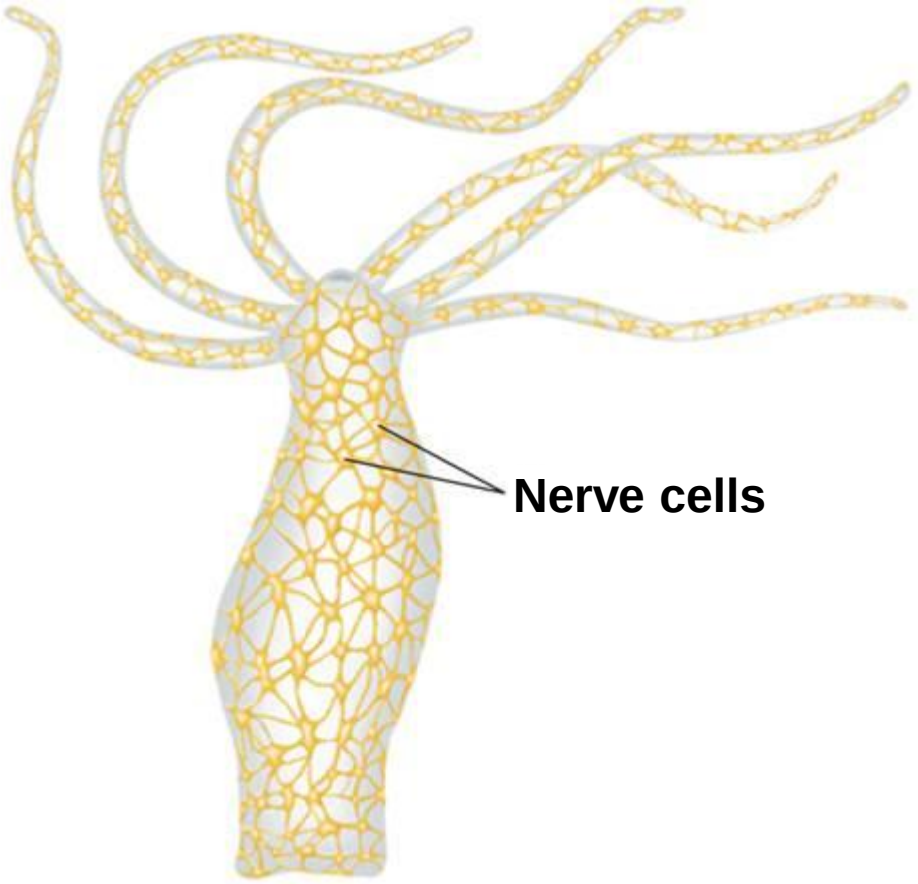
Following digestion, nutrients are usually transported throughout the body by diffusion.

Cnidarians respire and eliminate the wastes of cellular metabolism by diffusion through their body walls.

Response

Cnidarians gather information from their environment using specialized sensory cells.

Both polyps and medusas have a **nerve net**, a loosely organized network of nerve cells.



Cnidarians also have statocysts, which are groups of sensory cells that help determine the direction of gravity.

Ocelli are eyespots made of cells that detect light.

Movement

Sea anemones have a hydrostatic skeleton.

A **hydrostatic skeleton** consists of a layer of circular muscles and a layer of longitudinal muscles that, with the water in the gastrovascular cavity, enable the cnidarian to move.

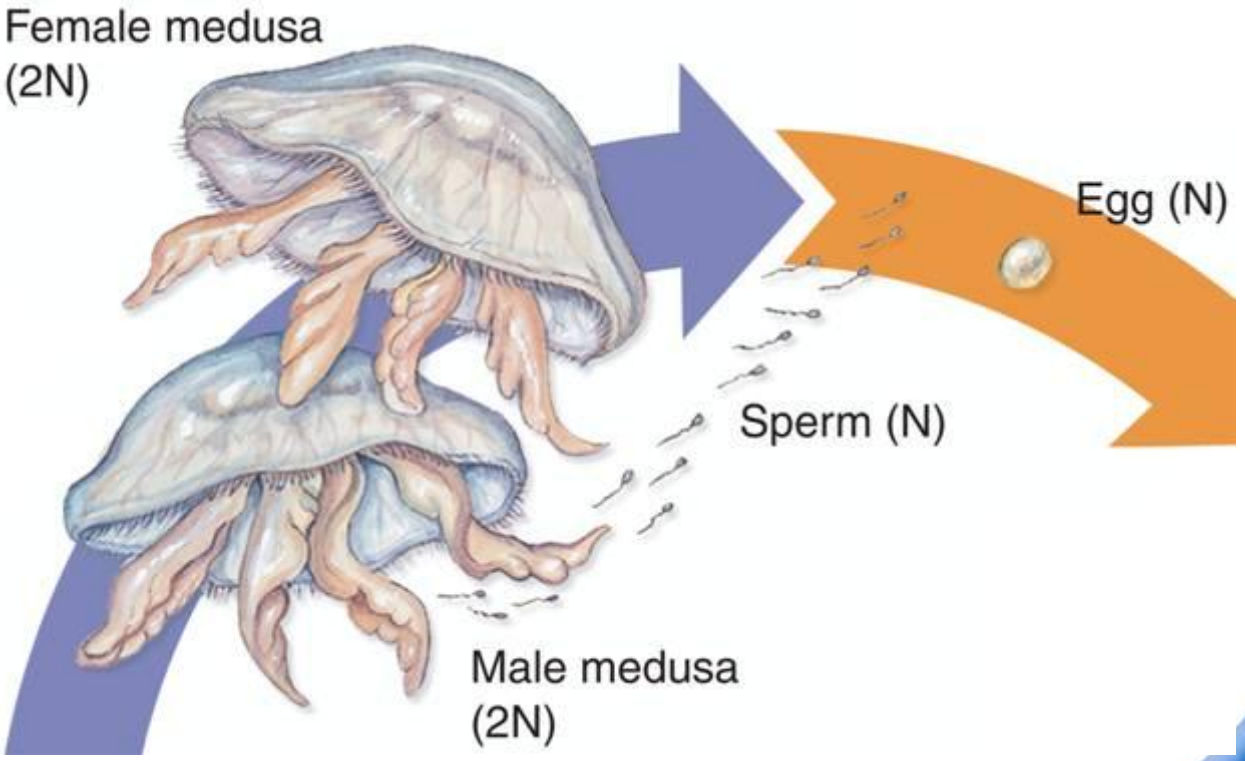
Reproduction

Most cnidarians reproduce both sexually and asexually.

Polyps can reproduce asexually by budding.

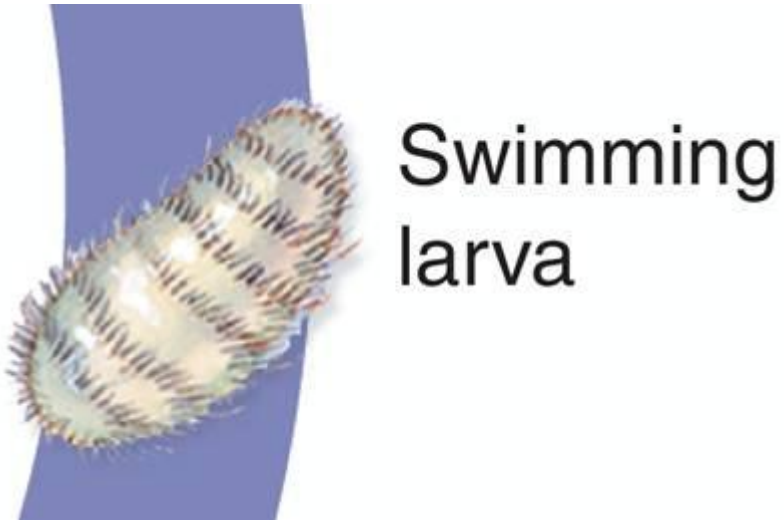
In most cnidarians, sexual reproduction takes place with external fertilization. **External fertilization** takes place outside the female's body.

In the life cycle of *Aurelia*, a common jellyfish, the female releases eggs into the water, and the male releases sperm.

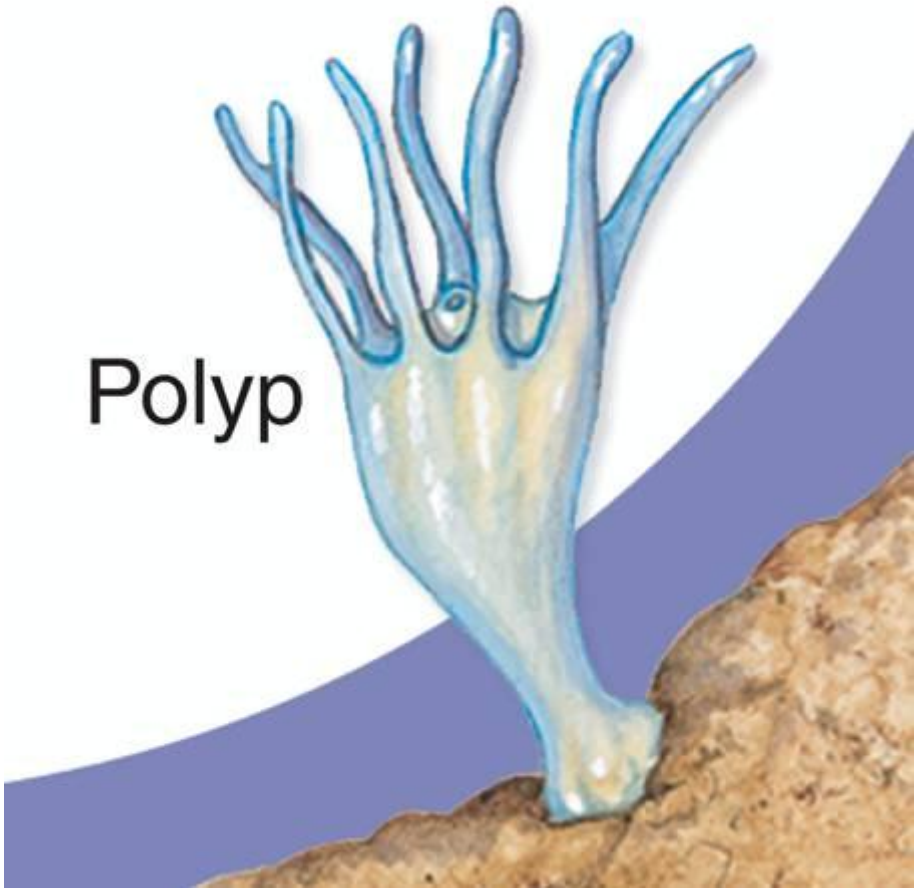


Fertilization occurs in open water.

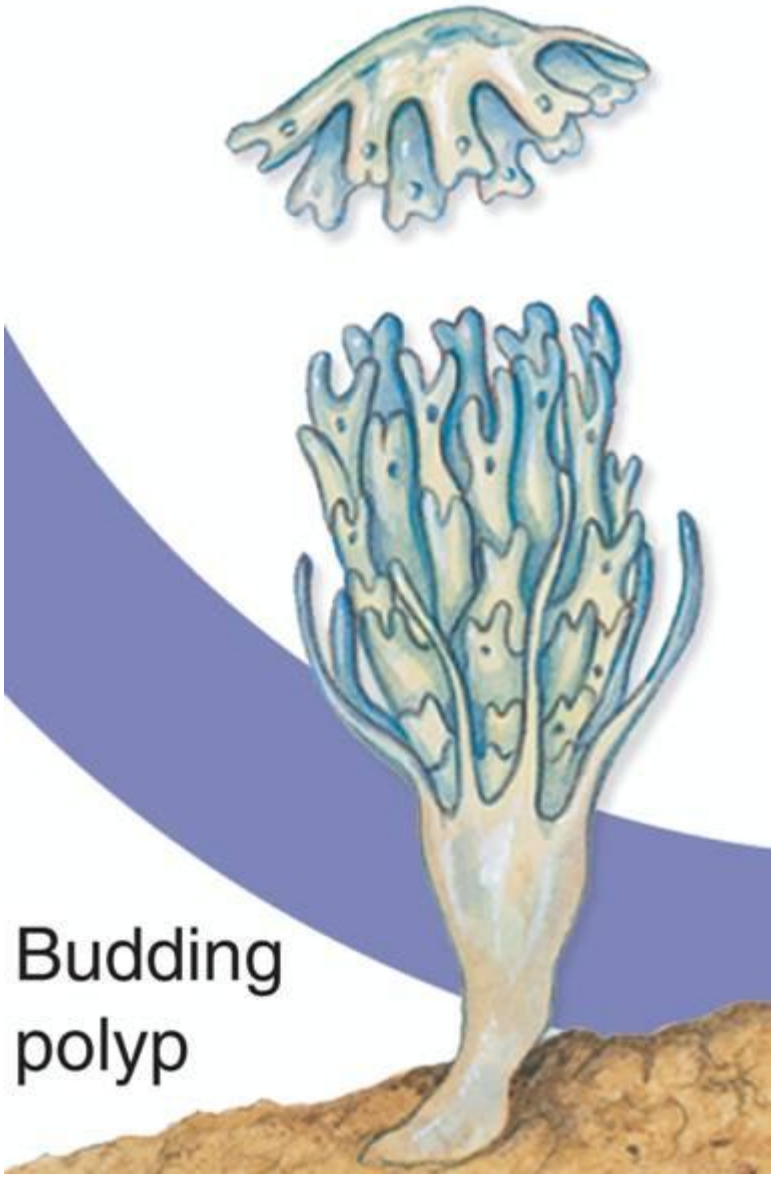
Each zygote grows into a free-swimming larva.



The larva eventually attaches to a hard surface and develops into a polyp.



The polyp eventually buds and releases young medusas that begin the cycle again.



What are the three groups of cnidarians?

Groups of Cnidarians

Cnidarians include:

- **jellyfishes**
- **hydras and their relatives**
- **sea anemones and corals**

Jellyfishes

The class Scyphozoa contains the jellyfishes.

Jellyfishes live their lives primarily as medusas.

The polyp form of jellyfishes is restricted to a small larval stage, and no elaborate colonies ever form.

Jellyfishes reproduce sexually.

Hydras and Their Relatives

The class Hydrozoa contains hydras and related animals.

The polyps of most hydrozoans grow in branching colonies that can extend more than a meter.

Within the colony, polyps are specialized to perform different functions.

Sea Anemones and Corals

The class Anthozoa contains sea anemones and corals, animals that have only the polyp stage in their life cycle.

Anthozoans all have a central body surrounded by tentacles.

Ecology of Corals

Worldwide distribution of corals is determined by a few variables:

- temperature
- water depth
- light intensity

Many coral reefs suffer from human activity:

- Silt and sediments from logging, farming, mining, and construction smother corals.
- Chemical fertilizers, insecticides, and industrial pollutants poison corals.
- Overfishing upsets ecological balance.
- Stresses that makes coral reefs susceptible to other threats.

26-3 Section QUIZ

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Section QUIZ

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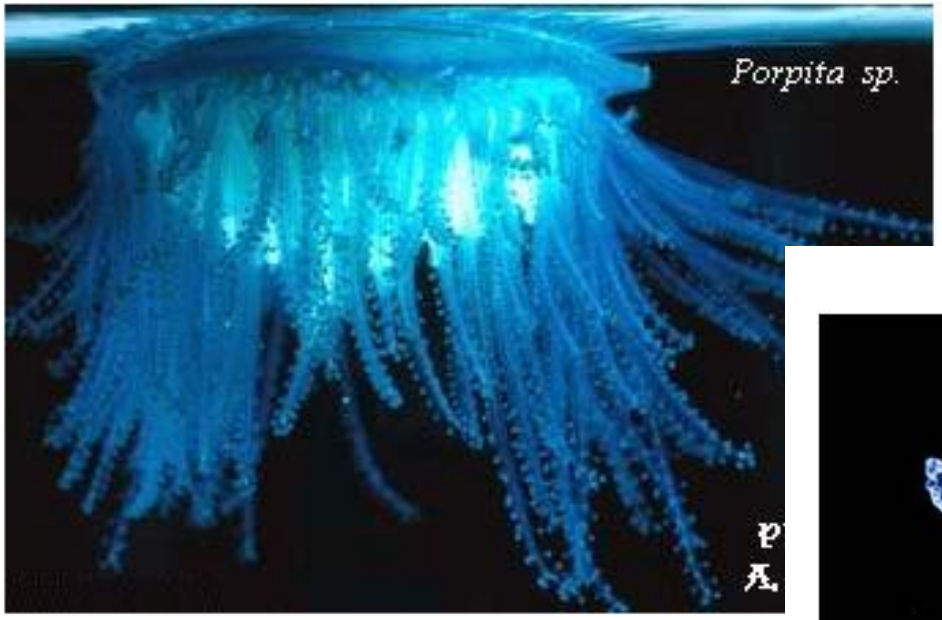

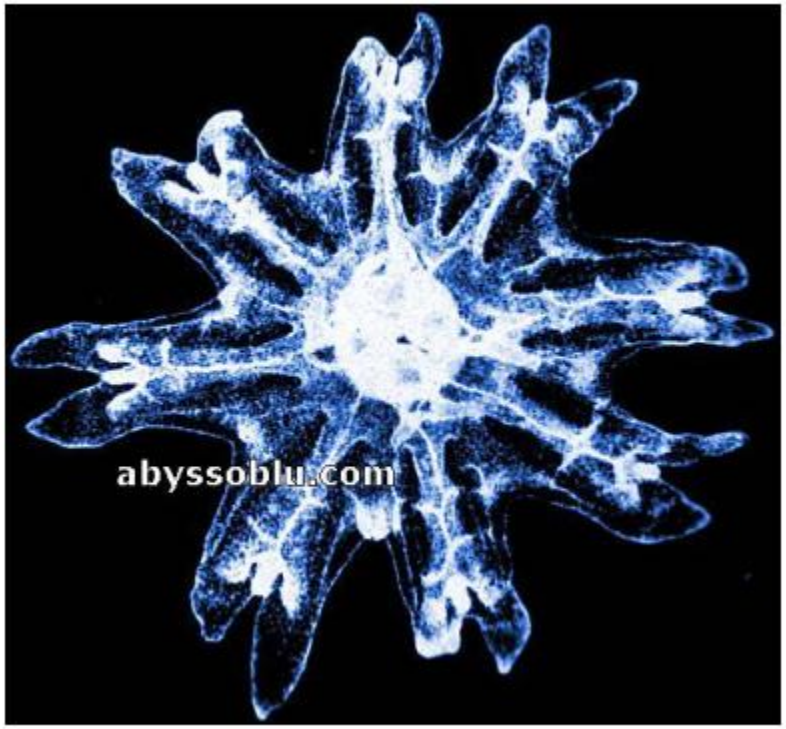

http://www.youtube.com/watch?v=HqfCm58SB6Y

26-3 Section QUIZ

1 The characteristic that defines the cnidarians is

a. bilateral symmetry.

A b. stinging cells.

c. a gastrovascular cavity.

d. cephalization.

2 Which of the following statements is generally true of polyps and medusas?

A a. Polyps are sessile, and medusas are motile.

b. Polyps are motile, and medusas are sessile.

c. Both polyps and medusas are sessile.

d. Both polyps and medusas are motile.

3 During the life cycle of *Aurelia*, the zygote grows into a free-swimming

a. polyp.

A b. larva.

c. medusa.

d. gemmule.

4 Cnidarians, such as the sea anemone, move using

a. water currents.

b. an exoskeleton.

A c. a hydrostatic skeleton.

d. an endoskeleton.

5 Groups of sensory cells that help cnidarians determine the direction of gravity are known as

a. nerve nets.

A b. statocysts.

c. ocelli.

d. cnidocytes.

END OF SECTION