Cnidaria Station Lab

Station 1. Class Anthozoa (the “flower animal”)

Have a close look at the sea anemone and answer the following questions.

1. What structure is contained within the main body area/column?

2. Digestion. The sea anemone has a single opening with which to eat, look at the “digestive systems” diagram and describe a challenge this type of organism faces.

3. What are the two layers of tissues called in Anthozoans? Use the diagrams to help you.

Station 2. Class Hydrozoa

4. With the hydra diagram, discuss similarities and differences between a human stomach and the gastrovascular cavity of the hydra.

5. According to the Matt Simon article, why is the hydra thought to be immortal?

6. Again, using the Matt Simon article, from Greek mythology, where did the hydra get its name? What was unique about the Greek hydra that is similar to today’s hydra species?

7. Describe the asexual process of reproduction that hydra use, what is it called and how does it work?
Station 3. Class Scyphozoa (the true jellyfish)

7. Look at the specimens present at this station, the Aurelia (aka moon jelly, common jelly, or saucer jelly) and the Portuguese man-o-war, and discuss the similarities and differences between them.

8. Now look at the diagrams of the Aurelia and the packet on the Portuguese man-o-war and choose 2 anatomical features that you didn’t know much about and write what you learned that you didn’t know before this.

9. Use the species card with the species in the table below. Then use it to identify the species of Scyphozoa in the numbered pictures. Fill in two facts about each.

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<th>Number</th>
<th>Common name of Scyphozoan</th>
<th>Two facts about each</th>
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DIGESTIVE SYSTEMS

- INCOMPLETE
  - single opening
  - both for input and output
  - sponges, cnidarians, ctenophores, flatworms

- COMPLETE
  - two openings
  - one for input and the other for output
  - nematodes, annelids, molluscs, arthropods, echinoderms and chordates
Anatomy of Anthozoa: Sea Anemones and Corals

- epidermis
- mesoglea
- muscle fibers
- nerve net
- gastrodermis
- nemocyst
- gastrovascular cavity
- thread (after discharge)
- coiled thread (before discharge)
- anemones (polyp stage)
- corals (tentacles)
- 2 tissue layers: gastrovascular cavity, epidermis, mouth
The hydra is one of the few creatures on Earth that looks exactly like a palm tree, another being the dancing palm tree during Katy Perry’s Super Bowl halftime show. But let’s not speak of the dancing palm tree. LISTEN, I DON’T want to live forever. First of all, it’d take a really long time to work enough to save up for that long of a retirement. And I dunno, I’m a writer. I live by deadlines. And there ain’t no bigger deadline than your own inevitable death.

But there’s one creature that doesn’t need to get hung up on retirement or deadlines, and accordingly it could well be immortal. This is the bizarre existence of the hydra, a half-inch tube of jelly that inhabits fresh water all over the world, where it lives a long, long time under the right conditions—and if you don’t assault it.

Yet even then, it has remarkable powers of regeneration. Cut it in half and you’ll eventually end up with two hydra. Mix a bunch of them up in a test tube, break them all apart into single cells, and still they’ll re-form into a ball and split off as individuals. Yeah, I know, that doesn’t really seem possible. But stick with me here.

As Kermit once said, it’s not easy being green. These transgenic hydra, which are loaded with a green florescent protein, would no doubt confirm that if they too had a puppeteer making them say stuff.

**Who Wants to Live Forever**

This is a supremely simple animal, belonging to the same group as jellyfish, the *cnidarians*. “I sometimes describe hydras sort of like a little free-living piece of intestine,” said hydrobiologist Rob Steele of the University of California, Irvine. At one end is a sticky disk, which the hydra uses to anchor itself, and at the other is a mouth and tentacles packed with stinging cells, which fire toxic harpoons into prey. Holding the quarry in place, the hydra then ratchets its mouth over the victim—typically a tiny crustacean called a water flea—until it’s entirely enveloped.

Back in the ‘90s, a fella named Daniel Martinez gathered up 60 of these creatures and isolated them in their own tiny tanks. Hydra reproduce asexually, budding off little clones, so Martinez had to pick those young out and toss them. After four years of this, not only were the hydra still alive, but they looked as good as new. Four years may not sound like a long time, but the rule in nature is that the smaller you are, the shorter you live. Thus can small insects last only a matter of weeks, while blue whales keep ticking for nearly a century. Something the size of a hydra living for four years is just ridiculous.

So Martinez published his findings, declaring the hydra potentially immortal. Unsurprisingly, this rustled a few people’s jimmies. “So he published that result,” Steele said, “and then the naysayers came along and said, ‘Well maybe the average lifespan of hydra is six years, so you didn’t do the experiment long enough.’ So he went back and restarted the experiment, and I think he’s now at about year eight,” making his hydras the oldest known specimens. “He’s going to do it for 10 years, and then he says never again. If 10 years isn’t enough for them, that’s their problem.”

I should reiterate: The hydra is thought to be potentially immortal. “To say that it’s immortal implies that there might actually be hydra running around that have lived for 10,000 years,” Steele said. “I don’t know that that’s possible. But it has the potential from what we know about it for being immortal.”
The hydra’s secret seems to be that it sheds its entire body and starts from scratch every few weeks. It’s essentially just a sack of stem cells, which are kind of like blank slates. These eventually specialize into, say, a cell that makes up the tentacle. But the hydra will shed this cell after just a few days, keeping it from aging and wearing out like our own cells do. “It doesn’t have any cells that hang around long enough to get old and decrepit,” Steele said, “and therefore the individual doesn’t get old and decrepit.”

So there you have it: the secret to potential immortality. (Another miniscule creature that’s worth mentioning, the adorable eight-legged water bear, has its own method of extreme longevity: It’s not immortal, but it can dry out to just a fraction of its normal water content and live for up to 10 years as a unconscious husk, only to reanimate once it again hits water.) Why the hydra would evolve such a unique way of life is still a mystery. And if you were hoping we could apply its trick to ourselves before you yourself keel over, I have some bad news. There really couldn’t be an animal more different than ourselves, so scientists don’t hold out much hope for indulging your egomania by way of the hydra. Sorry, but it’s for your own good.

The Show Must Go On

The Hydra of Greek mythology was a vicious serpent with a bunch of heads, which would grow into two if you cut one off. The hydra of the real world can do the same, only way, way more impressively. “You can poke a hole in them and they seal it up,” Steele said. “You can cut them in half and they regenerate the missing halves. You cut them into 20 pieces and you get 20 hydra.” Its ultimate trick, though, doesn’t make a lick of sense in a world governed by, you know, certain rules and stuff.

“Dissociate” is a verb, and a very good one at that, meaning to break something down into smaller bits, such as individual cells. You do not want to be dissociated. But dissociate a bunch of hydra into a soup of cells, and incredibly they emerge again as individuals.

Hydra reproduce asexually, budding off clones, as you can see here. It’s like the movie Multiplicity, only with less pizza. Here’s how it works. Scientists can drop 100 or so hydra in a test tube and treat them such that they dissociate into a goopy mass of cells, then spin the tube so the mass forms into a ball. “They’re all mixed up now,” Steele said. “The cells that were on the outside of tentacles are next to cells that were on the inside of the body column. Everybody’s just mixed up, there’s no pattern to the animal at that point.” But over the course of a few days, the cells that make up the outside of the hydra somehow make their way to the surface of the sphere, while the cells that should line the gut make their way into the center. Then the inside of the sphere forms a cavity, which will be the gut, and you end up with a hollow, two-layered sphere, just like an individual hydra has an outer layer and an inner one with fluid between the two.

“The next thing that happens is heads start to form,” Steele said, “and depending on how big the clump was that you started with, you may get one, two, three, four heads. And then those heads will form feet next to them eventually, and the whole thing will start to separate into individual hydra.”

“It’s just an amazing phenomenon,” he added. “You can’t do that with too many other animals. If you do that with a mouse you get a bloody mess.”

So from one super-hydra are born many. They slowly disperse, planting their sticky feet, then bending over and grabbing the surface with their mouths and releasing their feet, somersaulting their way through their (maybe) immortal life. Actually, if being immortal means somersaulting all the time, I just may be into it. No cartwheels, though. I draw the line at cartwheels.
LION'S MANE
This is the largest known species, with tentacles as long as 100 feet.

MOON JELLYFISH
They tend to stay close to the surface of the water, making them easy prey for large fish, turtles, and the occasional marine bird.

ATLANTIC SEA NETTLE
Unlike other species of jellyfish who only eat plankton, sea nettles have been known to prey on minnows, worms, and mosquito larvae by stinging them with their powerful venom.

PORTUGUESE MAN-OF-WAR
This is not a jellyfish but a siphonophore, an organism made up of many highly specialized minute individuals called zooids.

FRESHWATER
These tiny jellyfish (1 inch big) can be found in almost every state in America and almost every continent.
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