

Name of Scientist: _____

Period: _____

Purpose of today's activity

- Study basic regeneration using *Hydra*

Materials

- ~3-4 *Hydra* per person
- Petri dishes
- *Hydra* Medium
- Transfer pipettes
- 6-well plate for keeping dissected pieces
- Small square coverslips
- Ice in bowls or cups
- Permanent Marker
- Basic dissecting microscope

Introduction

Hydra is a small, freshwater animal related to jellyfish with a very simple body plan. *Hydra* is shaped like a hollow tube with **tentacles** and a **mouth** at the top of its body and a **foot** at the bottom. It uses its tentacles and mouth to catch and eat food and it uses its foot to stick to surfaces. The part in between its tentacles and foot is called the **body column** and contains the stomach.

Can you locate these structure on the cartoon?

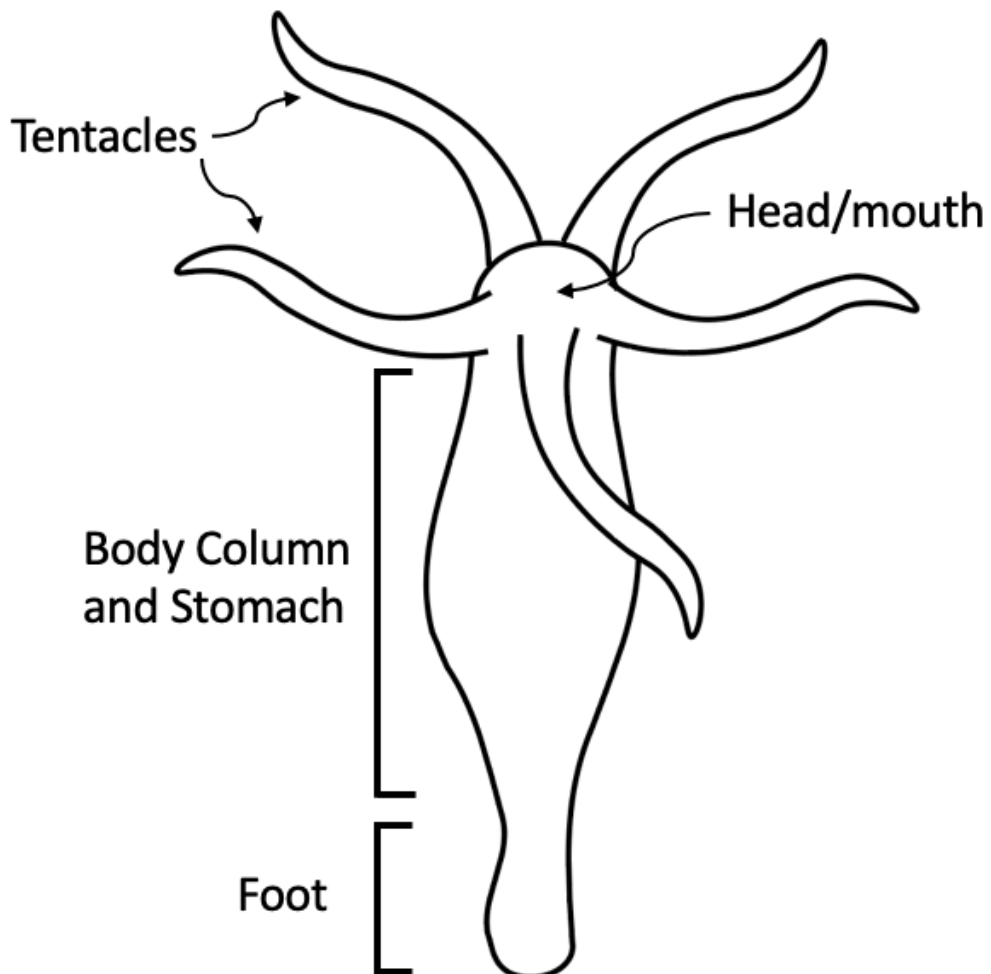
Hydra is very special because when it gets injured, it can **regenerate** (regrow) parts of its body! It can do this using a special type of cell called a **stem cell**.

Stem cells can make many different types of cells and help *Hydra* make new body parts after injury.

The stem cells are located in the body column but are not in the foot, head, or tentacles.

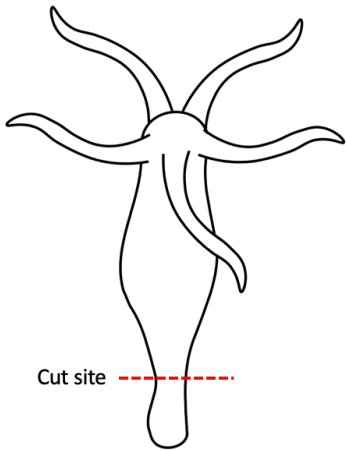
Can you color in where the stem cells are located?

In this lesson, we will be cutting *Hydra* into 2 or more pieces, making predictions about how the pieces will regenerate, and then observe them regenerating over 3-4 days.



Procedure Part 1: Making Predictions

1. Transfer the *Hydra* into petri dishes with enough *Hydra* medium to generously cover the animals. Observe the *Hydra* underneath the microscope. What are some features you notice about the animals? Can you find all the features from the labeled cartoon?
2. Put the petri dishes on ice for 20 minutes. This will help the animals stretch out and relax so they don't move around as much.
3. During this time, plan out how you're going to cut each *Hydra*. Draw on each *Hydra* cartoon exactly where you will cut each animal (1 cartoon per animal). Draw and write your prediction about how each piece will regenerate. Think about where the stem cells are located and use the following scenarios to help you make predictions.



Discuss your predictions with your group members!

Example Drawing and Prediction:

I predict that if I cut *Hydra's* foot off, it will not regrow a foot. I predict that it will regrow a tentacle instead of a foot.

I predict that if I remove the foot, the *Hydra* body **will** or **will not** (circle one) regrow a new foot.

Explain your reasoning. If you chose "will not", what do you predict will happen?

I predict that if I cut off and keep *Hydra's* foot, the *Hydra* foot **will** or **will not** (circle one) regrow a new body.

Explain your reasoning. If you chose "will not", what do you predict will happen?

I predict that if I cut the *Hydra* in half vertically, the *Hydra* **will** or **will not** (circle one) be able to regrow the missing body parts.

Explain your reasoning. If you chose "will not", what do you predict will happen?

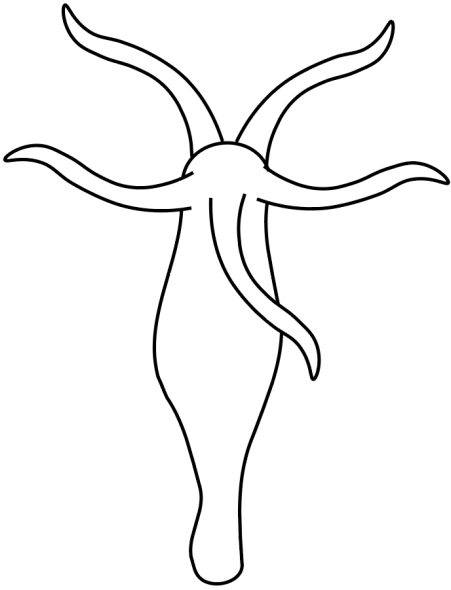
I predict that if I cut the *Hydra* into small pieces, the pieces **will** or **will not** (circle one) be able to regrow into whole *Hydra*.

Explain your reasoning. If you chose "will not", what do you predict will happen?

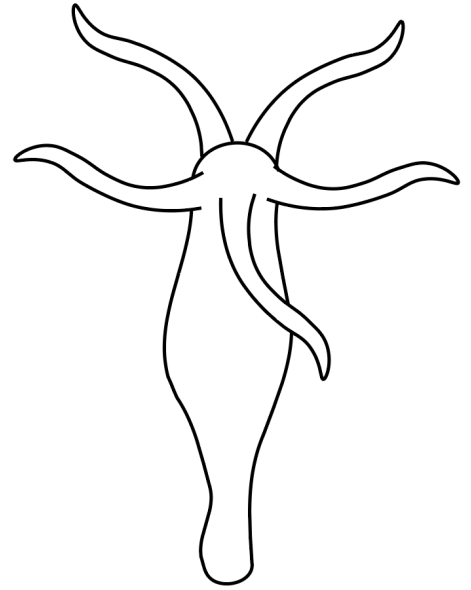
I predict that if I cut off and keep *Hydra's* tentacles, the tentacles **will** or **will not** (circle one) be able to regrow a whole *Hydra*.

Explain your reasoning. If you chose "will not", what do you predict will happen?

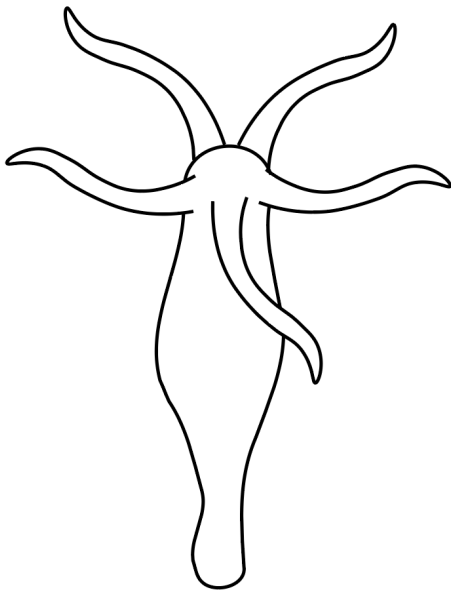
PREDICTIONS PAGE:
Draw out how you will cut
each *Hydra* and write your
predictions about what will
happen!



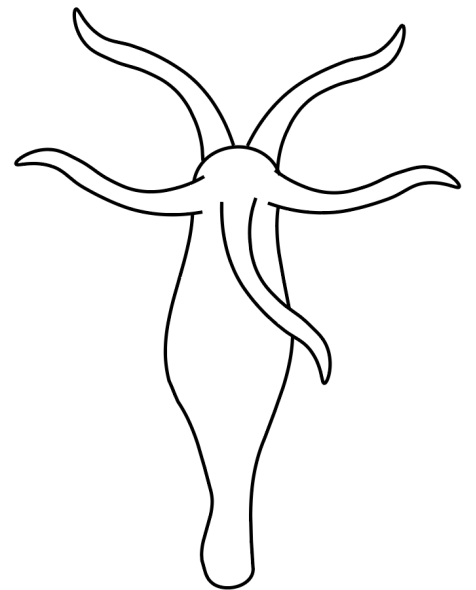
Hydra #1
I predict that...



Hydra #2
I predict that...



Hydra #3
I predict that...

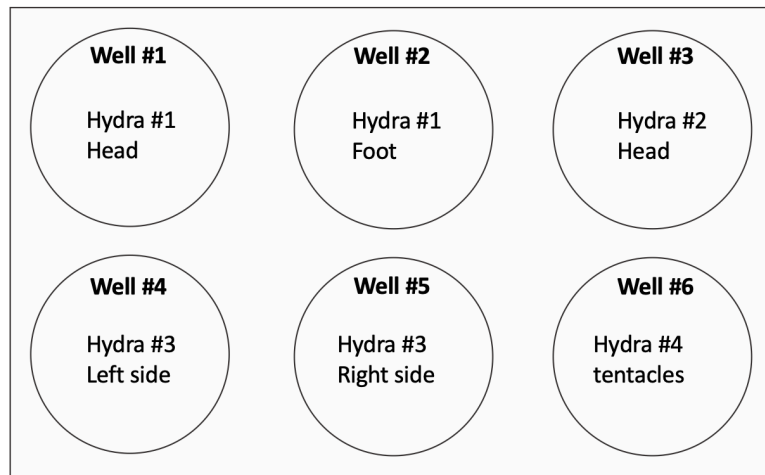


Hydra #4
I predict that...

Procedure Part 2: Performing Dissections

1. After the 20 minutes is over, take the petri dish off of the ice and place under the microscope
2. Use your coverslip to cut each *Hydra* as you planned with your cartoon drawings.
3. Place each piece into an appropriately labeled well in the 6-well plate. Add enough *Hydra* medium to generously cover the pieces
 - a. See image below for labeling examples
4. Check the pieces every day and record how they change. If you have time, do a drawing of how the pieces change every day. Are they regenerating how you predicted? Are they doing something you didn't predict? Did any parts not regrow?

An example of how to label each well



How will you label your wells?

Well #1	Well #2	Well #3
Well #4	Well #5	Well #6

Record your observations every day! Do the *Hydra* pieces look different? How? Were your predictions correct?

Hydra #1

Day 1:

Day 2:

Day 3:

Day 4:

Hydra #2

Day 1:

Day 2:

Day 3:

Day 4:

Hydra #3

Day 1:

Day 2:

Day 3:

Day 4:

Hydra #4

Day 1:

Day 2:

Day 3:

Day 4:



Nice job!

