Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

**Planarian Lab**

1. **Title**

**Determining the Location of the Stem Cell Niche based on the time it takes for parts of a planarian to regenerate.**

**2. Introduction**

Before we begin this lab, you need to do some research about planarians and their regenerative properties. Please research and answer the following questions – ***do not forget to cite your sources!*** Saying “google” is not citing a source. You may write the URL after the answer. ***Write all answers in your own words* in complete sentences*!!!***

* ***Background Information***

***About planarians:***

1. In what environment(s) are planarians normally found in nature?
2. What is the purpose of the planarian’s photoreceptors found in the eyespots?
3. Describe how a planarian normally eats.
4. When a planarian is cut into pieces, how does it eat?
5. How do planarians reproduce? (there are two different ways, **explain both**)
6. What is a blastema and what does it look like in the planaria?
7. What are neoblasts and what is their purpose in planaria?
8. Identify a specific way in which planarians are being used for research.
9. Define regeneration (in animals)?
10. How is regeneration useful for organisms?
11. Explain ways that humans regenerate?
12. Name 2 organisms (other than planaria) that can regenerate and how they regenerate.

***Watch the video:***

* <http://www.hhmi.org/biointeractive/planarian-regeneration-and-stem-cells>
* **Purpose**
* **To determine where stem cells are located in the planaria, based on the length of time it takes for the parts of a planaria to regenerate.**
* **Hypothesis**

If one piece of a planarian grows back faster than another then the stem

cells must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**3. Materials**

* planarian culture (*Dugesia dorotocephala*)
* disposable scalpels
* dropping pipets
* petri dishes
* permanent marker
* stereomicroscope/dissecting scope
* spring water
* paper towels

**Methods**

1. Number the **bottoms** of three of the petri dishes 1 through 3, fill halfway with spring water, and set aside. (Marking the bottoms will prevent confusion by accidental swapping of lids.)
2. **Bring the lid** of one dish to your instructor to obtain your planarian.
3. Using a scalpel, make Cut #1 to the planarian as indicated on the diagram on the right. Do not cut as if you were using a knife! Use pressure by placing the scalpel in the correct location and rock it back and forth*. Note: Cutting them in a precise location can be difficult, do your best.*
4. Using a transfer pipette, place the head in petri dish #1, the mid-section in petri dish #2 and tail section in petri dish #3.
5. On the data table, record any observations in movement or behavior of the planarian pieces.
6. Draw each planarian piece as precisely as possible taking into consideration body shape and coloring.
7. Monitor planarians daily, recording ***detailed, specific observations*** of their regeneration.
8. **Data Table:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Day** | **Segment #** | **Drawing** | **Photoreceptor**  **Present** | **Observations (movement, changes, etc.)** |
| **0** | **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |
| **Segment #** | **Drawing** | **Photoreceptor**  **Present** | **Observations (movement, changes, etc.)** |
| **3** | **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |
| **5** | **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |
| **Segment #** | **Drawing** | **Photoreceptor**  **Present** | **Observations (movement, changes, etc.)** |
| **7** | **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |
| **10** | **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |

**5. Discussion**

**Questions**

1. After you cut your planarian, how did the mobility of the tail fragments differ from the mobility of the head fragments? Do they move the same or differently? If they move differently, why do you think this is?
2. Did you notice a difference in the mobility of the tail pieces as the head regenerated? Explain what you saw and why this might be.
3. Describe the regeneration of piece 1 over time. Did it result in a complete (with eyespots and tail) planarian?
4. Describe the regeneration of piece 2 over time. Did it result in a complete (with eyespots and tail) planarian?
5. Describe the regeneration of piece 3 over time. Did it result in a complete (with eyespots and tail) planarian?
6. Discuss how the color of the regenerating parts changed over time? Explain why this difference in coloring may have occurred.
7. When the heads were growing back, do you think the eyespots were functional? How would you test this?
8. Did all the fragments regenerate at the same rate? Which were slower and which were faster? (give specific piece numbers and days)
9. What does the rate of the different fragments tell you about the regeneration ability of different sections of the worm? Based on your data, where might the main stem cell niche be for the planarian? Why did you choose this area?

**Explain how stem cells allowed the planaria to grow back the lost body parts. (use the words: stem cell, stem cell niche, migrate and gene activation)**