**Stem Cells in Planaria Regeneration and Wound Healing**



***Caption:***Amputation shows surgical removal of the two thirds of the body, incision shows a cut that does not result in loss of tissue and can reseal. Histone H3P which is present from the onset of mitosis to telophase is used as marker of mitosis. The number of mitotic cell divisions is determined throughout the animal at 6h, 18h and 48 h after injury. Data show average +/- standard deviation for 4 or more samples at each time point. \*\* shows a statistical significance of p< 0.01 (Student’s t-test) between the amputation and incision samples.

**BACKGROUND INFORMATION**

Mitotic cell division provides many functions. One of these functions is to replace cells that are destroyed after wounding. A specialized type of cell called **stem cell** can be useful in healing serious cell damage and/or for tissue and organ replacement. Planaria which is a flatworm that lives in freshwater environments can regenerate an entire body from up to 1/278th of its body when cut up and is therefore an excellent **model organism** to use for understanding cell regeneration as this organism regenerates at amazing rates. In this study scientists try to better understand how stem cell division helps produce new cells to heal wounds in humans by better understanding how the planaria model heals such wounds. They generate different types of wounds in planaria and observe how stem cells or “neoblasts” work to divide and produce new cells by mitosis in order to repair damage or produce missing structures.

REFERENCES

Scientist at Work Video from HHMI Biointeractive: Identifying Key Genes in Regeneration: <http://www.hhmi.org/biointeractive/identifying-key-genes-regeneration>

Scientist at Work video from HHMI Biointeractive: Planaria Regeneration and Stem Cells <http://www.hhmi.org/biointeractive/planarian-regeneration-and-stem-cells>

Planarian regeneration involves distinct stem cell responses to wounds and tissue absence. Wenemoser & Reddien; Dev Biol.; 2010 August 15; 344(2): 979–991. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2950745/>

DISCUSSION QUESTIONS

1. What is shown on the x-axis?

2. What does the y-axis indicate?

3. In this study, some planaria are amputated and others have a slit cut into them. Which of these treatments do you hypothesize would require more cell divisions to fix? Justify your hypothesis,

2. Based on the graph, what happens to the number of neoblast cell divisions during the first 6 hours after amputation of two-thirds of the planaria?

3. Compare the number of mitotic cell divisions at 6 hrs after the amputation tissue removal to the number of cell divisions 6 hrs after incision wounding. Is there a difference? Does this result support your hypothesis? Explain why or why not.

4. In the amputated planaria, are there more neoblastic cell divisions 8 hrs post injury or 18 hrs post injury? Discuss.

5. Is there a change in the number of mitoses from 18 hrs to 48 hrs post injury in the incised planaria? How about the amputated planaria? Do these data support your hypothesis? Discuss.