Growth, Metamorphosis, and Regeneration of Planaria

Zach Sergi, Cody Hyle, Zack Long, Cullen Williams
Longwood University 201 High Street, Farmville, VA, 23909
Department of Biological and Environmental Sciences

Background

- Planaria (Platyhelminthes) are flatworms that can mostly be found in freshwater and have the ability to regenerate.
- Planarian regeneration involves the formation of new tissue at the wound site via cell proliferation (blastema formation), and the remodeling of pre-existing tissues to restore symmetry and proportion [1].

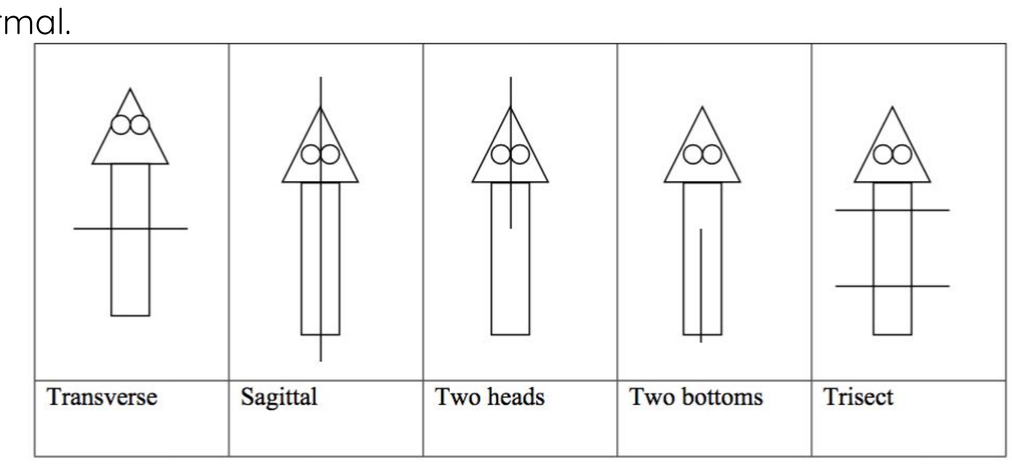
Introduction

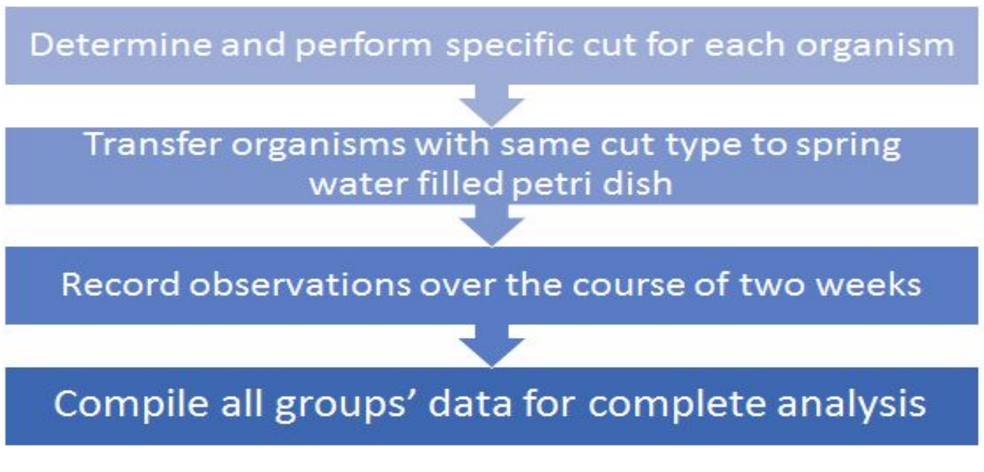
- A single pluripotent adult stem cell type (“neoblast”) gives rise to the entire range of cell types and organs in the planarian body plan, including digestive, excretory, sensory, reproductive, and central nervous systems [2].
- Neoblasts are abundant throughout the mesenchyme and divide continuously [2].
- The resulting stream of progenitors and turnover of differentiated cells drive the rapid self-renewal of the entire animal within a matter of weeks [2].

Methods

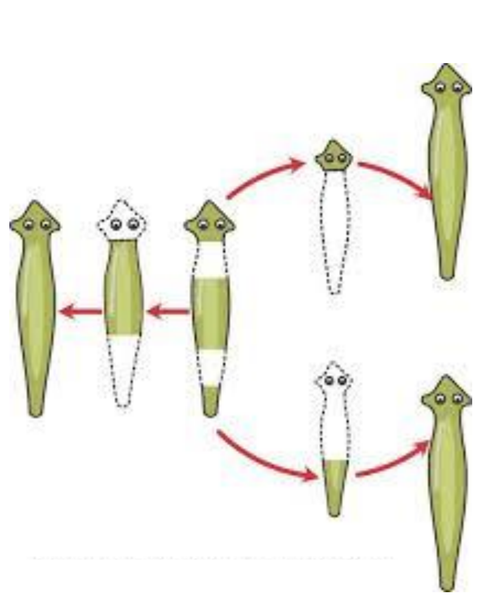
Question
Will the planaria regenerate completely when taken multiple cuts?

Hypothesis:
The planaria will regenerate all damaged areas of their body back to normal.



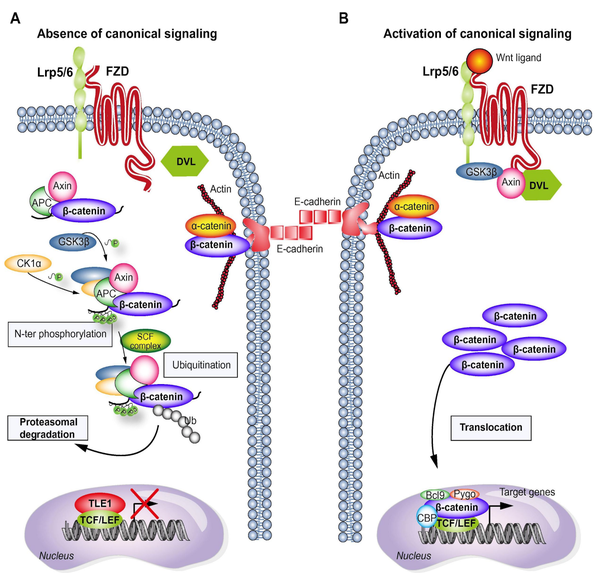


Results



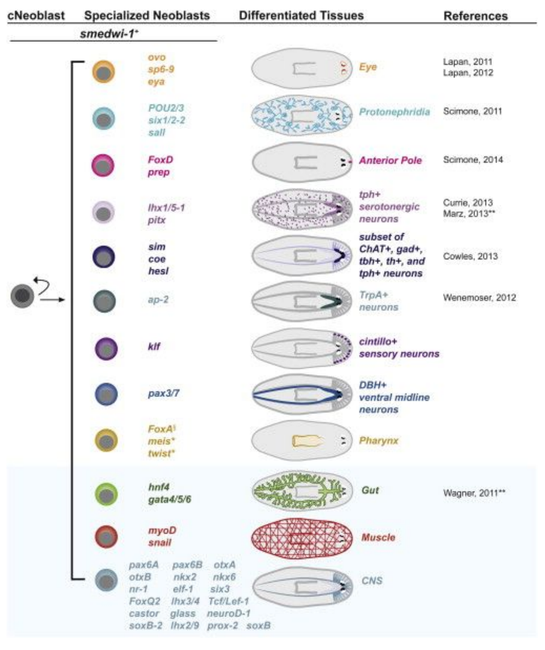
Cut Method	Results 8 days after cut
Transverse	Both segments regenerated
Sagittal	No segments survived
Two heads	Both segments regenerated
Two bottoms	Tail regenerated + budding on side
Trisect	Three segments regenerated

Discussion



Similarity to Mammalian Axis Polarity proteins[3]

Mechanisms of neoblast facilitation



Neoblast specialization

Application to stem cell research and regenerative medicine[3]

Literature Cited

1. Reddien, P. W., & Alvarado, A. S. (2004). Fundamentals of planarian regeneration. *Annu. Rev. Cell Dev. Biol.*, *20*, 725-757.
2. Rink, J. C. (2013). Stem cell systems and regeneration in planaria. Development genes and evolution, 223(1-2), 67-84.
3. Gentile, L., Cebrià, F., & Bartscherer, K. (2011). The planarian flatworm: an in vivo model for stem cell biology and nervous system regeneration. *Disease models & mechanisms*, 4(1), 12-19.