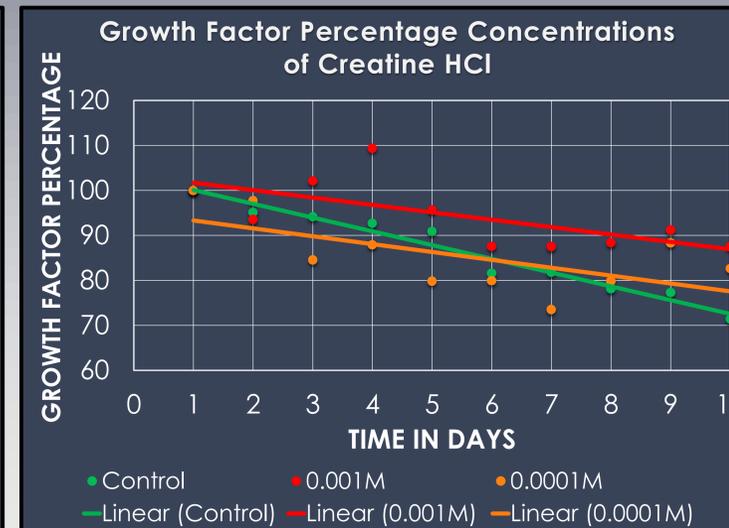
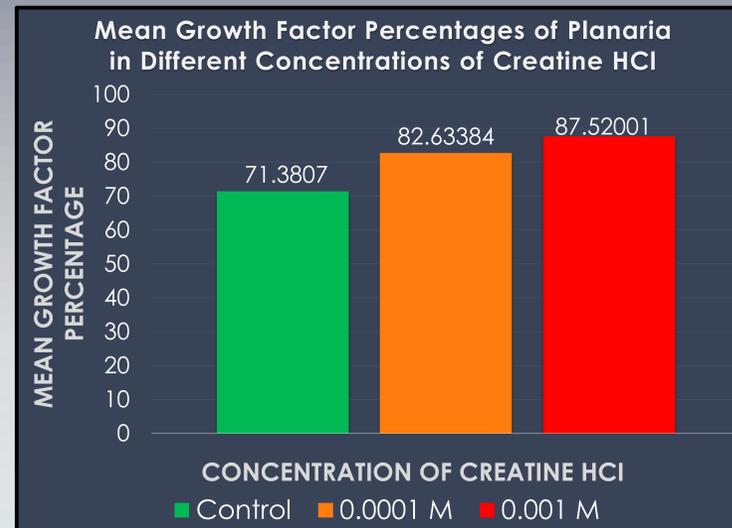


Abstract

Planaria are flatworms that live in freshwater and marine environments. One planarian can be cut into over two hundred pieces and each piece can regenerate into a whole planarian. This remarkable regenerative capability is due to the presence of neoblasts which are similar to the stem cells found in mammals. One neoblast cell is capable of forming thirty different types of cells. Creatine is a naturally occurring nitrogenous organic acid that provides additional energy to the muscles which enables rapid muscular growth and increase in body mass. The goal of this project is to study the effects of creatine on planaria regeneration. We hypothesize that planaria regeneration in the presence of creatine HCl will be faster and the regenerated planaria will be larger and have greater body mass. All planaria will be cut in the middle to create a head and tail piece. For this study only head pieces were used. These pieces were placed in petri dishes containing two different concentrations of creatine HCl (0.001M and 0.0001M). Images of the regenerating planaria were taken and processed using ImageJ software for quantitative data analysis. This data were recorded and analyzed, growth factor percentages were calculated, and two sample t-tests were conducted. The control specimens produced a mean growth factor percentage of 71.38%, the 0.0001M specimens produced a mean growth factor of 82.63%, and the 0.001M specimens produced a mean growth factor of 87.52%. T-test results showed a significant difference in growth factor percentages between the control and 0.001M specimens proven by a P-value of 0.034. This rejected the null hypothesis. T-test results of the control and 0.0001M specimens produced non-significant results proven by P-value of 0.152.

Results



Conclusion

Using descriptive statistics and a two sample t-test, it was determined that there was a significant difference in the growth factor percentage of the control and the experimental 0.001M head pieces. The specimens exposed to 0.001M creatine HCl produced a mean growth factor percentage of 87.52% while the specimens exposed to regular spring water produced a growth factor percentage of 71.38%. T-test results produced a P-value of 0.034, suggesting that there is a significant difference in regeneration between specimens exposed to regular spring water and 0.001M creatine HCl. Although the 0.0001M specimens produced a higher growth factor percentage than the control specimens, t-test results produced a non-significant P-value of 0.152.

Background Information

- Neoblasts are bundles of pluripotent stem cells.
- Solutions that planarians are placed within play a role in planarian regeneration.
- Cell division requires energy.
- Planarians will destruct their own cells to provide energy for regeneration which causes shrinkage during regeneration.
- Creatine supplementation is used to generate ATP from ADP.

Materials/Methods

Brown planaria were obtained from Carolina Biological Supply Company. Different amounts of creatine HCl were used to make both a 0.001M and a 0.0001M solution. The planaria were cut in half and placed into the different solutions. For this study only the head pieces were utilized. Two heads were placed in two separate control petri plates containing 8 ml of spring water. For both experimental solutions three heads were placed in three separate petri plates containing 8 ml of respective creatine solution. A baseline scale photo was taken of a mm ruler at a set distance for future measurements using ImageJ. Photos were then taken of all specimens at the same set distance and zoom for baselines. Photos were taken of all specimens every day for 10 days. These photos were then investigated using ImageJ software to measure the area of the planaria for each day. This data was recorded and analyzed. Growth factor percentages were then calculated and a descriptive two-sample t-test was used to determine if there were any significant differences in the results of the control and the experimental specimens.

Control Day 1 Control Day 10



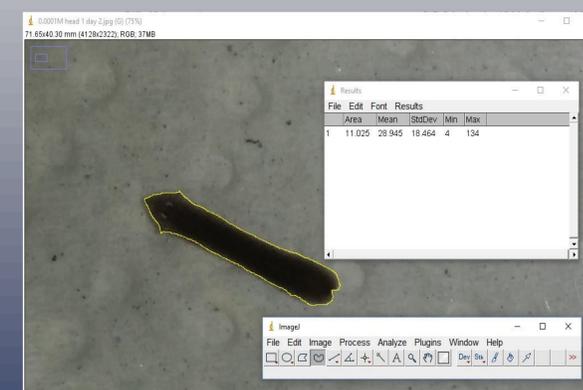
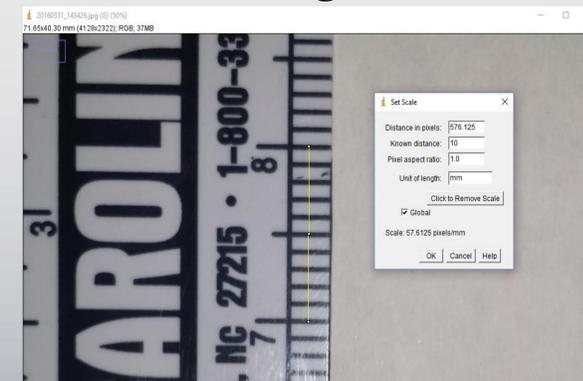
0.001M Day 1 0.001M Day 10



0.0001M Day 1 0.0001M Day 10



ImageJ



Future Work

- More planaria specimens will be used to observe the neoblast cells in creatine solutions to attempt to replicate the results found in this research study.
- Analysis of planarian will be taken after the regeneration period is completed to monitor the size of the planaria.
- Isolate regenerated cells to determine if cells regenerate faster or larger in creatine solutions.
- If the results provide substantial evidence that creatine positively affects the growth of cells, further research will be conducted with human stem cells.

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