



DOES TURMERIC ENHANCE THE REGENERATION OF *PLANARIA MACULATA*?

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BACKGROUND

For centuries, many Asian cultures have believed that turmeric (*Curcuma longa*) is beneficial in healing. Turmeric was used over 3,00 years ago in Ayurvedic, Unani, and Siddha practices as was thought to have many medicinal properties. This idea has carried on today as many South Asian countries believe that it is a good antiseptic and antibacterial agent for cuts, burns, and bruises. In Pakistan and Afghanistan, turmeric is used to clean out wounds and stimulate recovery of the broken skin.^[1]

The effects of turmeric have been tested many times, and it has been found that curcumin (diferuloylmethane) is the main curcuminoid present in turmeric and is also responsible for its yellow color. Curcumin has been proven to have significant anti-inflammatory, anti-coagulant, anti-carcinogenic, anti-mutagenic, antioxidant, and anti-infective effects. Curcumin has also been shown to have significant wound healing properties, hastening healing on the different stages of the natural wound healing process.^[2] Safety evaluation studies indicate that both curcumin and turmeric can be tolerated at very high doses without any toxic effects meaning that they have the potential for the development of modern medicine for the treatment of various diseases.^[3]

Since we were unable to acquire ethical approval to test the effects of turmeric on mammals, we had to resort to invertebrates. Planarians (free-living flatworms) have attracted many biologists because of their rapid regenerative abilities, their great abundance of adult stem cells, and the freshwater species are easy and cheap to maintain.^[4] Using *Planaria maculata* as a model, we wanted to compare the effects of turmeric to no treatment (control) and a western wound healing ointment called Polysporin. We chose Polysporin because we found that it was the #1-selling for infection protection and to heal wounds faster in Canada.^[5]

Purpose

1. To determine the effects of turmeric, compared to control and to Polysporin, on the regeneration of *Planaria maculata*.

Hypothesis

1. We predict that the correct concentration of turmeric will help the *Planaria maculata* regenerate the quickest in a dose-dependent manner.
2. We predict turmeric will increase the rate of *Planaria maculata* regeneration in a dose-dependent manner

Procedure

The regeneration environment was created using 42 tubs: six controls containing Nestle Pure Life spring water, 18 tubs with varying proportions of turmeric powder and spring water, and 18 tubs containing varying proportions of Triple Antibiotic Polysporin and spring water. The appropriate concentrations of turmeric and Polysporin were determined in an initial set of tests. All the concentrations that we created were too powerful for the *Planaria maculata* because they all died. After three trials, we got our correct concentrations. These concentrations were: control, 0.00025g/1mL of turmeric, 0.0005g/1mL of turmeric, 0.00075g/1mL of turmeric, 0.00125g/1mL of Polysporin, 0.0025g/1mL of Polysporin, 0.0005g/1mL of Polysporin. We then cut our *Planaria maculata* horizontally in their middle and then measured their lengths. We placed each half in its own separate tub, making sure that there were six *Planaria maculata* in each concentration. We measured the length of each *Planaria maculata* half every two days over the duration of fourteen days. Then using their lengths, we calculated their increases in length.

RESULTS

This broken line graph shows the daily increase of the Planaria's length over the fourteen days of the experiment. It shows their daily increase in lengths day by day. We added error bars onto our graph to show the

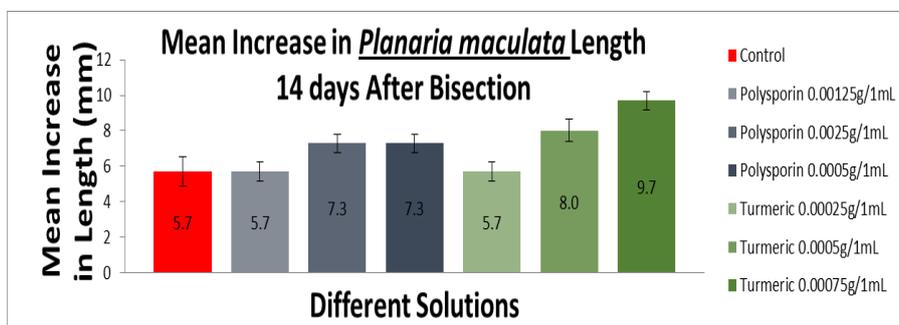
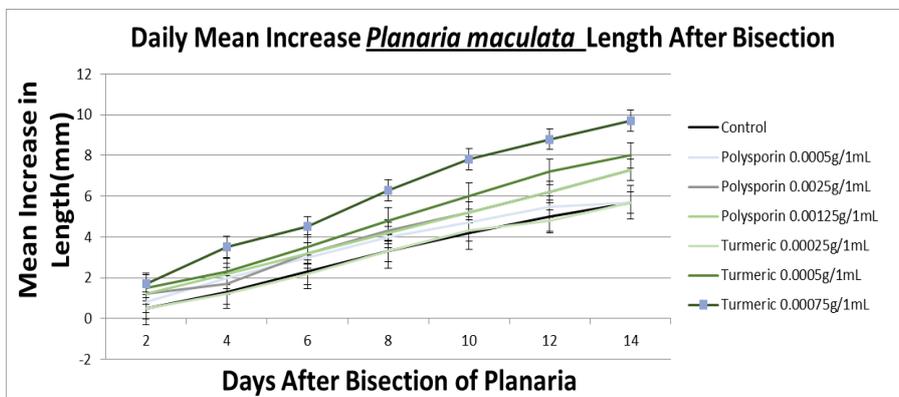
uncertainty of the means. We calculated one standard deviation above and one below the mean.

This bar graph shows the last day of the experiment. As you can see, the largest amount of turmeric had the greatest effect when compared to the control and any of the other concentrations.

Statistical Analysis

One mean increase shows the mean of 6 different *Planaria maculata* halves. Standard deviation shows

how spread the data is when compared to the mean (this helped create error bars). We used an unpaired test since we did not test all of the concentrations on the same *Planaria* half. We used a 2-Tailed T-Test because we were trying to figure out if the variable means had an increase or decrease in speed when compared to the control. The T-Tests gave us the p-values, which told us if our data was significant. All of our data that had P-values of < 0.01 were significant.



Treatment	Mean Increase in length after 14 days (mm)	Standard Deviation	Un-paired Student's 2-Tailed t-Test
Control	5.7	0.82	
Polysporin 0.25 g	5.7	0.52	No difference from control
Polysporin 0.50 g	7.3	0.52	p < 0.01
Polysporin 1.0 g	7.3	0.52	p < 0.01
Turmeric 0.05 g	5.7	0.52	No difference from control
Turmeric 0.10 g	8.0	0.63	p < 0.01
Turmeric 0.15 g	9.7	0.52	p < 0.01

DISCUSSION

Our study reveals that there is a strong association between *Planaria maculata* and turmeric. After bisecting the planarians and placing them in the environments with specific amounts of either Polysporin or turmeric in the spring water, the flatworms regenerated faster in the turmeric environment. The mean increase in length of planarians after 14 days was 5.7mm in spring water and 7.3mm in both 0.0025g/1mL and 0.0005g/1mL of Polysporin. The mean increase in length of planarians in the turmeric environment of 0.00075g/1mL was 9.7mm

after 14 days. The turmeric improved the speed of *Planaria maculata* regeneration in 14 days by 4.0mm when compared to the control. Although we used amounts as high as 0.0025g/1mL of Polysporin, the turmeric had a greater regeneration speed of the *Planaria* than the Polysporin at a much smaller concentration.

We were very restricted with the animals that we could test on. Since we used *Planaria maculata* as the subject and did not test it on humans, we cannot advise it to be used on human wounds.

Our study had limitations involving the planarians. The strength and speed of the neoblasts, the cells of annelid worms responsible for regeneration, for every *Planaria maculata* may not have been the same. The planarians may have not stretched fully before bisection, causing a possible inequality in the two halves.

REFERENCES

1. Prasad, S., & Aggarwal, B. B. (1970, January 01). Turmeric, the Golden Spice. Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK92752/#_ch13_sec13_
2. Akbik, D., et al. (2014, September 06). Curcumin as a wound healing agent. Retrieved from <http://www.sciencedirect.com/science/article/abs/pii/S0024320514007036>
3. Kumar, A. et al. (2011). A REVIEW ON SPICE OF LIFE CURCUMA LONGA (TURMERIC). Retrieved from <https://pdfs.semanticscholar.org/3f6e/10c453f1ab29545affd148e2d264168895f5.pdf>
4. Rink, J. C. (2013, March). Stem cell systems and regeneration in planaria. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3552358/>
5. About Us. (n.d.). Retrieved from <http://www.polysporin.ca/about>