



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b> <b>Sanjita Pamidimukkala</b>	<b>Project Number</b> <b>S2207</b>
<b>Project Title</b> <b>Prevention of Oxidative Stress Induced Diseases through the Effects of Curcumin on Planarial Stem Cells and Regeneration</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> Curcumin is an active ingredient in the commonly used spice, turmeric, and is often taken as a dietary supplement. Several studies have focused on the multifarious effects of curcumin like its antioxidative, cancer chemo-preventative, and anti-inflammatory properties. Some studies indicate that curcumin can decrease oxidative damage and improve cognitive deficiencies in regards to aging. Curcumin may be useful in the treatment of neurodegenerative diseases such as Parkinson s disease, a direct byproduct of oxidative stress. The goal of this research was to explore curcumin s effect on planarial regeneration and stem cells as well as monitor its impacts on reactive oxygen species and oxidative stress levels.</p> <p><b>Methods</b> First, planaria were soaked in different concentration of curcumin in the Permissible Exposure Limit assay to narrow the experimental range in further assays. Next, to narrow the range further and observe curcumin s effects on tissue development, planaria were exposed to light after curcumin pre-incubation with the knowledge that they are extremely photophobic. By testing their response to light in terms of time and locomotion, their regenerative stage could be determined quantitatively. Additionally, stem cell proliferation specifically could be monitored through the MTT assay. MTT is reduced by metabolically active cells, producing a purple dye whose concentration is proportional to the proliferation rate. Lastly, by inducing oxidative stress modeling Parkinson s disease through hydrogen peroxide in the Antioxidant and Protein ELISA assays, curcumin s ROS balancing and preventative capabilities were tested.</p> <p><b>Results</b> Through the MTT assay(reduction from a tetrazolium salt to a purple formazan dye) it was found that cell proliferation rates were significantly higher in planaria treated with curcumin in contrast to control groups (<math>p &lt; 0.05</math>, data is significant). Additionally, the Photophobia assay made it clear that curcumin enhances regeneration as it improved tissue growth and response times. Lastly, planaria pre-incubated with curcumin before Parkinson s modeling oxidative stress was introduced, showed much higher antioxidant activity (<math>p &lt; 0.005</math>). This indicates that curcumin operates as an effective ROS imbalance preventative and Parkinson s risk reducer.</p> <p><b>Conclusions</b> These results prove that curcumin is effective in accelerating regeneration and blocking oxidative stress-induced diseases in planaria flatworms. Many of the same genes and developmental processes that drive regeneration in planaria are present in humans, proven through several previous studies. The results hold</p>	
<b>Summary Statement</b> I found that curcumin was able to accelerate stem cell production and regeneration, as well as block oxidative stress, proving effective in the prevention of diseases like Parkinson's.	
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