High-Resolution Analysis of Neuroregeneration and Memory Retention in Planaria Under Pharmacological Treatment

Ayoola, Darion (School: Elite Scholars Academy)

Planaria (Dugesia spp.) are a well-established model for studying neural regeneration due to their ability to fully reform heads and central nervous systems after decapitation. This study investigates the effects of pharmacological agents, specifically antihistamines and neuroprotective compounds, on regeneration speed and post-regeneration memory retention. Planaria were conditioned to associate a stimulus with a food reward, decapitated, and allowed to regenerate under varying drug treatments, including single and combination dosing. High-resolution imaging was used to quantify blastema growth, head morphology, and eye development, while automated behavioral tracking software measured learning and memory retention throughout regeneration. Statistical analyses included ANOVA for regeneration metrics, repeated measures ANOVA for behavioral changes, and regression modeling for dose-response and drug interaction effects. It is hypothesized that drug-treated planaria will regenerate more rapidly and retain a greater proportion of pre-decapitation learned behavior compared to controls. The results are expected to reveal how specific pharmacological agents modulate neural regeneration and cognitive recovery. This project integrates quantitative morphological analysis, behavioral neuroscience, and pharmacology in a low-cost, accessible model system. These findings may provide insights relevant to neuroprotective strategies for mitigating cognitive deficits, such as those induced by chemotherapy or neural injury.

Awards Won:

NC State College of Engineering: Scholarship to attend NC State Engineering Summer Camp