Wasp Venom Stings Cancer: Investigation of Dictyostelium as a Model Organism and the Potential of an Improved Treatment Delivery System

Kaneria, Rini (School: Conrad Weiser High School)

This study focused on a targeted cancer treatment through the use of Polybia-MP1 (MP1), a peptide found in the venom of Polybia paulista. MP1 selectively attaches to phosphatidylserine (PS) lipids on cancer cells. PS-MP1 attachment causes pore formation in cancer cell membranes to promote apoptosis. There is a need to identify model organisms displaying PS-MP1 interaction. Starving Dictyostelium cells exhibit the same PS lipids on the outer leaflet of their cell membrane. To test Dictyostelium as a model organism for MP1-PS lipid attachment, healthy and starved Dictyostelium cells were exposed to increasing concentrations of MP1. The model was validated with cell count analysis, live cell imaging, an ATP/mitochondrial assay, and an Annexin V assay. Results support MP1 selectively targeting and inducing apoptosis in starving Dictyostelium cells. MP1 loses its potency in the bloodstream as enzymes degrade MP1 creating an obstacle to in vivo application. Hollow bioactive glass spheres (BGS) will be investigated to counteract this complication. MP1 will be encapsulated into BGSs followed by live cell imaging analysis. MP1-BGS could be injected directly into a cancer/tumor site for localized enhancement of apoptosis. Biodegradation of BGS simultaneously releases Ca+, attracting immune cells and promoting healthy cell proliferation. MP1-BGS would function as a two-tiered cancer treatment response, degrading tumor sites and promoting immune function. Additional cancer types, including breast cancer, should be investigated in the future for MP1 selectivity. Initial work will concentrate on breast cancer cells.