Honeybee Melittin Apitherapy for Targeted Cancer Cell Suppression and Decimation

Minichetti, Dante (School: Greenwich High School)

Chemotherapy continues to play an important role in treating various cancers; however, during the course of treatment it is often challenging to differentiate between cancerous and healthy tissue. This research investigates a new and more viable peptide found in honeybee venom, melittin, to demonstrate a selective mechanism for inhibiting cancer cell proliferation. Giant unilamellar vesicles (GUVs) were created to simulate healthy and cancer cell lipid bilayers using an integrated ITO glass chamber to assess the peptide's discriminatory properties. Honeybee melittin (0.11 mM) was introduced to the cancer and control GUVs. Confocal microscope images and ATR-FTIR scans of the GUV samples provided compelling evidence in support of melittin's selectivity. The cancer lines PA-1, MCF-7, and SKMG-4 were then subject to various concentrations of melittin (0–10 μg/mL). Fibroblast cells were tested under similar conditions as the control. A high concentration of melittin (10 μg/mL) was required to observe any noticeable influence on the fibroblast controls. Comparatively, all cancer cells were affected by the melittin treatment at much lower concentrations, as low as 2 μg/mL. The PA-1 cancer line was most dramatically affected by the treatment, while MCF-7 and SKMG-4 showed minor resistance. The results suggest that melittin induces cell death in PA-1, MCF-7, and SKMG-4 cancer cells, while leaving fibroblasts unharmed.

Awards Won:
Fourth Award of $500