



CALIFORNIA STATE SCIENCE FAIR

2015 PROJECT SUMMARY

Name(s) Jessika Baral	Project Number S0504
Project Title Novel Usage of Natural Phytochemical 3,3-diindolylmethane as Anti-Cancer Therapeutic and Preventative Drug for Melanoma	
Abstract Objectives/Goals Skin cancer accounts for more than 75% of all cancer diagnoses and melanoma accounts for more than 75% of skin cancer deaths. Every 57 minutes, someone with melanoma dies in US; only 10-15% of stage IV melanoma patients survive past 10 years. Brassica vegetables, such as broccoli and cabbages, represent a promising source of phytochemicals. This is the first study on the effects of 3,3-diindolylmethane (DIM), a metabolite found in Brassica vegetables, on human melanoma cancer cells. Methods/Materials Cells of three human melanoma cell lines (SK-MEL-28, G361, and SK-MEL-2) were cultured. Other materials used include DMSO (Dimethyl sulfoxide) [as a drug dissolving agent], DPBS (Dulbecco's Phosphate-Buffered Saline), DMEM (Dulbecco's Modified Eagle Medium) [for the media base], Nonfat dry milk powder, Bovine serum albumen, Chemiluminescent agents, Protein Antibodies, CCK-8 Reagent, and DIM powder. CCK-8 assays were carried out to gauge the effects of different concentrations of DIM on these cell lines by quantifying the amount of viable dehydrogenase enzymes. Flow cytometry assays and Western blots were then carried out to establish the path DIM is acting on to inhibit melanoma tumor proliferation. Results Results proved that DIM significantly reduced tumor size; cell proliferation rates decreased by 97.44% to 99.45% after just 24 to 48 hours of treatment respectively. Western blots show a PTEN upregulation, indicating that DIM works to significantly induce apoptosis. DIM induced a G1 cell cycle arrest in the G361 cells, which proved to be the most responsive to DIM treatment. Western blots also indicate a Cyclin D downregulation in the G361 cells, which correlates with this cell cycle arrest. Conclusions/Discussion The results support the hypothesis that DIM is a potent anticancer drug. Current treatments, including chemotherapy, drug therapy, and immunotherapy, target only select forms of melanoma, have severe side effects including autoimmune responses, and cost hundreds of thousands of dollars. Standard dosages of DIM exhibit no major side effects and DIM is more than 1000 times cheaper than current drugs. DIM can also be used as the first drug that is a preventative agent for melanoma. Clinical trials will be started.	
Summary Statement My research determined, for the first time, the significant tumor-suppressing effects of 3,3-diindolylmethane on human melanoma cancer cells and proved that DIM can be a therapeutic and preventative drug agent for melanoma.	
Help Received Used research facility at the Department of Molecular and Cellular Biology at UC Berkeley.	