A Novel Approach to Early Stage Melanoma Diagnosis Using Bioconjugated Gold Nanoparticles and Molecular Optical Coherence Tomography

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Optical Coherence Tomography (OCT) is relatively new non-invasive imaging technique that can be used for a variety of medical diagnosis. OCT is cost-effective and requires fewer resources than most other imaging systems, but without contrast agents the OCT's use in biological imaging is limited. OCT differentiates between substances due to their distinct optical properties; the lack of diverse optical properties within skin tissue requires the use of a contrast agent to enhance the image. This experiment explores the use of gold nanospheres as contrast agents by conjugating with proteins as cellular melanoma biomarkers and their use for imaging precancerous and cancerous lesions. The nanospheres will be bound to Galectin-3 antibodies which will then be attached to melanoma cells and not to fibroblasts, which are normal cells found in the majority of the dermis. It was hypothesized that a concentration of one million bioconjuagtes per cell will be the more effective contrast agent to differentiate between the cancerous and normal cells when viewed by the OCT. Bioconjuagtes were applied to three trials of each cell line in the following concentrations: 1:1,000, 1:10,000, 1:100,000, 1: 200,000, 1:500,000, 1:1,000,000, and a control. After all samples were imaged by the OCT, the melanoma cells showed great contrast due to the bioconjuagtes, while the fibroblasts were hardly affected by the change in bioconjuagtes concentration. The data collected supported the hypothesis and the possible use of galectin-3 antibodies as a melanoma biomarkers. The practical application of this experiment's results could lead to a novel application of the contrast agents in the early detection of melanoma and an improvement in the overall quality of skin cancer identification.

Awards Won:

University of Arizona: Tuition Scholarship Award