Public Abstract

First Name: Ryan
Middle Name: Michael
Last Name: Weight
Degree: Masters of Science
Degree Program: Biological Engineering
Advisor's First Name: John
Advisor's Last Name: Viator
Co-Advisor's First Name: Paul
Co-Advisor's Last Name: Dale
Graduation Term: Fall
Graduation Year: 2006

Title: Photoacoustic Detection Of Metastatic Melanoma In The Human Circulatory System

Detection of disseminating tumor cells among patients suffering from various types and stages of cancer can function as an early warning system, alerting the metastatic spread or recurrence of the disease. Early detection of such cells can result in preventative treatment of the disease while late stage detection can serve as an indicator of the effectiveness of chemotherapeutics. The prognostic value of exposing disseminating tumor cells poses an urgent need for an efficient, accurate screening method for metastatic cells. We propose a system for the detection of metastatic circulating tumor cells based upon the thermo-elastic properties of melanoma. The method employs photoacoustic excitation coupled with a detection system capable of determining the presence of disseminating cells within the circulatory system *in vitro*. Detection trials consisting of tissue phantoms and a human melanoma cell line resulted in a detection threshold on the order of 10 individual cells, thus validating the effectiveness of the proposed mechanism. Optical properties of latex microsphere tissue phantoms and human melanoma cells were derived using integrating sphere measurements and an inverse adding doubling algorithm for studies of comparison. Melanoma cells were introduced into human blood *in vitro* to mimic a metastatic envrionment. Results imply the potential to assay simple blood draws from healthy and metastatic patients for the presence of cancerous melanoma providing an unprecedented method for routine cancer screening.