

## Public Abstract

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Degree: Masters of Science

Degree Program: Biological Engineering

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Graduation Term: Fall

Graduation Year: 2011

Title: Photoacoustic detection and spectral analysis of hemozoin in human leukocytes as an early indicator of malaria infection

Malaria is a blood borne infection affecting hundreds of millions of people worldwide. The parasites reproduce within the blood cells, eventually causing their death and lysis. This process releases the parasites into the blood, continuing the cycle of infection. Usually, malaria is diagnosed only after a patient presents symptoms, including high fever, nausea, and, in advanced cases, coma and death. While reproducing within the bloodstream of a host, malaria parasites convert hemoglobin into an insoluble crystal, known as hemozoin. These crystals, approximately several hundred nanometers in size, are contained within red blood cells and white blood cells that ingest free hemozoin in the blood. Thus, infected red blood cells and white blood cells contain a unique optical absorber that can be detected in blood samples using photoacoustic detection methods. Our group separated the white blood cells from malaria infected blood and tested it *in vitro* using a photoacoustic set up with a tunable laser system consisting of an optical parametric oscillator pumped by an Nd:YAG laser with a pulse duration of 5 ns. These cells were tested at multiple wavelengths, and results imply the potential to assay simple blood draws from healthy and infected patients for the presence of hemozoin thus providing a novel method for malaria infection indication.