



AN HONORS UNIVERSITY IN MARYLAND

Department of Mechanical Engineering
Spring 2006 Seminar Series

Friday- March 17th
ITE Building Room 229 at 2:30pm

Drug and Thermal Therapy for Treating Intraocular Diseases

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ABSTRACT:

Primary Topic: Intraocular lymphoma (IOL) needs a long term therapy and its treatment protocol has not been well established. A controlled drug release micro-implant, implantable in scleral pocket in the *pars plana* region of the eye, is considered to treat IOL as it allows sustained release of therapeutic levels of drug for a desired period of time; thus, overcoming the blood-retinal barrier associated with systemic drug delivery. To establish a treatment method using controlled release implant: 1) therapeutic range of a new test drug (2-methoxyestradiol [2ME2]) is evaluated by conducting proliferation study on lymphoma cell line; 2) biodegradable microneedle implant is fabricated to obtain sustained release of 2ME2 within the therapeutic range; 3) computational eye model is created to calculate drug distribution and pharmacokinetics. Results show that the drug release rate for the microneedle implant follows zero order kinetics without significant burst. The efficacy studies of 2ME2 show dose-time dependent growth inhibition of lymphoma cell lines (IC₅₀: 0.21 ~ 0.45 μ M). It is expected that the mean release rate of 2ME2 (2.6 μ M/day) from implant could inhibit lymphoma cell proliferation up to 70-92% as compared with the untreated cell. Sustained-release of 2ME2 using intravitreal biodegradable micro-needle implants, designed to deliver therapeutic levels of 2ME2 for an extended period of time, shows promise for the treatment of IOL.

Secondary Topic: To treat a number of macular diseases such as age-related macular degeneration (AMD), diabetic maculopathy, central serous retinopathy, choroidal neovascularization, etc., selective retinal treatment (SRT) uses short pulsed lasers to coagulate retinal pigment epithelium selectively, while sparing the photoreceptors. This research quantifies the influence of laser parameters over the therapeutic range. The laser-tissue interaction is investigated by analyzing the transient temperature in ocular tissues during the photocoagulation. The rate process analysis for thermal injury is employed to estimate the selective damage of retina. The contours of Arrhenius integral value (Ω/Ω_{\max}) show both the area and magnitude of damage caused by various laser parameters. Results reveal that the 2 μ s pulsed-laser with green wavelength and Gaussian profile is relatively more effective for SRT. The repetition frequency of 100 Hz is found to produce selectively RPE damage, while higher frequencies produce damage to neural retina and choroid located within 2 μ m from RPE interface.

Refreshments will be served
Host: Prof. L. Zhu