ERATO SEMINAR

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Applying Optical Sensing and Imaging to Intra-arterial Drug Development For Brain Cancer Treatment

Dr. Shailendra Joshi

Columbia University Medical Center, USA

Date & Time: November 25th (Tue), 2014, 10：00 - 11:30

Place: Meeting Room 1A, Engineering Bldg #2, 3F, Hongo Campus, The University of Tokyo

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ABSTRACT: Intra-arterial (IA) drugs are used for the treatment of many cancers, mainly as off-label use of of conventional drugs. However, the pharmacokinetics if IA drugs is exceedingly complex because the pharmacological variables are superimposed on the complex hydrodynamic parameters which include vascular anatomy, blood flow and injection characteristics. The situation is even more challenging in the brain where the blood brain barrier prevents uptake of drugs. Furthermore when the drugs are injected into the arteries their concentration increases and decreases in sub-second time frame making equilibrium condition difficult to achieve. These complexities explain why there are no good models that can describe IA drug kinetics and the clinical use is driven by empirical protocols.

However, in the last decade optical methods and optical tracers are developing rapidly. Optical methods can determine concentrations in vivo in a sub-second time frame. They can map drug distribution. Experiments that would take days or months using chemical measurements take minutes to do and in very few animals. Such technology can greatly accelerate IA drug development. In addition optical methods can also determine changes in tumors sizes in vivo, blood brain barrier permeability, tumor histology and response and tumor specific drug delivery.

The talk will describe how we are using and developing optical methods and share some of the promising results we have achieved so far.

Biography: Assistant Professor of Anesthesiology at Columbia University Medical Center (CUMC). Member, Division of Neuroanesthesia.

Dr. Joshi's main research interest is the delivery of drugs by the intraarterial route to treat brain diseases. To do so the laboratory uses cutting edge optical methods to track drugs and tracers and monitor their physiological effects in whole animal models. Funded by the National Cancer Institute, the laboratory is the center of a multi-institutional research program optical engineers and pharmaceutical researchers in several universities. By using optical sensing and imaging methods such as, diffuse reflectance spectroscopy, ultraviolet spectroscopy, multispectral imaging, hyper-spectral imaging, optical coherence tomography, and infrared thermal imaging, the laboratory is developing novel drug delivery methods and drug formulations for the intraarterial treatment of brain cancer, stroke and cerebral vasospasm.

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