BILKENT UNIVERSITY

unam - INSTITUTE of MATERIALS SCIENCE & NANOTECHNOLOGY

FACULTY OF SCIENCE

MATERIALS SCIENCE and NANOTECHNOLOGY
GRADUATE PROGRAM SEMINAR

"Nanotechnology in Cancer Imaging and Treatment"

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In-vivo imaging offers unique insights into the nature of tumor kinetics, therapeutic responses and the dependence of tumor growth on the local environment. It provides invaluable knowledge and technological advancement that can be applied clinically to the diagnosis, control, and treatment of diseases in humans. Novel functional CT (X-ray Computed Tomography) contrast agents using gold particles at the nanometer scale to be used in imaging for cancer is of great interest.

Traditionally, CT scans have been used to obtain anatomical image of humans and animals whereas PET (Positron Emission Tomography) scans have been used to gain physiological information related to specific organs or tissues (for instance, cancer cells). The recent development of hybrid PET-CT scanners and sophisticated image registration algorithms allows for combined image sets from CT and PET to be used in the diagnosis and staging of malignant diseases. However, despite the benefits of combined PET-CT, it exposes patients to radioactive PET agents. More importantly, the full potential of CT imaging cannot be utilized because the superb spatial resolution provided by CT scans is not shared by the PET images, making early diagnosis of small lesions more difficult.

Our approach to meet this challenge is to develop a novel functionally targeted CT contrast agent using gold nanoparticles that will provide high resolution images without the use of additional radioactive agents. Gold, because of its high atomic number, significantly attenuates X-ray and is capable of producing high contrast in a CT scan. By attaching organic molecules, such as deoxyglucose, to the surface of the gold nanoparticles, it is possible to enhance the preferential uptake of these nanoparticles by the cancer cells. Consequently, the cancer cells will have a higher gold concentration and therefore show higher contrast with respect to the surrounding normal tissue in a CT image. A CT scan taken under this condition will provide both anatomical and physiological information of the subject under investigation. Hence the name: functional CT (*f*CT). This approach offers potential advantages over PET scans, such as eliminating the need for radioactive tracers and offering the superior spatial resolution of CT scans, which is essential for tumor definition and targeting as well as early detection of cancer.

The successful completion of this project would be a significant step in the development of a new set of capabilities in small animal imaging by providing unmatched high-resolution anatomical and functional images in a single CT scan. Such a contrast agent would be valuable in the early detection, accurate localization, and the monitoring of therapeutic response of cancer in humans.

Date : October 1, 2010 (Friday)
Time : 15:40
Place : Faculty of Science Building, A Block, Seminar Room (SA 240)
Tea will be served after the seminar