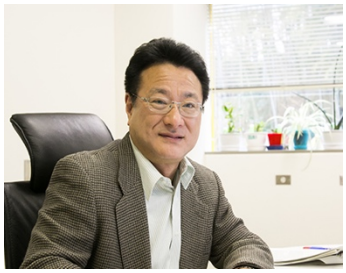
Research Talk

Speaker: Prof. Takashi Jin



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Venue: Auditorium, Dept. of Biotechnology, Goa University

Date and time: 10 Dec, 2019 from 2:30PM.

Title: Quantum dot-based deep tissue imaging in the second optical window

Abstract

NIR fluorescence imaging is one of the most popular modalities for the non-invasive visualization of biological process *in vivo*. In the case of deep-tissue imaging, visible-emitting fluorescent probes cannot be applied because of the strong absorption and scattering of visible light by intrinsic chromophores (e. g. hemoglobin, melanin and flavin) and organelles (e.g.s mitchondoria and cytoskeleton) in tissues. Compared with visible light (400-700 nm), NIR light (700-1400 nm) is highly permeable in living tissues. In addition, tissue autofluorescence and scattering induced by NIR light excitation are much lower than those by visible light excitation in tissue imaging. In most of the commercially available *in vivo* imaging systems, the NIR region ranging from 700 to 900 nm (1st-NIR optical window) has been used for deep-tissue imaging. This is because the conventional NIR photodetectors (silicon CCD camera) are sensitive in the 1st-NIR region, and 1st-NIR emitting probes (e.g. Indocyanine green, Cy 7, and CdSeTe quantum dots (QDs) are commercially available. Although 1st-NIR fluorescence imaging is useful for the non-invasive visualization of tissues and organs at the whole-body level, its spatial resolution is not enough to observe cellular dynamics *in vivo*. As autofluorescence and light scattering by tissues significantly decrease in the NIR region ranging from 1000 to1400 nm (2nd optical window), NIR fluorescence imaging in the 2nd-NIR region is expected to offer better spatiotemporal resolution in deep tissue imaging. To achieve deep-tissue imaging with high spatiotemporal resolution, we have developed 2nd-NIR emitting probes (PbS QDs, Nakane *et al. Chem Comm. 2013*, Patent 2013-51102) for non-invasive fluorescence imaging of lymph nodes (Tsukasaki *et al. Chem Comm. 2014*), cerebral blood vessels (Tsukasaki et al. RSC adv. 2014), breast tumors (*Sasaki et al. Chem Comm. 2015*), and phagocytic cell migration (Tsukasaki *et al. Chem Comm. 2014*) in mice.

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