Biomedical Discussion Group

High-speed observation system designed for elucidating mechanisms of sonoporation

Tuesday March 6, 2018
11:00 –12:00 pm, East Campus 4 Boardroom (EC4 – 2101a)
Coffee and Timbits available - RSVP required

Dr. Nobuki Kudo
Executive Trustee, Japan Society of Ultrasonics in Medicine
Editorial Board member, Journal of Ultrasonics in Medicine
Associate Professor, Dept. of Biomedical Engineering
Graduate School of Information and Science Technology, Hokkaido University

Abstract: There is still no conclusive evidence that determines dominant mechanisms of sonoporation. To elucidate the mechanisms, we have been studying a high-speed microscopic system for observation of sonoporation phenomena. The main part of the system is an inverted-type fluorescence microscope with confocal optics, and a high-speed camera with a CMOS image sensor is used to visualize dynamics of cavitation bubbles during sonoporation at the maximum framing rate of 10 MHz. For detailed observation of bubble-cell interaction, an observation chamber was designed to enable the observation from a lateral direction. Phase contrast and fluorescence tehcniques were used for sensitive visualization of cell changes during sonoporation. The system is also equipped with optical tweezers that can move a microbubble of several microns using a donut-shaped light beam. Several recent results that indicate usefulness of the system will be shown in the presentation.

Biosketch: Nobuki Kudo received BS degree in electronics engineering in 1982, the MS and PhD degree in Biomedical Engineering in 1984 and 1987 from Hokkaido University, respectively. From 1987, he worked at Toshiba corporation and engaged in developments of an extracorporeal-shockwave lithotripter and diagnostic imaging equipment. In 1995, he returned to Hokkaido University as an assistant professor in an engineering faculty. He is currently an associate professor of Graduate School of Information Science and Technology, Hokkaido University. He is an executive trustee of the Japan Society of Ultrasonics in Medicine. He is also an editorial board member of Journal of Ultrasonics in Medicine, and IEEE Transaction on Ultrasonics, Ferroelectrics, and Frequency Control. His current research interests are diagnostic and therapeutic applications of microbubbles, visualization of an ultrasound field by an optical technique, and ultrasound safety.

Keywords: sonoporation, biomedical ultrasound, biomedical optics, medical systems, phase contrast, fluorescence techniques, phase contrast microscopy, cell membranes, bubble dynamics, cell adhesion

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