Imaging antimicrobial peptides acting on nano structured lipid bilayer membranes using multi-modal optical microscope

Hyunjun Kim¹, Suho Lee², Kyuhan Kim², Jiheun Ryu¹, Siyoung Q. Choi², Myung-Chul Choi², Dae-Gab Gweon¹
1 Mechanical Engineering dept.
2 Bio and Brain Engineering dept. KAIST, Daejeon, South Korea
E-mail: hyunjuns@kaist.ac.kr

KEY WORDS: Lipid bilayer, AMP(antimicrobial peptide), multi-modal microscope, confocal fluorescence microscope, fluorescence lifetime imaging microscope

We study antimicrobial peptides (AMPs) disrupting supported lipid bilayer membranes using a multi-modal optical microscope that has a fluorescence confocal microscope and a fluorescence lifetime imaging microscope (FLIM) [1]. To mimic bacteria cell membranes, supported lipid bilayer membranes with different ratios of charged lipids are prepared on the glass surface using a Langmuir-Blodgett technique [2]. A confocal fluorescence microscope is used to visualize structural information of nano-structured lipid bilayer membranes with high resolution, and simultaneously, FLIM is used to image biochemical environment near the membrane. The multi-modal optical microscope with two modes detect nano-structured lipid bilayer membranes without moving a sample stage. We present the change of AMPs' activity on the model cell membranes by changing pH, salt concentrations, and lipid composition of the membranes. The lifetime of a fluorescence probe detects such changes, therefore it is possible to quantify the interactions between lipid bilayer membranes and AMP under different environmental conditions. We combine information obtained by two imaging techniques to correlate the activity of AMPs and environmental conditions. The influence of different environments on the activity of AMPs for nano-structured lipid bilayer membranes are discussed and modeled.
