Scanning Probe Microscopy, IR Spectroscopy and Electrochemical Studies of Antimicrobial Peptides incorporated into Biomimetic Membranes Supported at a Au Electrode

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Antimicrobial peptides (AMPs) are important components of the innate immunity which is the first line of defense of all organisms, including plants and humans. AMPs have typically 12-50 amino acids and about 50 % of them are hydrophobic. They are involved in antiseptic, immune modulatory and chemotactic processes. They aggregate in the cellular membrane of pathogens and form pores leading to the cell death as a result of the osmotic shock and leakage of intracellular content. In this lecture we describe our recent studies of antimicrobial peptides such as gramicidin, alamethicin, trichogin and valinomycin incorporated into a phospholipid monolayers or bilayers supported at a gold electrode surface. In this architecture, we were able to apply scanning tunneling microscopy (STM), photon polarization infrared reflection absorption spectroscopy (PM IRRAS) and electrochemical techniques to determine the nature of peptide aggregation, orientation and conformation in phospholipid monolayers and bilayers. We will present molecular resolution STM images of pores formed by antimicrobial peptides in phospholipid membranes. We will also show a correlation between the conductivity of ion channels formed by antimicrobial peptides in gold supported bilayers to their orientation and conformation in such membranes.