MAR11-2010-020089

Abstract for an Invited Paper
for the MAR11 Meeting of
the American Physical Society

Structural Studies of Biological Solids Using NMR

AYYALUSAMY RAMAMOORTHY, Biophysics and Department of Chemistry, The University of Michigan, Ann Arbor, MI 48109-1055

High-resolution structure and dynamics of biological molecules are important in understanding their function. While studies have been successful in solving the structures of water-soluble biomolecules, it has been proven difficult to determine the structures of membrane proteins and fibril systems. Recent studies have shown that solid-state NMR is a promising technique and could be highly valuable in studying such non-crystalline and non-soluble biosystems. I will present strategies to study the structures of such challenging systems and also about the applications of solid-state NMR to study the modes of membrane-peptide interactions for a better assessment of the prospects of antimicrobial peptides as substitutes to antibiotics in the control of human disease. Our studies on the mechanism of membrane disruption by LL-37 (a human antimicrobial peptide), analogs of the naturally occurring antimicrobial peptide magainin2 extracted from the skin of the African frog Xenopus Laevis, and pardaxin will be presented. Solid-state NMR experiments were used to determine the secondary structure, dynamics and topology of these peptides in lipid bilayers. Similarities and difference in the cell-lysing mechanism, and their dependence on the membrane composition, of these peptides will be discussed. Atomic-level resolution NMR structures of amyloidogenic proteins revealing the misfolding pathway and early intermediates that play key roles in amyloid toxicity will also be presented.