Lipid-induced fibrillation and membrane protection by amyloid peptides

Tania Sheynis and Raz Jelinek

Department of Chemistry and Ilse Katz Institute for Nanotechnology,
Ben Gurion University of the Negev, Beer-Sheva, Israel
razj@bgu.ac.il

Interactions between membranes and amyloid proteins are believed to be a major factor contributing to pathogenesis in amyloid diseases. Here we describe an intriguing phenomenon in which bilayer-induced fibrillation of human calcitonin (hCT) gave rise to significant inhibition of membrane interactions of alamethicin, an antibiotic, membrane-permeating peptide. The experimental data indicate that cholesterol-promoted formation of amyloid fibril network at the bilayer interface is most likely responsible for the shielding effect. This phenomenon might point to a role of amyloid fibers in preventing membrane disruption by antibiotic peptides and other toxic species. In addition, our work indicates that the structural and kinetic properties of peptide fibrils as well as lipid interactions of fibrillar species are interrelated and are significantly affected by specific residues within amyloid peptide sequences.

[1] Sheynis, T & Jelinek, R. (2010) Shielding lipid bilayers through calcitonin fibrillation, *J. Phys. Chem B,* 114 (47), 15530-35.

[2] Shtainfeld, A., Sheynis, T. & Jelinek, R. (2010) Specific mutations alter fibrillation kinetics, fiber morphologies, and membrane interactions of pentapeptides derived from human calcitonin. *Biochemistry*, 49(25), 5299-5307.