Interaction of Melittin with E. Coli Membrane: Role of Cardiolipin

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We studied the interaction of melittin peptide with E. Coli's lipid membrane as a function of molar peptide-to-lipid ratio (P/L). Two experimental methods were employed. The oriented circular dichroism (OCD) measured the peptide's orientation in membrane whereas the lamellar x-ray diffraction (LXD) measured the membrane perturbed by peptides. The result shows that in the measuring range, P/L ~ 1/150 to 1/20, all peptides binding to the membrane adapt helical conformation in which about 40% of them with helical orientation in normal (I-state) and the rest in parallel (S-state) to membrane surface. In the same P/L range, it appears that the membrane is strongly perturbed by peptides in which the membrane is thinning and such thinning is increased with P/L. Furthermore, we mimicked E. Coli membrane by two model lipid membranes, one with cardiolipin contained while another without. We found that cardiolipin is the key lipid component in E. Coli membrane to enhance the insertion of melittin in low P/L region.

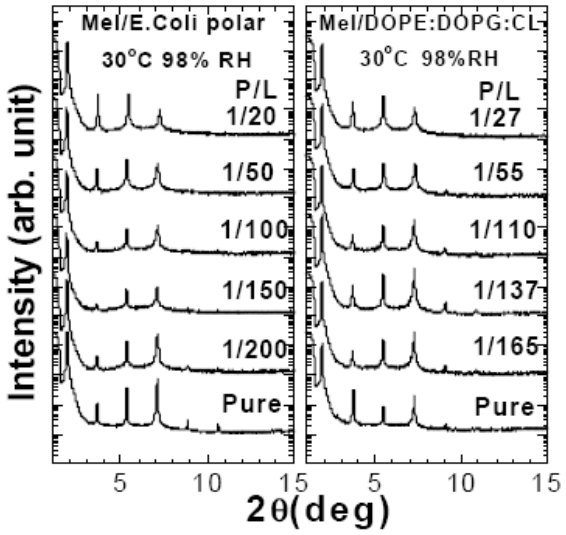

Figure 1. Representative LXD diffraction patterns. An attenuator was used for the first order Bragg peak to prevent the photon count from exceeding 10^4 per sec. The patterns were displaced for clarity. Note that each pattern consists of only one Bragg series, indicating the homogeneity of the sample.

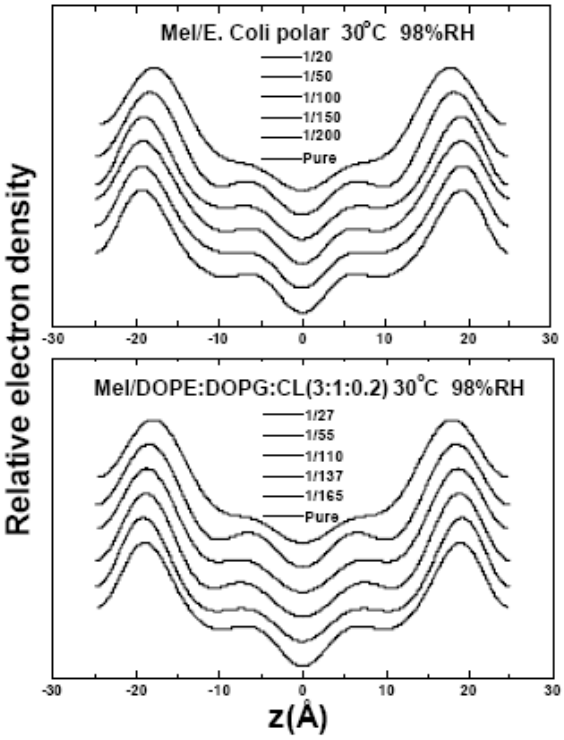

Figure 2. Representative electron density profiles constructed from the measured diffraction amplitudes, displyed for a series of P/L.