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Microtubule Cationic Liposomes Assemblies: Pathways to the Formation of Lipid-Protein Tubular Complexes URI RAVIV, DANIEL NEEDLEMAN, KAI EWERT, YOULI LI, HERBERT MILLER, LESLIE WILSON, CYRUS SAFINYA, University of California, Santa Barbara — The self-assembly of microtubules and charged membranes has been studied, using X-ray diffraction and electron microscopy. Polyelectrolyte lipid complexes (PLC) usually form structures where the lipid phase acts as the template, when the polyelectrolyte curvature (Cp) is much larger than the membrane spontaneous curvature (Co). When Cp approaches Co, as in microtubules, two new structures emerge. Depending on conditions, vesicles either adsorb onto the microtubule, forming a beads on a rod structure, or undergo a wetting transition, coating the microtubule, which now forms the template. Tubulin rings next coat the microtubule-lipid assembly, forming a lipid protein tubular complex (LPTC). The beads on a rod structure is a non-templated, kinetically trapped assembly state. The kinetic energy barrier between the two states depends on the membrane bending rigidity and charge density. The LPTC is the ground state of the system. Finally we make a connection to earlier studies and describe the assembly pathways of PLC as a function of polyelectrolyte curvature, membrane bending rigidity and charge density. This project is supported by NIH GM-59288, NSF DMR- 0203755, CTS-0404444. U.R. is supported by the HFSPO fellowship.

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