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Nanoparticulate systems for delivery of drugs has drawn much attention recently and holds great potential for future effective therapeutics. Dendrimers are one of several groups of macromolecules that are considered promising in this respect. They are synthetic molecules of nanoscopic dimensions built from several layers of branches around a central core. They have unique properties given their monodispersity and multivalency and can be used both by covalently attaching or encapsulating drugs.
I will present data from dissipation quarts microbalance (D-QCM) and neutron reflectivity experiments from studies of dendrimer interactions with model cell membranes. The D-QCM measurements will be employed to identify the concentration range at which the dendrimers make a significant change in mass or rheological properties of the bilayer. Deuterated POPC bilayers will be used as a simple model for mammalian blood cells. Neutron reflectivity experiments will be applied in order to determine the dendrimer uptake mechanisms. Four models for for possible localization of dendrimers in supported bilayers are proposed. The dendrimers could simply adsorb on top of the bilayer, interact with the outer lipid monolayer, localize in the hydrophobic region of the bilayer or create a hole in the bilayer without coadsorption. The interaction with three different dendrimers will be studied and presented. Two have good activity against Gram(-) and Gram(+) bacteria but have either high or low hemotoxicity. The third dendrimer selectively attack Gram(+) bacteria.
In future research we will aim to develop models of different lipid composition to differentiate between mammalian cells and bacteria.