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SURF Student Colloquium

NIST – Gaithersburg, MD

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Title: Impact of Functionalization on Quantum Dot Liposome Interactions

Abstract:

Quantum dots (QDs) are promising bioimaging and biosensor agents that may be useful for in vivo imaging. Liposomes are one possible carrier to deliver quantum dots for such imaging; however it is first essential to understand the interactions between QDs and liposomes. Here, we examine the interaction of hydrophobic and hydrophilic functionalized semiconductor (CdSe/ZnS) quantum dots with the liposome surface. We demonstrate that hydrophilic carboxylated quantum dots interact with the 1,2-Dimyristoyl-sn-Glycero-3-Phosphocholine (DMPC) liposome surface differently than hydrophobic trioctylphosphine oxide functionalized quantum dots. We used total internal reflection fluorescence and differential interference contrast microscopy to study liposome formation in a solution of water and quantum dots. We then measured the diffusion of the QDs in or around the surface of the lipsome by single particle tracking methods. We observed a functionalization dependent difference in the rates of diffusion of the QDs which we hypothesize is due to differences in the interactions of hydrophilic and hydrophobic quantum dots with the lipid bilayer. Hydrophilic QDs were observed to skate along the surface of the lipid liposomes, while hydrophobic QDs moved much more slowly, suggesting trapping within the lipid bilayer. These results demonstrate that functionalization of QDs will have a significant impact on their interactions with liposomes, possibly affecting their delivery potential.