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Experimental Investigations of Single Vesicle to Supported Lipid Bilayer Residence Times

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One of the primary ways in which cells interact with their environments is by release of extracellular vesicles that are formed either from the cell plasma membrane (microvesicles) or secreted from multivesicular bodies (exosomes). These vesicles contain nucleic acids and proteins that have been suggested to play an important role in intercellular signaling and molecular communication between cells. In microvesicle (MV)-mediated intercellular communication, vesicles released by a donor cell must bind to the plasma membrane of a recipient cell in order to deliver their cargo to the target. Despite the important physiological role of vesicle-plasma membrane fusion and vesicle endocytosis, the details of the physical interactions between MVs and the plasma membrane are still poorly understood. To better understand the forces which occur between MVs and cells, TIRF microscopy was employed to experimentally investigate single liposome and exosome binding events with a supported lipid bilayer. Binding lifetimes were determined using a least-squares fitting or a maximum likelihood estimation technique. Comparison of these two techniques shows that a maximum likelihood technique should be used to estimate binding lifetimes. Comments about differences in observed binding lifetimes due supported lipid bilayer composition, liposome composition, and exosome isolation techniques will be made.