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The Effects of Ca^{2+} on the Dynamics of PIP_2 containing Lipid Bilayers IAN MCCABE, MARTIN FORSTNER, Syracuse University — Changes of intercellular Ca^{2+} concentrations are one of the most ubiquitous signaling events that accompany or precede large scale cellular responses. We are in particular interested in the direct modulation of phosphatidylinositol 4,5-bisphosphate (PIP_2) organization in the membrane due to Ca $^{+2}$. At physiological conditions, PIP_2's headgroup is multiply negatively charged (> 3 effective charges) and interacts with the cationic Ca^{2+}. By coordinating several PIP_2 head-groups, calcium ions can induce condensation and aggregation of PIP_2. A series of experiments were conducted on supported lipid bilayers containing physiological quantities of PIP_2. Fluorescence correlation spectroscopy (FCS) was used to study the response of the PIP_2 to changes in the concentration of Ca^{2+} ions. As Ca^{2+} concentration increases, the FCS indicates that PIP_2 goes from a freely diffusing single species to a multiple species system. The diffusion rates of the additional species decrease with increasing $[Ca^{2+}]$, thus indicating increasing aggregate sizes with increasing, but physiological relevant Ca^{2+} concentrations. An intriguing effect was observed at very low Ca^{2+} levels. The diffusion rate was consistently measured to increase upon addition of small concentrations of Ca^{2+} before decreasing as the concentrations increased. A series of polymer cushioned bilayers were used to attempt to gain greater insight into the nature of the membrane/support interaction and the nature of this effect.

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