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Fluctuation correlation spectroscopy of membrane domains

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**Fluctuation correlation spectroscopy of membrane domains.**


**Abstract**

We have developed a spectroscopic method to detect the small phase domains in giant unilamellar vesicles (GUV) made of synthetic phospholipids. In the GUV system, it is relatively straightforward to directly observe, under a microscope, regions of different phases (gel and liquid crystal) using mixtures of phospholipids with different transition temperatures when the size of the domain is large. When the size of the domains is smaller than the point-spread-function of the microscope, small domains of different phases give an average value of the spectroscopic property used to establish the existence of different domains. The analysis of the fluorescence intensity fluctuation in one pixel can provide evidence of an underlying phase structure. We labeled the GUVs composed of single phospholipids and phospholipid mixtures with Laurdan, a fluorescent probe that display different spectroscopic properties in the gel and in liquid crystalline phase. We used a relatively high concentration of Laurdan to avoid fluctuations due to the change of the number of Laurdan molecules in the volume of observation. We observed an increase in the fluctuation amplitude at and near the phase transition temperature of the phospholipids. We present a model to analyze the fluorescence fluctuation to obtain information about the size and lifetime of the phase domains. In several of the mixtures analyzed, we were able to detect formation of domains smaller than the microscope lateral resolution. Support: SB=Angelo della Riccia; EG=NIH, PHS P41 5 RR03155.