

The Single GUV Method for Probing Biomembrane Dynamics

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So far almost all studies of biomembrane function have been done using a suspension of many small-size vesicles such as large unilamellar vesicles (LUVs) (the conventional LUV suspension method). In these studies, the average values of the physical parameters of vesicles have been obtained from many vesicles, and thereby much information has been lost. Recently we have proposed a novel method, the single GUV method. In this method we observe and measure physical properties of single giant unilamellar vesicles (GUVs) with a diameter of $\geq 10 \mu\text{m}$, and analyze these results over many single GUVs statistically, which will provide much new information that cannot be obtained by the conventional LUV suspension method. In this symposium I show several examples of applications of the single GUV method

The measurement of leakage of internal contents such as small fluorescent probes from the inside of LUVs has been used to investigate the interaction of various substances with lipid membranes. For this leakage experiment, the single GUV method can provide new information such as direct information of the cause of the leakage, the rate constants of elementary processes, and the leakage from single vesicles. I discuss effects of antimicrobial peptide, magainin 2, and antibacterial tea catechin, EGCG, on lipid membrane. Membrane fusion and vesicle fission have been characterized using LUV suspensions by DLS and fluorescence spectroscopy. The single GUV method can provide new information such as their detailed processes and structural changes in single vesicles during membrane fusion and fission. Finally, I discuss the advantage of the single GUV method in biomembrane research.