Adhesion of Binary Vesicles Induced by Phase Separation

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生体膜の機能の一つである膜接着の機構を調べるため、モデル生体膜を用いた研究がなされている。今回我々は負の自発曲率を持つリン脂質（逆コーン型脂質）と自発曲率０のリン脂質を混合した２成分ベシクルが高温で成分が均一のときには接着せず、低温で相分離すると逆コーン型脂質ドメインを通して接着することを実験的に明らかにした。

We report the adhesion of binary giant vesicles composed of two types of phospholipids, one has a negative spontaneous curvature and the other has a zero spontaneous curvature. The phospholipids having negative spontaneous curvature prefer to form inverted micelle phase, which may correspond to so-called hemifusion. In the high temperature region where the two components are homogeneously mixed, the giant vesicles do not adhere each other, whereas in the low temperature region in which the binary system undergoes a phase separation into solid and liquid phases, the giant vesicles show adhesion. A fluorescence microscope observation reveals that the adhesion takes place through the region rich in phospholipids having negative spontaneous curvature. One plausible explanation of the adhesion is the interplay of the generic interactions (repulsive undulation interaction and attractive van der Waals interaction). This model, however, cannot explain why the vesicles composed of the negative spontaneous curvature lipid only do not adhere each other. Then we propose a new model where the adhesion takes place through the hemifusion between the two apposed monolayers of adjacent vesicles using the negative spontaneous curvature lipids as shown in Fig.1. This hemifusion results in the decrease of the interfacial energy between the domain and the matrix.

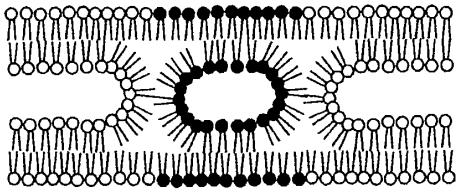

Fig.1. Hemifusion model

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