The spreading of natural or artificial membrane vesicles to monolayers

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Any type of vesicle, including natural and artificial vesicles, were shown to form spontaneously a monolayer at the air-water interface. In this way lipid-protein monolayers with similar composition as that of the original membrane are generated without the need for extraction of components. Such monolayers may either be further transformed to planar bilayers [1] or studied by means of monolayer characterisation techniques. The latter study requires a complete separation of the monolayer from vesicles. This is achieved by applying hydrodynamic shear forces to vesicles adhered to the monolayer. In this way monolayers are generated at constant and high surface pressure, which is important to prevent or minimize surface denaturation of proteins. The velocity of monolayer spreading from vesicles strongly depends on the salt concentration. Soy bean lipid vesicles show a steep increase of the spreading velocity, when sodium or potassium concentration is increased from 10 mM to 100 mM. With increasing calcium concentration the spreading velocity rises exponentially until liposomes begin to aggregate (at about 5 mM calcium). Liposomes of natural lipid mixtures and vesicles of natural membranes generally exhibit high spreading velocity and yield whereas large variations of these properties are found for single lipid liposomes. The spreading of vesicles into a monolayer held at constant surface pressure (below equilibrium pressure [2]) decreases in velocity with increasing pressure value.

1) H. Schindler, FEBS Letters 122, 1 (1980) 77-79

2) H. Schindler, BBA 555 (1979) 316-336