Synopsis of Original Research Paper

Temperature-controlled release from hyaluronic acid-coated hposomes

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We prepared liposomes containing 5,6-CF, the surface of which was coated with carboxymethyl cellulose or hyaluronic acid. Above the phase transition temperature of the lipids composing the liposomes, almost 100% of 5,6-CF was released from the liposomes within 30 mins, although little release of 5,6-CF was observed at and below the phase transition temperature. Surface charge density of the liposomes was changed by the adsorption of hyaluronic acid or carboxymethyl cellulose on liposome surface. Also, we measured the zeta potential values of DMPC, DPPC or DSPC liposomes at various temperatures. Neutral liposomes were found to exhibit non-zero zeta potentials in an external electric field even when dispersed in solution at pH7.4. A model for the orientation of lipid head groups was proposed to explain the observed non-zero zeta potentials. The dependence of the zeta potential on temperature and ionic strength was analyzed via this model to obtain the information on the direction of the lipid head groups in the liposome surface region. The direction of the lipid head group was found to be sensitive to the temperature and the ionic strength of the medium. At low ionic strengths, the phosphatidyl groups locate at the outer portion of the head group region. With increasing ionic strength, the choline groups move outward to the outer region of the bilayer surface. At constant temperature, as the ionic strength decreases, the choline group approaches the surface while the phosphatidyl group hides behind the surface. At the phase transition temperature of the lipid, the phosphatidyl group lies in the outer-most region of the surface and the choline group is in the inner-most region.