

Basic Study on Physical Property and Function of Cellular Membrane Lipids — Application of Physical Property of Phospholipids to Cosmetology

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Cosmetology includes physiological approach to skin cells of human body. And all cells are constructed with biomembranes which are assemblies of lipids, proteins and various minor constituents held together by non covalent interactions. Membrane lipids are amphipathic molecules, and they spontaneously form bilayers in aqueous environments. Hydration of lipids plays an important role in this process. So the hydration was investigated in various phospholipid species by an optical microscope with image processing devices. Interaction of membrane proteins with lipids is hydrophobic with the lipid hydrocarbon chains in contact with hydrophobic regions on the protein surface or penetrating into the protein interior and electrostatic interaction between charged groups on the protein surface and the lipid head groups. Although a lot of studies are focused on the structure of biomembranes, the organization of lipid molecules in biomembranes has not been fully determined. In order to resolve more extensively the interaction between lipids and proteins, it was investigated by differential scanning calorimetry (DSC) in model membrane systems.

The effect of electrostatic interaction between basic polypeptides (polylysine and polyarginine) and acidic phospholipids (phosphatidylserine and phosphatidic acid) was examined by DSC. Poly lysine raised the phase transition temperature of dipalmitoylphosphatidylserine (DPPS) by 5 degrees. On the other hand, polyarginine lowered the phase transition temperature of DPPS by 6 degrees. The same effects were observed in dimyristoyl phosphatidic acid (DMPA) and dipalmitoyl phosphatidic acid (DPPA). Melittin is a major component of bee venom and consists of 26 amino acids starting with predominantly hydrophobic amino acids in the N-terminal part and finishing with charged and hydrophilic residues in the C-terminal part. DSC studies revealed that melittin was able to induce membrane fusion between neutral phospholipids and acidic phospholipids.