

The synthesis of primitive surface protein by interaction among molecules at juxtamembrane in the water

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[Introduction]

The hydrogen bond in water is oriented to fit with the surroundings, and the influence of interface reaches about 20 molecular layers. Since there are thermal motions of molecules in liquid water, the arrangement of orientation of molecule is not necessarily uniform. Amino acid is soluble in water but not soluble in oil. Since hydrophilic group of amino acid is oriented toward the outer side of membrane, the side chain of amino acid is able to adsorb on the surface of membrane. The thermal motion of the adsorbed amino acid is suppressed and the degradation of the peptide bond of amino acids is suppressed, the synthesized protein is incorporated into the membrane. The membrane incorporates structural surface protein for long life at first, and it resulted in the acquisition of various functions. As the experimental facts, the longer life of bubbles that is made from iron powder in carbonated water was achieved by addition of amino acids.

[Synthesis and degradation of organic molecules by thermal motion of molecules]

The situation of early Earth was possible to synthesize various organic molecules including amino acids. There, the intense mantle convection erupted volcano in the sea of carbonated water, and the ultraviolet light was irradiated from the sun. As the fact, the bubble is made from the carbonated water in which iron powder is dissolved. Here, the bubble is made from released carbon atoms and hydrogen atoms. The oxygen atom of carbon dioxide is taken away by oxidization of iron powder, and the iron-carbide that is made from the released carbon atom and iron atom takes the oxygen atom from the water [1]. The membrane of bubble is made from the organic molecules those are arranged at the interface to adjust the boundary conditions. The combination of molecules in contact with the membrane in water is changed by trial-and-error due to thermal motion of the molecules. Various structures through hydrogen bond are possible by tetrahedral units of molecules in the liquid water. There, the covalent radius of carbon is approximately the same size as that of an oxygen atom, and the carbon atom is bonded as a tetrahedral unit.

[Synthesis of structural surface proteins at the membrane]

In the case of organic molecules with large the hydrophilic part, small spherical micelles will be formed. But in the case of organic molecules with large the hydrophobic part, the liposome with hydrophobic portion inward will be formed. On the other hand, the amino acid is soluble in water but not soluble in oil. Some amino acids have the side chain that is able to adsorb to the surface of the liposome. The amino acid molecules adsorbed on the membrane makes peptide bond to another amino acid molecule, and it will form the thread of protein adsorbed to the membrane. The liposome became possible to have various functions by incorporating organic molecules or protein molecules via amino acids.

[Co-evolution of membrane and of its constituents]

The bubble that is made from by addition of iron powder to carbonated water has a long lifetime by supplying the molecules immediately in order to repair the early stages of damage. The membrane in the aqueous solution in which molecules are organized in the intermolecular forces, can adsorb specific molecules at membrane. The membrane with long life by incorporated amino acids on the surface makes possible to conduct the circulation of synthesis and degradation. The long life membrane is possible to incorporate atoms, such as phosphorus that is contained in seawater. Moreover, it is possible to form the new cell by using broken parts of the membrane as units of the organization. A large cell of liposome is able to include another liposome in it. We can consider the age of the liposome world in which the liposome formed an ecosystem in the first stage of the biological evolution.

[Conclusions]

The hypothesis that primitive protein was synthesized from inorganic substances is proposed. It is explained as follows. Organic molecules are generated and membrane is formed at interface in liquid water. A molecule in the water interacts with the membrane, and the molecule that is specified by the membrane adsorbs at the interface. A structural surface protein was synthesized by the amino acids adsorbed on the membrane. By incorporation of the protein, the membrane exists the longer time. The membrane incorporated the protein becomes the mechanism to acquire new function for the long life.

[References] [1] S. Karasawa, "Inorganic production of membranes together with iron carbide via oxidization of iron in the water that includes carbon dioxide plentifully", AbSciCon2010, Prebiotic Evolution: From Chemistry to Life II, League City, Texas, Apr.27, 2010.