Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

BAO01-P12 Room:Convention Hall Time:May 21 18:15-19:30

The mechanism that had formed the primitive liposome in the early Earth

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[Introduction]

Materials used for the experiment for investigation of first primitive liposome had existed in the early Earth. Bubbles were generated by injection of iron powder into carbonated water. The side chain of appropriate amino acid adsorbs on the surface of the membrane. So, the life of bubble became longer by injection of the appropriate amino acid, because thermal motion of the adsorbed amino acid is suppressed and degradation of peptide bond of the amino acid is suppressed. A primitive protein is synthesized by incorporating into the membrane. The bubble rise to surfaces of water, and it will burst at the surface. As the result of repeating of the bursts, the surface of water was covered with similar membrane. After stirring that water, the bubbles were generated again under atmosphere of CO_2. After some time, the vesicles that stayed long time at middle portion of the water between surface and bottom were generated. The vesicle must be produced at burst of the bubble. It is able to include the membrane and the water inside of it. This special vesicle with long life was made from the membrane and the amino acids.

[Experiments on effects of amino acid to the bubble made from carbonated water and iron]

By addition of amino acid, the life of bubble generated in carbonated water mixed with iron powder becomes longer and its number increases. Here, materials for these experiments are (a)carbonated water: 75 cc, (b)iron powder: 5g and (c)amino acid (glutamine: 143mg, valine: 36mg, leucine: 71mg, isoleucine: 36mg). After several days from the mixing, the bubbles and the substance that had floated on the surface of the water were dissolved in the water by stirring of the water. After this stirring, bubbles were generated again. Initially, the rises-up and the fall-down were repeated. After some time, there emerged the vesicle that stayed in middle portion of the water. At this case, the atmosphere was filled with CO_2.

[Theoretical understandings]

The reason why bubbles are generated by injection of iron powder into carbonated water is as follows. The iron atom reacts with the oxygen atom of the carbon dioxide because the electronegativity of carbon atom is larger than that of hydrogen atom. The free carbon atom released from oxygen reacts with the iron atom. The iron carbide that has been produced reacts with the water. As the result, the free carbon atoms and the free hydrogen atoms form the membrane of the bubble. If insoluble gas is generated in the water where suitable organic molecules exist, the appropriate molecules will be arranged at the interface of the gas. The bubble made of the membrane rises up to the surface. The bubble will soon burst at the surface. The organic molecule that had been organized membrane of the bubble will cover the surface of water. After that, following phenomenon takes place at the burst of the bubble. The closed vesicle that includes the membrane and the water inside is produced by the mechanism to form the bubble. The reason why a liposome is generated is as follows. Amino acid is soluble in water but not soluble in oil. Organic molecules exist in the membrane of the bubbles generated in carbonated water mixed with iron powder. Appropriate side chain of amino acid is able to adsorb on surface of the membrane. Thermal motion of the adsorbed amino acid is suppressed and degradation of the peptide bond of amino acids is suppressed. The amino acid molecules adsorbed to the membrane will be mutually linked by the peptide bond. Although the association of amino acid is sensitive to the environment, the bubble of which membrane incorporated with linked amino acids becomes robust. The number of vesicles with long life will be increased. The large number of vesicles makes possible to form complicate cell by using broken parts of the membrane as units of the organization. The closed vesicle is able to include plural of small liposome.

Keywords: bubble, membrane, amino acid, peptide bond, protein, liposome