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Necessities for the First Life to Emerge

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Introduction: The origin of life remains unsolved still now, in spite of strenuous efforts of many researchers. On the other hand, all organisms on the Earth inhabit under the fundamental life system composed of gene, genetic code, protein (metabolism). Therefore, the most important point for elucidating the origin of life should be to make clear how the first life system was established [1].

Theoretical Consideration: Then, I propose here the conditions required for emergence of the first life on the primitive Earth, in order of protein, genetic code and gene.

1. Condition for formation of the first protein

Catalytic activity out of many functions of protein is the most essential for life. Therefore, even the first protein must be folded into water-soluble globular structure to exhibit catalytic function in the absence of any genetic function. This means that the first protein must be produced by random joining of amino acids in a protein 0th-order structure or a specific amino acid composition, in which water-soluble globular protein with more flexible structure than extant mature protein can be synthesized by random joining of amino acids at a high probability.

2. Condition for formation of the first genetic code

Genetic code is always used for bridging over between genetic function and protein synthesis. Therefore, the first genetic code must encode a protein 0th-order structure, so that polypeptide chain synthesized under the genetic code can be folded into water-soluble globular structure.

3. Condition for formation of the first gene

Genetic information or base sequence for protein synthesis cannot be designed previously. Therefore, the first gene must be created by random joining of nucleotides under the first genetic code. This means that formation of the first gene would meet with a large difficulty. On the other hand, even the first life could not live with only one gene encoding one protein. This indicates that many homologous genes and entirely new genes must be produced from sense and antisense sequences of the first double-stranded gene, respectively.

Discussion: Water-soluble globular [GADV]-protein, actually aggregate of [GADV]-peptides, can be produced by random joining of [GADV]-amino acids at a high probability, because [GADV]-amino acid composition is one of protein 0th-order structures, which satisfies four conditions (hydrophobicity/hydrophilicity, α -helix, β -sheet and turn/coil formabilities) for formation of water-soluble globular protein [2]. We have previously proposed GNC code encoding [GADV]-amino acids as the first genetic code and (GNC)_n sequence as the first gene [2]. Therefore, polypeptide chain synthesized under the genetic code could be folded into water-soluble globular structure, and various homologous and entirely new genes can be produced from sense and antisense sequences of the first double-stranded (GNC)_n gene after gene duplication, respectively. Based on the above consideration, it is assumed that the first life emerged on the primitive Earth, according to [GADV]-protein world hypothesis or GADV hypothesis [1, 3].

References: [1] Ikehara K (2016) LAP LAMBERT Academic Publishing, Saarbrücken, Germany. [2] Ikehara K et al. (2002) *Journal of Molecular Evolution* 54: 530-538. [3] Ikehara K (2005) *Chemical Records* 5:107-118.