

Early evolution of life

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Life evolved about 4 billion years ago. The first step in the evolution of life is called chemical evolution. In this phase of evolution, organic compound related to life was non-biologically synthesized and accumulated on the earth. The organic compounds concentrated lead to origin of life. The process lead to life formation is still ambiguous. However, it is likely that RNA world preceded DNA world. RNA world is the world of life whose genetic materials and catalytic compounds were made of RNA. However, the path from pre-biotic world to RNA world is not clear yet.

From the genetic information retained in genomes of extant living organisms, it is possible to resurrect genes of the last common ancestor, Commonote. Commonote is the ancestor of all the organisms on the earth, from human to *Escherichia coli*. We have been analyzing the ancestral proteins that have a part of the amino acid sequence of the Commonote. The artificial proteins that have a part of the Commonote sequence were designed, produced in *Escherichia coli* cells, purified and analyzed. It is possible to elucidate the environment where the Commonote lived. The results suggest that the Commonote was living at the temperature higher than 80C. I will present the possible application of ancient enzyme to elucidate the ancient environment on the earth.