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Origins of Life, RNA World or Alternative RNA World

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Why and how our living-bodies, such as human beings, have originated from a barely non-life planet into the highly-intelligent life existing Earth, and have been interested and pursued by large population of readers and investigators. Based on evolution of Darwin's arguments, some detailed evolutionary theories and steps have been renewed and discussed by modern evolutionists and investigators, including the evolutionary step of first genetic information replication. It seems to be a major topic of life origin [1].

Present Established Hypotheses about the Origin of Life

Present established hypotheses about the origin of life contains three scenarios; (i) evolution from prebiotic broth that is originated from the energy of meteorites crashes (ii) input from outside meteorites or comets that carry primitive life (iii) synthesis in the deep sea vents that carry energy of Earth heat and catalyzed by metals or sulfur [2-4]. Among these three hypotheses, first hypothesis is most frequently reviewed and discussed, [5,6] which is divided by RNA world hypothesis and alternative RNA world hypothesis.

RNA World and Alternative RNA World

There have been different hypothesis based on DNA [7], RNA [2,3,8,9] and protein [10,11] as main genetic materials, regarding the genetic information retrieving and duplication. Since genetic information duplication is the foremost important step to copy a life with integrity and persistency, it is widely accepted that this process is a crucial step in evolution progression for life creation. In this article, we try to overview these hypotheses and discuss one of the crucial factors for evolution, RNA world or alternative RNA world.

RNA world is most frequently reported and studied theory in which has invited many specialized books and lead to most critical arguments. RNA world is the argument that RNA is prehistoric than any other genetic materials and RNA itself can originate primitive life. RNA world is the mainstream of present studies. The main argument of RNA world is the self-replication characteristics of RNA [2,3,8,9] and an argument that the world life comes from RNA viruses [12]. But more recently, there are increasing arguments of alternative RNA world. These hypotheses argue that other genetic or biomolecules such as small peptides might also take part in life origin [13].

Genetic Material Replication and Life, Which Comes First?

In order to answer the question of RNA world or alternative RNA world, let us go one step further. Let us make some logic deduction first. We first need to answer the question of genetic material replication and life; which comes first and what is life? Genetic material replication and life, which comes first? This is like the dilemma as a "chick and egg problem". There is no answer, but we deduce that they might have occurred at same timescale. The second question is what is life? We must first understand the meaning of "life". There are many detailed papers to discuss "life" [14]. Since life is so complicated, a form that contains not only genetic materials replication, but also cell membranes (material isolation) and sugars (energy donor) for keeping cells alive, it seems a little naïve to think only one material (RNA) can origin life. RNA world argument seems unconvincing now. Since there might be a lot of materials, such as proteins, lipids, sugars at the time of RNA presence, we argues more than one materials might take part in life origin instead of RNA alone. Is there any other arguments and question?

Cooperative Model

Here we provide a cooperative model to explain the first genetic replication system establishment. Since at present we cannot root out any possibilities of genetic materials such as pro-DNA, pro-RNA or protein as an origin of life, may we hypothesize that there might be pro-DNA, pro-RNA and pro-peptide polymers coexistence in prebiotic broth at the stage of early genetic information duplication. So there is no such question of which single genetic material can fulfill this process. However, these polymers cooperatively and competitively reproduce genetic information. We have this hypothesis by finding many reports that materials promoting genetic replication such as ribosome are a mixture of RNA and proteins and we think the genetic information duplication is a complex process and might be fulfilled by more than one type of materials. It is the cooperative model of action in producing the first life. So, according to our deduction, among all three genetic-carrying materials presently existing, RNA, owing to its characteristics of competitively advantages, might be mostly possibly as a media of initial genetic information reproducible in the life-origin on Earth. But all the other materials, like today's life form, also take part in life origin process.

Mathematical Simulation and Data Analyzing

With a new trend of using mathematic models to analyze or solve the important problems of biology worldwide [15-17] we here provide a proposal to solve this problem by using systems biology approaches. By building simulating conditions of "prebiotic broth" to decide rate of copying or mutation of different genetic information reproduction spans (DNA, RNA or peptide) throughout the definite time-scale and decide if rate factor can decide the process of genetic information duplication. Also we can data back the prehistoric rocks of different epics for organic compounds remnants, especially genetic materials by the analysis of isotope abundance, compare and calculate the data for coming up with a correct and helpful verdict of this long-standing scientific dilemma, controversy and/or organize some well-organized competitions among world algorithmic research groups and practicing institutions at different levels [18].

References

1. Darwin C (1859) On the origin of Species. London: Murray.

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2. Orgel LE (2004) Prebiotic chemistry and the origin of the RNA world. Crit Rev Biochem Mol Biol 39: 99-123.
3. Orgel LE, Crick FH (1993) Anticipating an RNA world some past speculations on the origin of life: where are they today? FASEB J 7: 238-239.
4. Wachtershäuser G (1988) Before enzymes and templates: theory of surface metabolism. Microbiol Rev 52: 452-484.
5. Wachtershäuser G (2007) On the chemistry and evolution of the pioneer organism. Chem Biodivers 4: 584-602.
6. de Duve C (2007) Chemistry and selection Chem Biodivers 4: 574-583.
7. Crick FHC (1967) Origin of the genetic code. Nature 213: 119
8. Orgel LE (1992) Molecular replication. Nature 358: 203-209.
9. Zimmer C (2006) Did DNA come from viruses? Science 312: 870-872.
10. Lupi O, Dadalti P, Cruz E, Sanberg PR; Cryopraxis' Task Force for Prion Research (2006) Are prions related to the emergence of early life? Med Hypotheses 67: 1027-1033.
11. Lupi O, Dadalti P, Cruz E, Goodheart C (2007) Did the first virus self-assemble from self-replicating prion proteins and RNA. Med Hypotheses 69: 724-730.
12. Culley AI, Lang AS, Suttle CA (2006) Metagenomic analysis of coastal RNA virus communities. Science 312: 1795-1798.
13. Francis BR (2011) An alternative to the RNA world hypothesis. Trends in Evolutionary Biol 3: e2.
14. Jortner J (2006) Conditions for the emergence of life on the early Earth: summary and reflection. Philos Trans R Soc Lond B Biol Sci 361: 1877-1891.
15. Pennisi E (2003) Systems biology. Tracing life's circuitry. Science 302: 1646-1649.
16. Lu DY, Ding J (2005) Systems biology, 21st-century biology. Biology J. 22: 60.
17. Bialek W, Botstein D (2004) Introductory science and mathematics education for 21st-century biologists. Science 303: 788-790.
18. (2008) Going for algorithm gold. Nat Methods 5: 659.