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Short Communication

Goal Directed Mutational Changes: Evolutionary Pathway for Better Survival

Anindya Das*

Assistant Professor, Department of Microbiology of KPC Medical College and Hospital, West Bengal University of Health Science, Kolkata, India

***Corresponding Author:** Anindya Das, Assistant Professor, Department of Microbiology of KPC Medical College and Hospital, West Bengal University of Health Science, Kolkata, India.

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All the evolutionary developments from unicellular microbes to multicellular organisms and from lower animals to higher animals were need or requirement based and goal directed for better survival. At the early stage primitive prokaryotic microbes were of two types – autotrophic and heterotrotrophic microbes. Autotrophs are again of two types – Lithoautotrophs which can produce their own food from inorganic carbon dioxide and Photoautotrophs which can trap energy from sunlight to produce their own food. On the contrary Heterotrophs are mainly Organotrophs using reduced carbon compounds as electron sources, like carbohydrates, fats and proteins. From the Photoautotrophic microorganisms plant kingdom developed and from the Heterotrophic microorganisms animal kingdom developed.

Before that, eukaryotic microorganisms evolved from the prokaryotic microorganisms and the transition from unicellular to multicellular organization is a major step in eukaryotic evolution. In the beginning unicellular organisms ruled the earth. For more than 3 billion years after the appearance of unicellular microbes, life got more complicated. Today, most plants, animals, fungi, and algae are composed of multiple cells that work collaboratively as a single being. But how did life evolve from unicellular simplicity to multicellular complexity?

In this context it can be said that the group behavior of unicellular organisms with better survival advantage and moving towards the more complex form is crucial to the development of multicellularity from unicellular life. It is well known that the bacteria which can be considered as the primitive life form, remaining in groups in biofilm can well protect themselves from antibacterial substances. This group behavior of bacteria inside biofilm pertains to survival advantages. From this example it is presumed that the group behavior of unicellular organisms might also provided survival advantages from other harsh environmental conditions of primitive earth. After all, creation of higher life from simple life form is said to be goal-directed towards more complexity for better performance and better survival. To explain the creation of multi-cellular organisms from the unicellular organisms it can be said that though multicellular form is not found in prokaryotes as they are the primitive form of cell and their genetic information is not well organized enough to create multicellular form, but later on with the development of eukaryotic cell from prokaryote through endosymbiosis [1], the well organized genetic structure and better information dissipation capability with critical development of cell membrane signaling pathway with better way of keeping intercellular communication, multiple eukaryotic unicellular forms in a collection followed this group behavior for a long time to evolve into multicellular eukaryotic organisms.

After the development of multicellular eukaryotic form, photoautotrophs created the plant kingdom and the heterotrophs created the animal kingdom. Initially the basic needs of living organisms were acquisition of food to sustain growth, nutrition, metabolism and reproduction. As the plant kingdom was capable to capture sunlight to produce their own food, so the need based requirement of them was less in comparison to the animal kingdom which had to move in search of their food. So the need or requirement based goal directed evolutionary development of organ of locomotion can be found only in animals but not in plants. As for the basic need of survival, plants don't have to move from one place to another, they didn't acquire any organ of locomotion but only developed roots to move deep inside the soil to acquire inorganic nutrients, the rigid stem for support and the branches and the leaves growing in the direction of sunlight to capture sunlight. Due to the lack of flexibility they acquired rigid cell wall. On the contrary, as movement was the basic requirement of animals for the collection of food, so animal cells became extremely flexible with only presence of cell membrane but no cell wall and later on development of different locomotory organs.

During the initial stage of evolutionary development of early living forms like unicellular microbes, the struggle was against the

unfavorable environmental conditions and the development of sporulated form of microbes is an example of need based goal directed evolutionary development to combat harsh environmental condition. Later on with the development of multicellular complex living forms of diverse species and the creation of predator and prey relationship the struggle between the predator and prey for better survival was the main force that created the direction oriented evolutionary development and the creation of more fittest living forms of higher animals.

From evolutionary standpoint it can be said that during the different stages of evolutionary development from simple to complex living forms, due to establishment of predator and prey relationship, for better survival, direction oriented development of specific parts of the body occurred in several times. For example, the development of wings in several insects and later on in avian species, color changing capabilities of different living forms to camouflage themselves from the predators, development of gigantic animals like elephant, dinosaurs; development of fishes which can survive in both water and air; development of long neck of Giraffe to collect leaves, fruits and flowers from tall woody plants which most herbivorous cannot do; development of two footed animals from four footed animals – are all examples of need based goal directed development of specific parts of the body for better survival.

Among all these direction oriented development of specific body-parts, the most miraculous was the direction oriented development of neo-cortex or the forebrain from the primitive brain during the evolutionary development of man from the lower species like chimpanzee. This miraculous development of forebrain of human has created the modern world and so far this is the most advantageous evolutionary development among all other direction oriented developments that has created the new era of human history and modern world!

The above mentioned idea of "Need or requirement based and goal directed evolutionary development of living organisms" and "The group behavior of unicellular organisms leading to multicellular organisms" is in accordance with the theory of "Biological Evolution" developed by the English naturalist Charles Darwin (1809–1882) and others, stating that all the different species of organisms arose and developed through the process of natural selection of small, inherited variations that increased the individual's ability to compete, survive, and reproduce [2]. However it is worth mentioning here that an another group of scientists like Michael J. Behe and Michael Denton [3,4] believe that Darwin's Theory of Evolution is a theory in crisis in light of the tremendous advances that has been made in the field of molecular biology, biochemistry and genetics over the past fifty years. They are arguing in favor of "irreducibly complex system" which is a system composed of multiple parts, all of which are necessary for the system to function and even if one part is missing, the entire system will fail to function as every individual part is integral to the system. Thus, it is not possible for such a system to evolve slowly, piece by piece. A very simple and common non-biological example of "irreducibly complex system" is a common "mousetrap". It is composed of five basic parts: a catch (to hold the bait), a powerful spring, a thin rod called "the hammer," a holding bar to secure the hammer in place, and a platform to mount the trap and if any one of these parts is missing, the mechanism will not work as each individual part is integral. The mousetrap is irreducibly complex and with the development of molecular biology, biochemistry and genetics, it can be shown that there are in fact tens of thousands of irreducibly complex systems on the cellular level and the opponent group is even opining is favor of "intelligent designing" of living organisms.

However, the above mentioned ideas of "Need or requirement based and goal directed evolutionary development of living organisms" and "The group behavior of unicellular organisms leading to multicellular organisms" can only act by taking advantage of slight successive variations; it can never take a great and sudden leap, but must have advanced by short and sure, though slow steps. As the process is extremely slow, successive and short but gradual transformation, so it is not possible to prove it in one person's life span. But if microorganisms of very short life cycle like bacteria of medical importance are taken into account then it can be easily said that under unfavorable environmental condition of anti-microbial substances like antibiotics and chemotherapeutic agents, multi-drug resistant strains of bacteria can be produced and the multi-drug resistant genes can be transferred from one bacterium to another bacterium through the process of transformation, transduction and conjugation which is a definite laboratory proof of goal directed mutational changes of microbes which predicts in favor of "Need or requirement based and goal directed evolutionary development of living organisms".

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