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Should we terraform Mars with silicon utilizing organisms even in presence of *in situ* microorganisms on it?

S. Das
Dept. of Microbiology, Peerless Hospital & B. K. Roy Research Centre, Kolkata, India (drsatdas@hotmail.com Fax: 91-33-24620766)

Abstract
A proposal of terraforming of Mars with silicon utilizing organisms appears most interesting due to various distinct properties of these organisms. Evidences are also there that they can adapt in new ecosystems without affecting resident organisms. On Earth many living creatures remain as aliens in different geographical areas without altering the ecosystem and similar findings are also true for extremophiles. Terraforming will also help any compromised microorganism present on Mars to thrive properly. Mankind should spread on extraterrestrial bodies by terraforming for their survival in the universe.

1. Introduction

Silicon utilizing organisms are defined as organisms with high silicon content (≥ 1% dry weight) and they can metabolize silicon with or without demonstrable silicon transporter genes (SIT) in them. There are seven major groups of silicon utilizing organisms belonging to Gram positive bacteria, algae, protozoa, sponges, fungi, lichens, and monocotyledon plants. Probably the most silicon utilizing organisms are algae belonging to Centrobacillariophyceae, Pennatibacillariophyceae and Chrysophyceae.

1.1 What is special about terraforming with silicon utilizing organisms?

In mass extinctions most ecosystems were destroyed throughout the world which was followed by developments of restructured communities with all surviving members in continuous struggles till formation of stable ecosystems. Those new stable ecosystems were mainly reconstructed from low-diversity systems composed of opportunistic group of organisms. Silicon utilizing organisms have a long evolutionary history and it was found in fossil records that some silicon utilizing organisms dominated the Earth after mass extinction events indicating their biological selectiveness in extinction episodes and this leads to an unperturbed ecosystem of them throughout all mass extinctions. Their ability of persistence in mass extinctions remains to the fact that they can survive in extremes of temperature, pressure, radiation, pH, salinity and nutrient conditions. This unusual tolerance to stress depends on the presence of more silicon in their body than in other organisms. Other characteristics of them include increased autotrophic activity, ability to encounter metal toxicities (including iron toxicity which is important on Mars), increased mechanical strength, ability to prevent infections, and higher light transmission. Many of them can also grow in the dark for more than three months even in absence of any organic substrate. Silicon metabolism also requires 30% less energy than carbon and that might be one important reason why it was not abandoned in over 100 million years of evolution; even in presence of a well advanced and dominating carbon living world. Additionally, silicon utilizing organisms have undergone resistance and capacity adaptations during their long existence on the Earth. It was found that when electropositive elements are less in extraterrestrial situation, then polymerization of silicon-oxygen profusion may occur easily, particularly in carbon and nitrogen paucity in the rocky worlds of the Universe. Thus terraforming with silicon utilizing organisms on Mars will be easier and a proposal [1,2,3]of such terraforming

indicated lowest expenditure, fast and simple terraforming system of Mars without risk when compared to other suggestions like orbital mirrors, albedo reduction, use of greenhouse gases, synergic approach of Fogg etc.

1.2 Should we terraform Mars with silicon utilizing organisms even if *in situ* microorganisms are there?

Because these organisms are adapted in mass extinctions with new ecosystems they are likely to adapt similarly on Mars without eliminating *in situ* ecosystem if any. If we look into the ecosystem of earth then it is obvious that alienation is a natural phenomenon on it. Thus one can find out a long list of alien plants in different countries which are supposed not to be present there and similar trend is also found with many microbes and insects and such process is continuously going on without affecting the ecosystem. If we consider human beings on Earth, then discovery of America by Columbus was a process of alienation which leads to development of presently the most prosperous country in the world. Thus if we follow the ideas of ecocentric mind then progress of human race will be fixed. Similarly when British Rule was established in Bengal there was a renaissance and Western system was found to advance much of the *in situ* systems. At present, we are not sure that microorganisms are there on Mars, however, if they are present then they remain in an extremely compromised state because recent studies suggest that Mars had a warmer and wetter climate in the past and thus it is our duty and not a passion to thrive them easily by terraforming. Extremophiles are there on Earth; they may also be present on Mars and terraforming with some silicon utilizing organisms will not cause extinction of them. So far we know life has only developed on Earth and human beings are exceptionally intelligent living creatures on it. Thus terraforming is the essential step for our survival in the universe.

2. Conclusions

Silicon utilizing organisms appears to be the most suitable agents for terraforming Mars. Terraforming is an important step for progress and survival of the mankind which we should follow.

References

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