

Space environment-related genetic analysis of terrestrial cyanobacteria

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Cyanobacteria are photosynthetic organisms that produce dioxygen (O₂) on Earth and sustain life. It is thought that O₂ produced by primitive cyanobacteria changed primitive earth environment to oxygen-rich condition. The ozone produced from O₂ absorbed ultraviolet (UV) radiation, and a more effective UV-absorbing layer, the ozone layer, was formed in the upper atmosphere. Atmospheric gasses absorbed solar radiation, i.e. X-rays and gamma rays. Thus, organisms such as cyanobacteria could live on the land and produce atmospheric gasses that would absorb radiation. Terrestrial cyanobacteria live in an extreme environment. Some terrestrial cyanobacteria have desiccation tolerance and nitrogen fixation abilities. *Nostoc commune* (Ishikurage) lives in widely different environments, such as the polar and desert environments. We have previously reported the genome analysis of *Nostoc* sp. HK-01 (NIES-2109, hereafter HK-01), isolated from the crust of Ishikurage. HK-01 survives under low vacuum conditions, such as those in the environment of Mars, and dried HK-01 shows tolerance to high temperatures and high gamma-ray radiations. We will show a part of our results and discussion related to extra-terrestrial environments, based on the *in silico* data of various cyanobacterial genome sequences. We would also discuss the circulation of materials and their stress tolerance.

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