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有機物・微生物の宇宙曝露と宇宙塵・微生物の捕集『たんぽぽ計画』 PCR法による捕集微生物の検出方法の検討

Investigation of analytical conditions of captured microbes in space with PCR ? Microbe capture experiment on ISS propos

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Terrestrial life may fly off into outer space by volcanic eruption meteorological impacts, and so on. Microbes have been collected from high altitude up to 70 km since 1936 [1]. We also isolated microbes at high altitude up to 35 km using an airplane and balloons [2, 3]. The two isolates of these microbes are new species, one of which shows higher UV ray tolerance than Deinococcus radiodurans [2, 3]. On the other hand, there is a hypothesis on the origin of terrestrial life called panspermia [4, 5], in which terrestrial life is thought to have come from space (or astronomical bodies other than Earth). This hypothesis suggests that life may migrate between Earth and other planets. If microbes were to exist at the high altitude of low earth orbit (400 km), it would endorse the possibility of interplanetary migration of terrestrial life
We proposed, the Tanpopo mission to examine interplanetary migration of microbes and organic compounds on Japan Experimental Module (JEM) of the International Space Station (ISS). We will capture micro-particles including microbes and micro-meteoroids at the altitude of ISS orbit (400 km) with ultra low-density aerogel exposed to space for a given period of time. After retreaving the aerogel, we will investigate captured micro particles and tracks followed by microbiological, organic chemical and mineralogical analyses.
Captured particles will be analyzed after the initial curation of the aerogel and tracks. Particles potentially containing microbes will be used for PCR amplification of small subunit (ss) rRNA gene followed by DNA sequencing. Comparision between the determined sequences and known ss rRNA gene sequences of terrestrial organisms will suggest the origin and properties of the organism.
The density of microbes at the ISS altitude might be quite low, and microbe cell number on each captured particle may be quite limited. Therefore, it is necessary to establish the effective PCR procedure for quite small amount of DNA template in the presence of other materials such as clay and aerogel.
We will report current status of the PCR identification of microbes from test samples. The PCR conditions to amplify ss rRNA gene from quite small number of cells and quite low concentration of genomic DNA with/without clay and aerogel are examined.

References
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