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Current status of preparation of TANPOPO mission and investigation of survivability of microbes in space

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Microbes have been collected from high altitude using balloons, aircraft and meteorological rockets since 1936, even it is not clear how those microbes could be ejected up to such high altitude. Spore forming fungi, spore-forming Bacilli, and Deinococci (e.g. *Deinococcus aerius* and *Deinococcus aetherius*) have been isolated in these experiments. If microbes could be found even at the higher altitude of low earth orbit (400 km), the fact would endorse the possibility of interplanetary migration of terrestrial life.

For the origin of life on Earth emerged within a short period after the end of heavy bombardment, Panspermia hypothesis was proposed. Recent the reports on the possible fossils of microbes in the Martian meteorite promote the debate on the possible existence of extraterrestrial life, and interplanetary migration of life as well.

On the other hand, it is the question where precursors of materials such as protein and nucleic acids came from in the era of ”chemical evolution” on the Earth? Recent studies suggest that the some of such organic compounds were created in space. Then, they reached the surface of Earth via meteorites, cosmic dusts, and so on. Avoiding contamination of terrestrial materials from the extraterrestrial materials is quite important issues for the analysis of extraterrestrial materials. Capturing such extraterrestrial materials before falling down on the surface of Earth might be one of possible solutions.

We have proposed a mission, named TANPOPO, to examine possible interplanetary migration of microbes, and organic compounds at the Exposure Faculty of Japan Experimental Module (JEM) of the International Space Station (ISS). The Tanpopo mission consists of six subthemes ? capture of microbes in space, exposure of microbes in space, capture of organic compounds in space, exposure of organic compounds in space, measurement of space debris at the ISS orbit, and evaluation of ultra low-density aerogel special for the TANPOPO mission.

Ultra low-density aerogel will capture micrometeoroid and space debris. Particles captured by aerogel will be analyzed from biological, chemical, and meteorological aspects.

In addition to particle-capture on ISS, we also proposed direct exposure experiments of microbial cell aggregates that might protect the microbes themselves from UV and cosmic rays. Deinococci (*Deinococcus radiodurans*, *D. aerius*, and *D. aetherius*), terrestrial cyanobacteria, and fungi are under consideration for space exposure. Amino acids and complex organic compounds that can be formed in space are also planed for space exposure.

In this paper, we overview the TANPOPO mission and discuss the current status of experiments related to the microbe existence/survival set for this mission.

Keywords: Panspermia, Space exposure, Origin of life