

The collision and exposure experiments of microorganisms

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In TANPOPO project (TANPOPO: Astrobiology exposure and micrometeoroid capture), we are planning to perform experiments for six subthemes in parallel as the exposure experiment of KIBO platform of International Space Station (ISS). Two of six subthemes concern to the possible survival abilities of microorganisms in space.

One is the direct capture experiment of microorganisms at the ISS altitude. We think that, if any microorganisms can survive at the ISS altitude, they might hidden in the inner voids of micrometeorites, then they might be protected from UV light, cosmic ray, etc. To capture small particles in space, the aerogel (0.03 g/ml or less) have been used. The aerogel with quite small density has been shown to be good media for the capture of struck small particle with small damage for the particle. However, if any microorganisms exist at the ISS altitude, when the microorganisms are captured, they strike the media for capturing microorganisms at 8 km/s or more. To test whether it is possible to detect microorganisms in the captured samples struck at high-speed (several km/s) by the aerogel, we performed the collision experiments of microorganisms by using the 2-step light gas gun. The preliminary experiments suggested that the microorganisms mixed with clay material shot at 4 km/s can be detected by fluorescence-microscopic observation.

The other is the long-term (1 to several years) exposure experiment of microorganisms in space at the ISS altitude. We are going to expose various microorganisms to space without any covers. The radiation tolerant bacterium *Deinococcus radiodurans* and its related species, spore-forming bacteria (e.g. *Bacillus*), and other microorganisms are going to be used for the exposure experiment. As discussed above, microorganisms hidden in the inner voids of micrometeorites might be most possible candidates of survivors at ISS altitude. The various tests for deciding condition of exposure experiments of microorganisms in space, such as procedure of fixation of microorganisms on the exposure apparatus, and estimation of effect of space environment to the exposing microorganisms by ground experiments are in progress.