DRIED COLONY IN CYANOBACTERIUM, *NOSTOC* SP. HK-01 - SEVERAL HIGH SPACE ENVIRONMENT TOLERANCES FOR "TANPOPO" MISSION

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Introduction:

Habitation in outer space is one of our challenges. We have been studying future space agriculture to provide food and oxygen for the habitation area in the space environment, in the craft and/or on Mars[1]. A cyanobacterium, *Nostoc* sp. HK-01, has high several space environmental tolerance. Arai et al. already reported that *Nostoc* sp.HK-01 had an ability to grow for over several years on the Martian regolith simulant in a laboratory experiment[1]. *Nostoc* sp HK-01[2] would have high contribution for the "TANPOPO" mission in Japan Experimental Module (JEM) of the International Space Station (ISS) [3]. Here, we will show the importance of this material for TANPOPO Project and further utilization and important aims for future using them as a food after its growing on Mars.

Material and Method:

Cyanobacterium, *Nostoc* sp.HK-01, was used in this all experiments. The dried colony as material, *Nostoc* sp. HK-01, was exposed to high temperature (100°C:3h, 4h, 5h, 6h, 7h, 24h), UV (253.7nm:24h, 48h), gamma-ray (5KGy), heavy particle beam. After the exposure, they incubated in water for 2 days. Fluorescein diacetate, FDA, was used for the staining of *Nostoc* sp. in this study. The detailed method was described previously. The stained cells were observed under a fluorescent microscope (BX50 type, OLYMPUS, Japan).

Results and disscussion:

All or a part of the tested cells in the colony could survive under the exposed serious environments, 100°C (1~7h), UV (24h, 48h), gamma-ray (5kGy), heavy particle beam (5, 20, 40, 80min). In the high temperature, 100°C in 24h, the percentages of survived cells were decreased. According to these results, *Nostoc* sp. would have survival limit temperature within 24h at 100°C.

On the other hand, the easy cell separation method was examined. The optimum conditions were ascertained. The dry material, *Nostoc* sp. HK-01, was incubated at 37 °C for 30 minutes with water. After their shaking for 15 minutes, cells could be cultured on ager in cell culture plate for 2-3the days.

The increased cells were re-incubated for screening a high tolerance material for future space utilization. The screened material would be used in the several evolutional experiments. In the heat exposure experiment, even the cells without EPS has also had a high tolerance. These results, in the case of high temperature tolerance, it has a possibility that the contribution of their tolerance would be a little relation to extracellular polysaccharides (EPS), although several reports suggested the relation to EPS on the cyanobacteria tolerances[4,5]. We are studying the identification of functional substances related to their tolerance in their cells.

We are trying to determine the best conditions and evolution for high space environment tolerance of *Nostoc* sp.HK-01 and studying the proposal of utilization of cyanobacteria, *Nostoc* sp HK-01, for the variation of total utilization as space agriculture [6].

References:

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