[EE] Evening Poster | B (Biogeosciences) | B-AO Astrobiology & the Origin of Life

[B-AO01]Astrobiology

convener:Hikaru Yabuta(Hiroshima University, Department of Earth and Planetary Systems Science), Seiji Sugita(Department of Earth and Planetary Science, Graduate School of Science Sciece, The University of Tokyo), Misato Fukagawa(名古屋大学, 共同), Fujishima Kosuke(Tokyo Institute of Technology, Earth-Life Science Institute)

Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Twenty years have passed since when the field of Astrobiology, which aims to unveil the origins, evolution, and habitability of life by integrating multidisciplinary fields, was established. Origins of Life are currently being re-conceptualized via expansion of prebiotic chemistry to systems chemistry and chemical space. Besides their relationship to life's building blocks, it is expected to demonstrate the significant roles of organic molecules in the history of planetary formation. The linkages among the variations in chemical compositions of deep-sea hydrothermal environments, geological settings, and ecological systems were systematically investigated. Cassini, which accomplished in the long-term explorations of the planets bearing liquid, had "Grand Finale" this year. Discoveries of extrasolar planets have been dramatically increased to date.

Originally, Astrobiology does not need a specific science category. We therefore aim to make this session so that Earth and Planetary scientists from all the categories join for discussing 'where we came from and where we are going' and for making novel integrated researches.

For the next stage of Astrobiology, presentations on the instrument development in space explorations, comparative studies of solar system and exoplanets, etc, will be very much welcome.

[BAO01-P12]Analysis of DNA damage induced by space exposure of *Deinococcus radiodurans* R1 in Tanpopo mission

*Jun Yatabe[1], Yuko Kawaguchi[1], Iori Kinoshita[1], Daisuke Fujiwara[1], Motohide Aoki[1], Kie Taniguchi[1], Issay Narumi[2], Mio Shibuya[1], Hirofumi Hashimoto[3], Shin-ichi Yokobori[1], Akihiko Yamagishi[1] (1.Tokyo university of pharmacy and life sciences, 2.Toyo University, 3.ISAS/JAXA)

Keywords:Panspermia hypothesis, Space exposure experiments, Cell aggregate, DNA damage, Quantitative-PCR

Tanpopo mission is a Japanese astrobiology experiment addressing basic questions on the origin of terrestrial life and panspermia hypothesis (Yamagishi et al., 2009; Kawaguchi et al., 2016). We have started the space experiments at the Exposure Facility of the Japan Experiment Module on the International Space Station (ISS). Capture experiment investigates existence of terrestrial microbes in space. Exposure experiment investigates the microbial survival and DNA damage caused in space. We analyze degree and types of DNA damage in *Deinococcus radiodurans* using following methods: 1) comparison of survival fractions of mutant strains deficient in each of DNA repair systems, 2) analysis of DNA double-strand breaks using pulsed-field gel electrophoresis, 3) estimation of DNA damage using quantitative-PCR (q-PCR), 4) detection of mutation in *rpoB* gene and 5) analysis of DNA base damage using LC-MS/MS. In this work, we quantified DNA damage (double-strand breaks, single-strand breaks, hydrolysis of base, modified base, and so on) in part of the *rpoB* gene using q-PCR.

Methods

Dried *deinococcus* cell-aggregates with different thickness were exposed to space (space samples) for about one year. The cells were also stored in the ground laboratory (ground references) and in ISS cabin (ISS references). After exposure or storage, genomic DNA was extracted from each sample and an 887-bp

region in the *rpoB* gene was amplified by q-PCR. Intact DNA (%) was determined from the quotient N/N_0, where N = copy number of *rpoB* gene amplified from DNA of exposed or stored cells and N_0 = copy number of *rpoB* gene amplified from freshly prepared DNA.

Results and Discussion

Cell-aggregates with 100 µm-thickness exposed to space all cells were dead. Intact DNA of the cell-aggregates with 100 µm-thickness exposed to space was less than 1%. On the other hand, Survival fraction in those with 500, 1000 μm-thickness was similar between the ground references and the space samples. The result indicates that UV affected only the surface of the cell-aggregates. Intact DNA showed a good correlation with surviving fraction. We will also report the types and degrees of DNA damage using other methods.

Yamagishi, A., et al., (2007) *Biol. Sci. Space* 21: 67−75. , Kawaguchi, Y., et al., (2016) *Astrobiology* 16: 363−376.