CAPTURE OF INTERPLANETARY DUST PARTICLES AND EXPOSURE OF BIOORGANIC COMPOUNDS USING THE INTERNATIONAL SPACE STATION: THE TANPOPO MISSION. K. Kobayashi[1], H. Mita[2], H. Yabuta[3], K. Nakagawa[4], J. Takahashi[5], E. Imai[6], K. Okudaira[7], M. Tabata[8], H. Kawai[9], H. Yano[8], H. Hashimoto[8], M. Yamashita[8], S. Yokobori[10], A. Yamagishi[10] and TANPOPO WG[8], [1]Yokohama National University, Tokiwadai, Hodogaya-ku, Yokohama 240-8501, Japan, e-mail: kkensei@ynu.ac.jp, [2]Fukuoka Institute of Technology, Wajiro-higashi, Higashi-ku, Fukuoka 811-0295, Japan, [3]Osaka University, Machikaneyama-cho, Toyonaka 560-0043, Japan, [4]Kobe University, Tsurukabuto, Nada-ku, Kobe 657-8501, Japan, [5]NTT, Morinosato-Wakamiya, Atsugi 243-0198, Japan, [6]Nagaoka University of Technology, Kamitomiokamachi, Nagaoka 940-2188, Japan, [7]University of Aizu, Tsuruga Ikki-machi, Aizu-Wakamatsu 965-8580, Japan, [8]JAXA Institute of Space and Astronautical Science, Yoshinodai, Chuo-ku, Sagamihara 252-5210, Japan, [9]Chiba University, Yayoicho, Inage-ku, Chiba 263-8522, Japan, [10]Tokyo University of Pharmacy and Life Science, Horinouchi, Hachioji 192-0392, Japan.

Introduction: A wide variety of organic compounds have been detected in carbonaceous chondrites, and their relevance to the emergence of terrestrial life is discussed. It was suggested that more organic carbons were delivered to the early Earth by interplanetary dust particles (IDPs) than by meteorites or comets [1]. IDPs (micrometeorites) have been collected in Antarctic ices, and in stratosphere. Presence of bioorganics in IDPs is expected, but it is difficult to judge it since they are so small and were collected in the terrestrial biosphere. Thus it would be of importance to collect IDPs out of the terrestrial biosphere.

We are planning a novel astrobiology mission named *Tanpopo* by utilizing the Exposed Facility of Japan Experimental Module (JEM/EF) of the International Space Station (ISS). Here we introduce the mission.

Outline of the Tanpopo Mission: Two types of experiments will be done in the Tanpopo Mission: Capture experiments and exposure experiments. In order to collect cosmic dusts (including IDPs) on the ISS, we are going to use extra-low density aerogel, since both cosmic dusts and ISS are moving at 8 km s^{-1} or over. We have developed novel aerogel whose density is 0.01 g cm^{-3}. In the exposure experiments, organics and microbes will be exposed to the space environments to examine possible alteration of organic compounds and survivability of microbes.

Collection of IDPs and Analysis of Extraterrestrial Organics Contained Therein: Several aerogel blocks will be attached on several faces of an integrated experimental rack that will be placed on JEM/EF of ISS. High-speed dusts will make tracks in the aerogel. After recovering them to the Earth, we will separate each track with a terminal grain, and will apply to chemical analysis, including microscopic techniques (FT-IR, STXM-XANES, etc.) and amino acid enantiomers analysis after acid hydrolysis.

We have tested whether hypervelocity dusts can be trapped in aerogel by using a two-stage light gas gun equipped in JAXA/ISAS. Samples such as powder of Murchison meteorite were shot out at 4- 6 km s^{-1}, and were captured in an aerogel to see whether organics could be recovered in the terminal grains or tracks.

Exposure of Amino Acids and Their Precursors to Space Environments: A number of amino acids were detected in water extract of carbonaceous chondrites. When dusts are formed from meteorites or comets in interplanetary space, they are exposed to high-energy particles and photons. In order to evaluate possible alteration of amino acid-related compounds, we chose amino acids and hydantoins (precursors of amino acids), and products of proton irradiation of a mixture of CO, NH_3 and H_2O (CAW; containing complex precursors of amino acids [2]).

We performed ground simulation experiments by using accelerators, which showed that amino acid precursors were much more stable than free amino acids against radiation.

Verification of *Pansperimia*: The Tanpopo Mission has several other objectives, which include verification of *Panspermia* (interplanetary migration of microbes) [3]. Living microbes have been detected in high altitude of terrestrial atmosphere, which suggested that microbes might escape to space. In the Tanpopo Mission, we will also search for terrestrial dusts containing microbes in low Earth orbit. In addition, selected microorganisms including UV-resistant bacteria that we found in terrestrial upper atmosphere will be exposed to space environments.

Conclusion: The Tanpopo Mission is Japanese first astrobiology space experiment, which is now scheduled to start in 2013. Samples will be retrieved 1-3 years after launch. We can expect to have the first IDPs sampled in space to see what kind of organics can be delivered by IDPs. In addition, we might have a new evidence of interplanetary migration of life.

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