

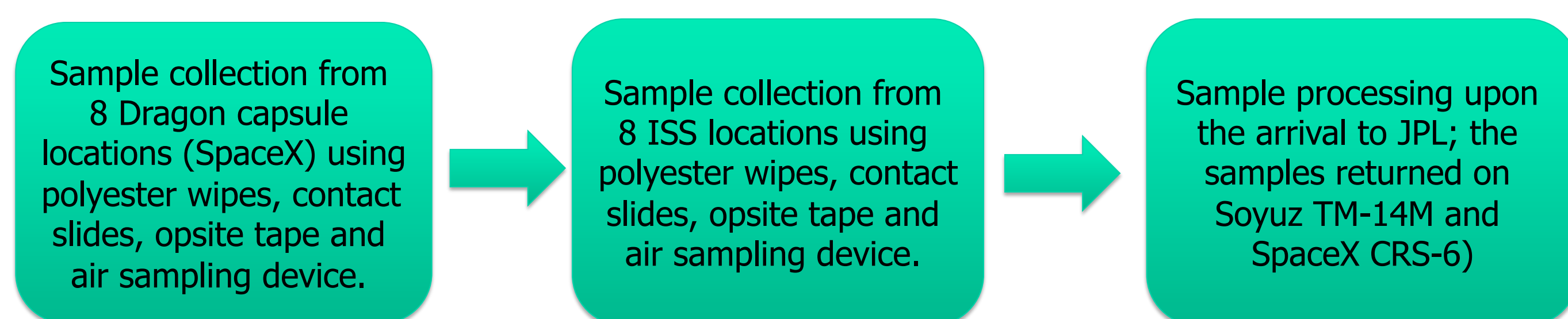
The International Space Station Microbial Observatory Experiment

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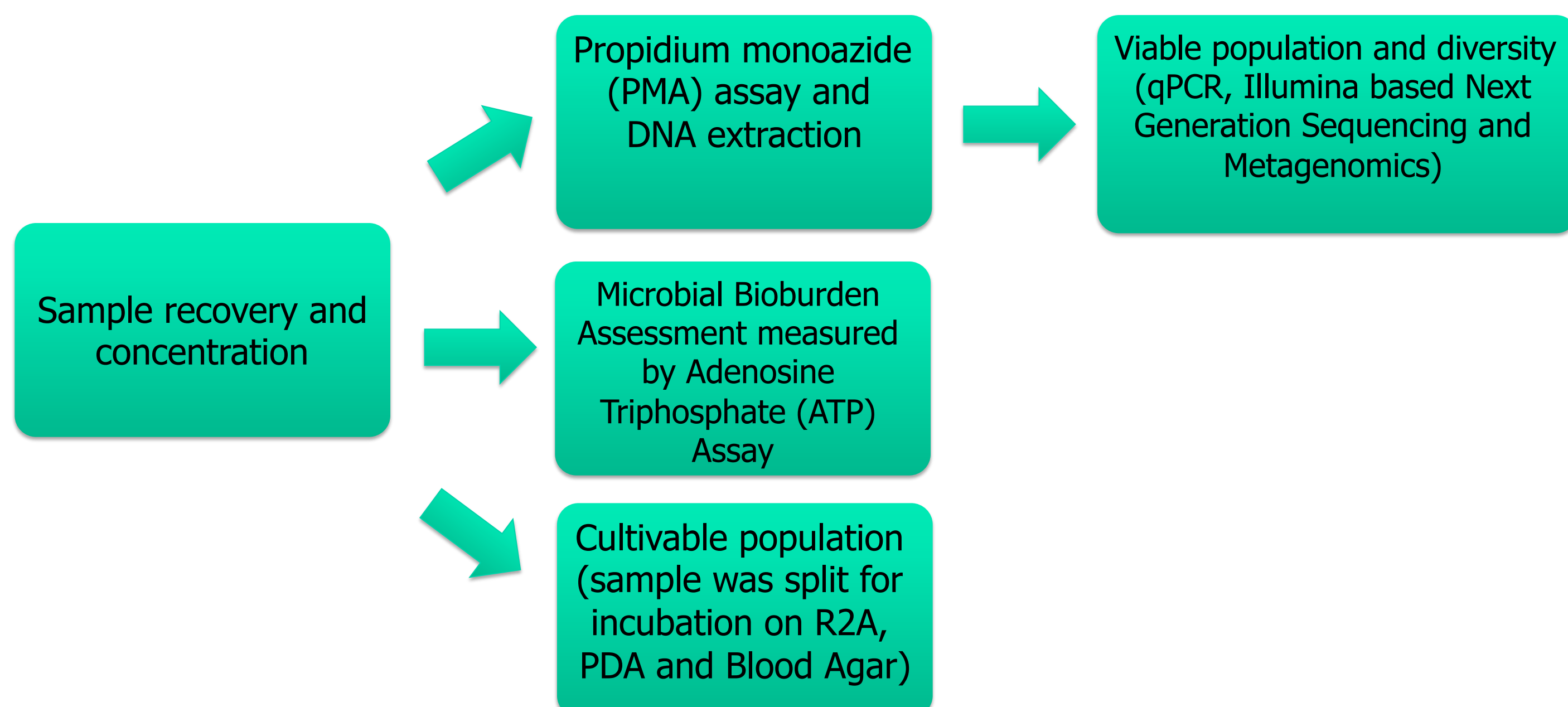
Objectives

- The safety of the International Space Station (ISS) crewmembers and maintenance of hardware are the primary rationale for monitoring microorganisms in this closed habitat.
- National Research Council (NRC) recommended to utilize ISS – a closed habitat– and observe changes encountered due to the microgravity. Subsequently, NASA Space Biology program funded JPL to catalogue microbial diversity of ISS surfaces and atmosphere under NASA – Microbial Observatory Program.
- Molecular techniques were used to measure microbial burden and diversity associated with these samples that were previously.
- This study provides the insight into microbial diversity of ISS using the state-of-the-art molecular techniques applied by JPL-352N group for the MARS program.**

Sample Collection



Sample Processing



Cultivable Microbial Diversity

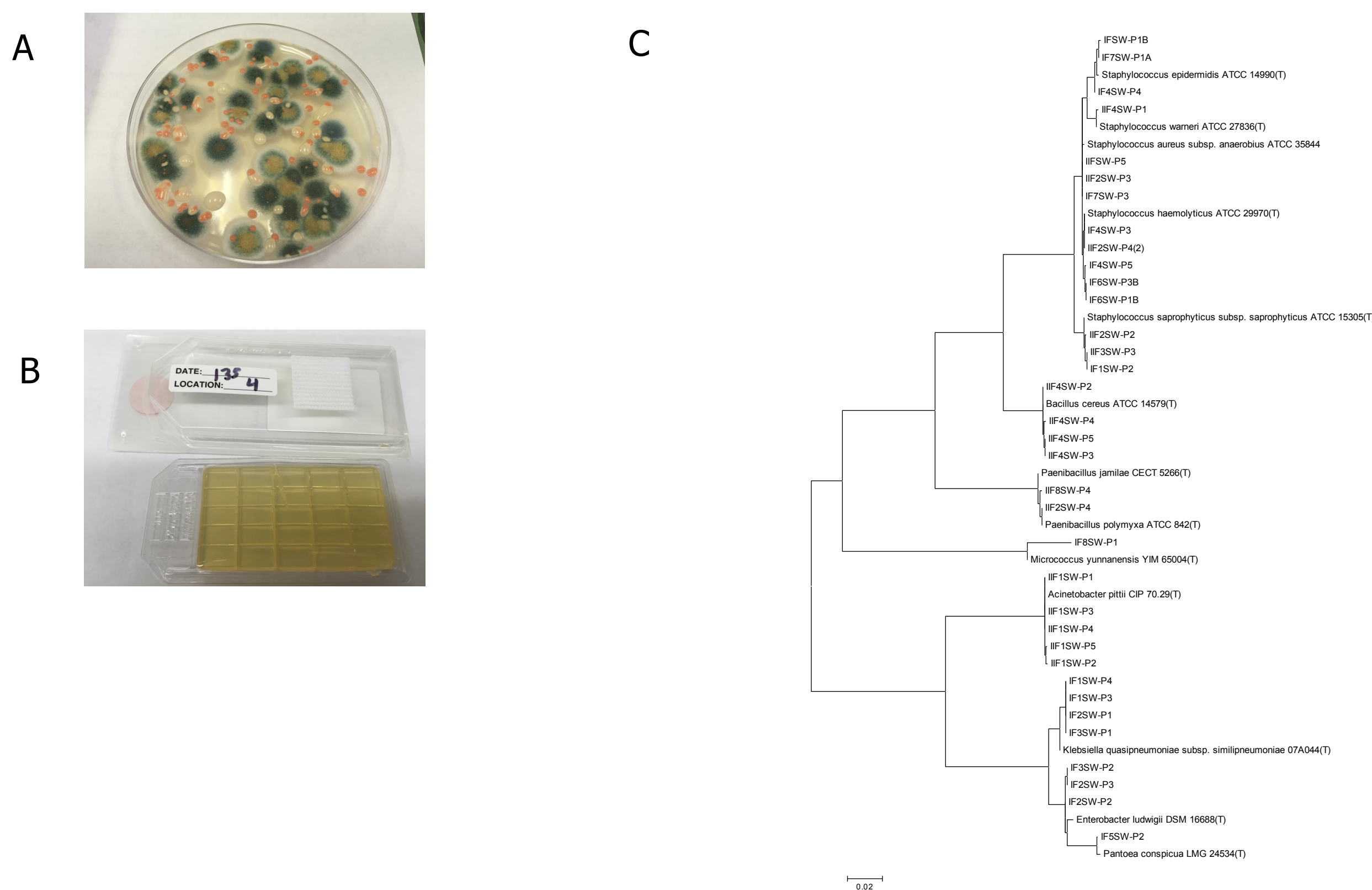


Fig. 1. Microbial population from ISS location no. 4 (dining table) on PDA plate (fungi promoting media) (A). The contact slide used for sampling the ISS location no. 4 (dining table) (B). Contact slides cover a surfaces of 25 cm² while a polyester wipes 1 m². Phylogenetic tree for the isolates collected from Blood Agar plates (potential pathogens); IF, IIF– first and second sampling on the ISS, respectively.

Cultivable, Viable, Bacterial Community

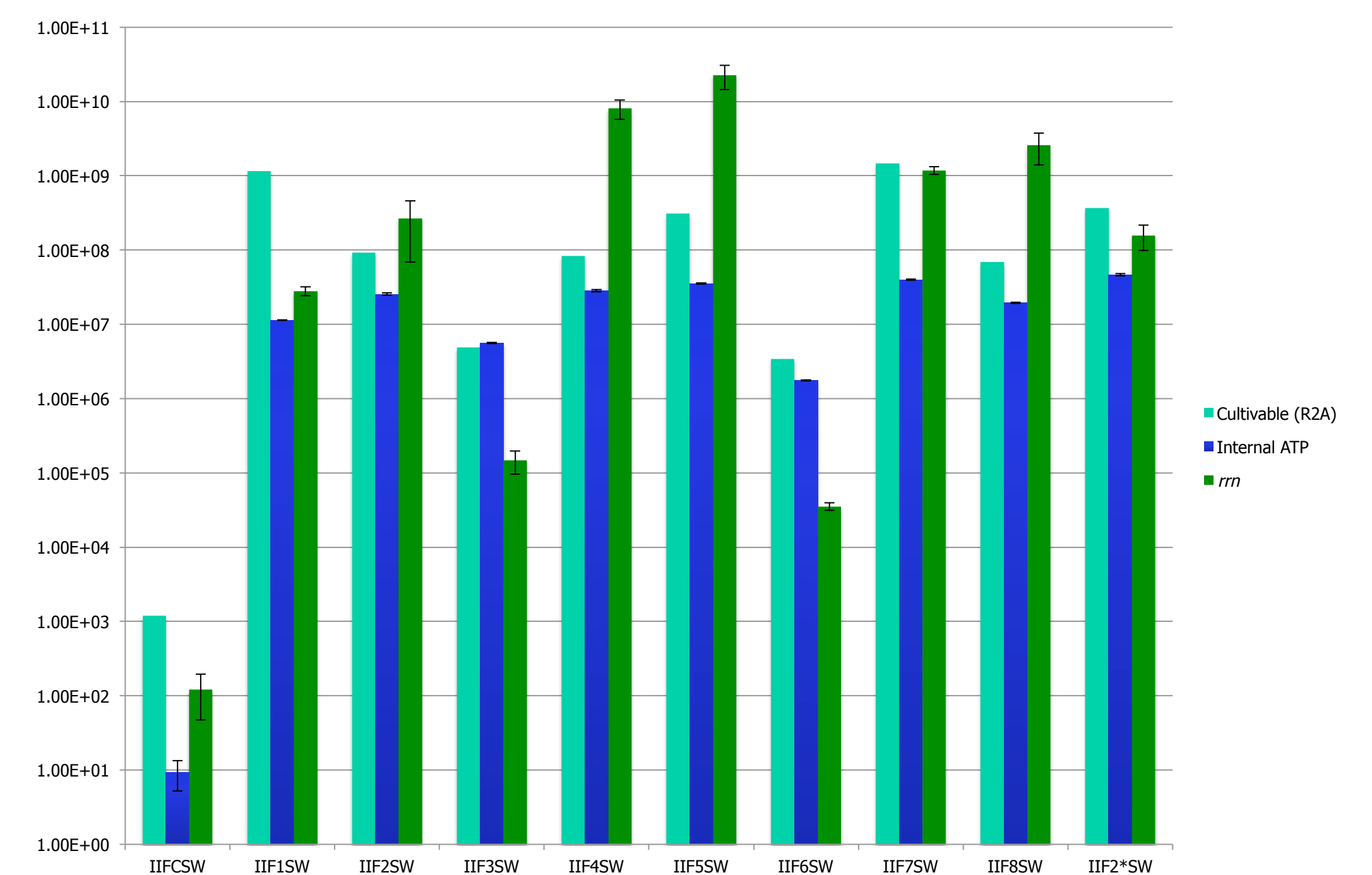
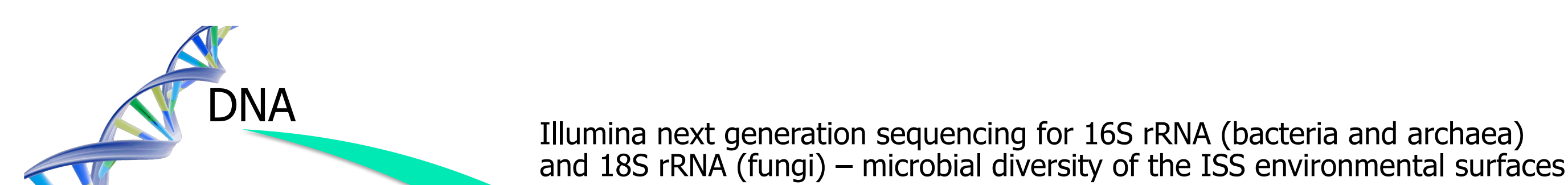


Fig. 2 ATP assay measure total microbial burden (bacteria, fungi, archaea). The assay has been applied by JPL-352N for the estimation of microbial bioburden for the environmental surfaces of cleanrooms.

Molecular Microbial Community Diversity Analysis



Metagenomics study for functional analysis: metabolism, defense/survival mechanisms, antibiotic resistance, pathogenicity

Whole genome sequencing – novel species studies

Data storage/accessibility:

- ISS-MO – project database
- GeneLab - NASA database for all genetic data
- NCBI – worldwide database for biological data

Conclusions

- Two sampling campaigns revealed presence of diverse microbial population with some microbial species dominating in ISS. The ongoing 16S rDNA Illumina sequencing will provide data on microbial diversity over time (subsequent months of sampling).
- The long-term goal of this project is aimed to develop practices for better cleaning and maintenance of the ISS, cataloguing and preserving beneficial microorganisms for future applications, and the general knowledge on microbial ecology of closed, environmentally controlled built systems.
- The microbial diversity study on the ISS will help to implement better practices for future robotic and human missions.