FY2006 Ground-based Research Program for Space Utilization Research Report
(Summary of Research)

1. Title
FY2006 Ground-based Research Program for Space Utilization Research Report

2. Research Term
FY2006～2009

3. Research Fields
Life Science

4. Research Categories
Priority Research for KIBO Utilization

5. Research Theme
Development of Analyzing System for Microbial Flora on board Space Station and Astronauts

6. Investigators
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8. Summary of Research
The environment on board a space-station is controlled to be comfortable for astronauts, and also for saprophytic microorganism. Therefore, the crews and facilities are potentially exposed to high concentration of microbes in the closed system. This makes it essential to investigate the microbiota present in spacecraft and space stations in order to control microbial infection, allergy and disaster. The aim of this research was to prepare the survey to know the condition and change of microbiota on
board a Japanese International Space Station (ISS) module from brand-new to well-used condition. To accomplish the goal we have successfully performed following ground research and developed analysis systems for microbiota on board ISS and astronauts. (i) The research on growth and antifungal susceptibility in Candida albicans and other fungi on the simulated microgravity using three-dimensional clinostat have shown the possibilities of commensal fungi to grow, and they were also controllable by antifungal agents in the same condition on ground. As sampling methods for microbes in environment, (ii) based on the data of good correlation between air particle count and colony forming unit, culture-free monitoring method of airborne fungi was developed. (iii) To understand the organization of microbes growing on board, quantitative analysis systems on ATP, β-glucan, peptidoglycan, and endotoxin were developed. (iv) To detect and identify the variation of protozoa, optimal condition of sampling, storage, and incubation were determined. As sampling and analyzing method for human commensal, (v) analysis method for skin bacteria and Malassezia biota using 16SrDNA clone library and real-time PCR methods was developed and evaluated. (vi) For fecal bacterial microbiota, terminal restriction fragment length polymorphism (T-RFLP) was also established. The information and technology obtained from this project enables us to accomplish undergoing space experiment; Study on Microbial dynamics in International Space Station as Microbe-I and forthcoming Microbe-II, III, and Study on Mycological evaluation of crew member exposure to ISS ambient air as Myco.

9. Publication List


9. URL
   http://timm.main.teikyo-u.ac.jp/makimura/