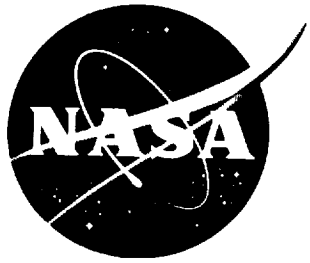
MSC-07475

NASA TECHNICAL MEMORANDUM

NASA TM X-5809
November 1972



APOLLO 14 MICROBIAL ANALYSES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS 77058

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
TM X-58094		

4. Title and Subtitle	5. Report Date
APOLLO 14 MICROBIAL ANALYSES	November 1972
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Gerald R. Taylor, MSC	MSC-07475
	10. Work Unit No.
9. Performing Organization Name and Address	951-17-00-00-72
Manned Spacecraft Center Houston, Texas 77058	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Technical Memorandum
National Aeronautics and Space Administration Washington, D.C. 20546	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

Extensive microbiological analyses that were performed on the Apollo 14 prime and backup crewmembers and ancillary personnel are discussed. The crewmembers were subjected to four separate and quite different environments during the 137-day monitoring period. The relation between each of these environments and observed changes in the microflora of each astronaut are presented.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
*Apollo 14 Flight *Microbiology *Microorganisms *Lunar Receiving Laboratory	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
None	None	115	

NASA TM X-58091

APOLLO 14 MICROBIAL ANALYSES

Gerald R. Taylor
Manned Spacecraft Center
Houston, Texas 77058

CONTENTS

TABLES

FIGURES

APOLLO 14 MICROBIAL ANALYSES

By Gerald R. Taylor
Manned Spacecraft Center

SUMMARY

The crewmembers of Apollo 14 resided in four separate environments during a 137-day monitoring period. These included their "normal" environment, a preflight isolation, confinement in their spacecraft, and a tight postflight quarantine. Detailed microbial analyses and comparisons of specimens collected during this period reveal that there was very little change in the total numbers and numbers of different types bacteria. However, there was a dramatic and significant decrease in the number of fungal types recovered with time through the postflight recovery. A list of 25 specific observations is presented which indicate patterns of microbial change throughout the mission.

INTRODUCTION

Since the first manned Apollo flight in October of 1968, the microbial load of the Apollo astronauts has been monitored during each mission. The exact microbiology protocols have varied from mission to mission, with the Apollo 14 crewmembers being subjected to the most extensive microbial analyses. These crewmembers were the first to be involved in a preflight health stabilization program, in which contact was restricted to some 170 microbially screened individuals. Also, these crewmembers were the first to be subjected to a complex microbial analysis 2 weeks after splashdown and the first crewmembers to receive complete microbial identification of all specimens collected.

Also, the microbial analysis of noncrew portions of the Apollo 14 mission was more complex than for previous missions. This was the first mission to include a postflight microbial analysis of the cabin air circulation fan filter, the first to include both prequarantine and postquarantine microbial examination of crew reception area (CRA) personnel, the first to include a complete preisolation and postisolation microbial analysis of mobile quarantine facility (MQF) personnel, and the first to include medical microbiological analyses of the backup crewmembers. These combined factors make the Apollo 14 mission a unique entity in the broad field of human microbiology and could serve as a standard for the comparative analysis of other contemporary space oriented human microflora studies.

The microbiology investigation for Apollo 14 began officially on December 7, 19 with the onset of the Crew Health Stabilization Program. The last of the microbiolog

data were available on April 23, 1971, at the conclusion of the Lunar Receiving Laboratory (LRL) health surveillance program. Nearly 5 months (137 days) of microbiological activities were required to support the 10-day space flight. How these activities were conducted in relation to the flight of Apollo 14 is shown in a milestone graph for the major activities (fig. 1).

The crewmembers were subjected to four different types of environments throughout the 137-day period. Each environment was studied in detail to evaluate how it affected the microflora of the crewmembers. The four different environments were as follows.

1. The premission environment was the environment in which each crewmember experienced a "normal" habitat until 21 days before launch (F-21).

2. The preflight health stabilization environment was the environment in which each crewmember spent the last 21 days before launch in carefully controlled quarters and was allowed contact only with 175 specified persons (primary contacts).

3. The mission environment was the environment in which the astronauts were confined to their space vehicles and extravehicular activity (EVA) clothing throughout the 10-day mission.

4. The postmission environment was the environment in which the crewmembers were restricted to the mobile quarantine facility and the crew reception area of the LRL for 16 days after recovery (R+16) from the command module (CM).

A study of this magnitude requires the combined efforts of many people. All segments of the study were supervised and evaluated by the Preventive Medicine Division of the Medical Research and Operations Directorate at the NASA Manned Spacecraft Center (MSC). All laboratory and statistical analyses were conducted by an MSC contractor.

The total numerical analyses for the 36 prime astronaut samples is listed in table I. These individuals are referred to by coded letters so that the resulting data may be impersonalized.

ABBREVIATIONS AND ACRONYMS

BA	blood agar
BA+	blood agar with vitamin K and hemin
CD	Czapek-Dox agar
CFU	colony forming units
CHOC	chocolate agar
CM	command module

CMMYA+	corn meal-malt-yeast extract agar plus antibiotics
CRA	crew reception area
EVA	extravehicular activity
EYA	egg yolk agar
FEA	Fildes enrichment agar
F-0	launch day
F-27	27 days before launch
LM	lunar module
LRL	Lunar Receiving Laboratory
MAC	MacConkey agar
MQF	mobile quarantine facility
MSA	Mitis-Salivarius agar
MSC	Manned Spacecraft Center
PVM	Paromomycin-Vanocomycin-Menadione agar
RA	Rogosa agar
R+0	day of recovery
R+16	16 days after recovery
SAB+	Sabouraud's dextrose agar plus antibiotics
SS	Salmonella-Shigella agar
S-110	Staphylococcus-110 agar
Thio	thioglycolate broth
TSB	trypticase soy broth
TTH	tetrathionate broth
UCD	urine collection device
VIB	veal infusion broth

YMB+	yeast malt broth plus antibiotics
α hem	alpha hemolysis of blood agar
β hem	beta hemolysis of blood agar
γ hem	gamma hemolysis of blood agar

THE PREMISSION ENVIRONMENT

Premission Astronaut Surveillance

The normal premission environment of each of the three prime crewmembers was sampled by several indirect methods. One of these methods was the medical microbiological surveillance of each astronaut conducted in conjunction with the Flight Medicine Branch. This surveillance was conducted for several months before flight and was extended to the family of each crewmember and associate contacts where applicable. The major phenomenon of medical importance involved microbial urological analyses of astronaut B. Urinalyses were initiated 26 months before launch in response to a recurrent urethritis of possible microbial origin. However, no microorganisms were recovered until 7 months before launch. Urine samples were evaluated periodically up through the day of launch, with a total of seven different medically important microorganisms being isolated, as shown in table II. Of the microorganisms listed, the Haemophilus sp. was the most likely candidate for a bacterially mediated recurrent urethritis.

Twenty-Seven-Day Preflight Microbial Evaluation of Prime Crewmembers

An exhaustive microbial evaluation of the three prime crewmembers was conducted 27 days before launch. Twelve different samples were secured from each of the astronauts and treated according to the protocol described in appendix A. These 12 samples consisted of nine different swab samples (fig. 2) in addition to stool, urine, and gargle specimens. Resulting data were evaluated for the presence of medically important microorganisms, as well as total aerobic bacteria, anaerobic bacteria, yeasts, and molds.

Medical microbiology evaluations. - A summary of the microorganisms of possible medical importance isolated from each sampled area of each prime crewmember is presented in table III. The rationales for selection of each of these microorganisms as being of possible medical importance are given in appendix B. Seven of the 12 species, listed in table IV, were isolated from no more than one crewmember.

Members of the genus Haemophilus were isolated from the throat of all three crewmembers. None of the three β-hemolytic streptococci were of group A. The single Staphylococcus aureus isolated belonged to phage type 85. It is important to note that only a single S. aureus was isolated from the three prime crewmembers.

Because S. aureus can be characterized by means of phage lysis patterns, the incidence and phage typing pattern of this species will be followed carefully throughout this report.

Aerobic bacteria isolated from crewmembers. - A total of 183 different isolates was identified and, where possible, the isolates were quantitated (table V). Fifty-five different species representing 17 genera were identified. In addition, two cultures expired before they could be identified. These are listed as "unidentified" in table V. The total quantitation from all sites of all three crewmembers was 4.1×10^7 viable aerobic bacteria. This number is useful because samples were collected from the same sites and quantitated five different times throughout the course of the Apollo 14 preflight monitoring period. This number will be used as an indicator of the total aerobic bacterial load of the three prime crewmembers.

The most ubiquitous species was Staphylococcus epidermidis. This species was recovered from all three astronauts and was isolated at least one time from each of the body surface swabs, throat swabs, and gargle samples. This species was isolated 23 times from the three crewmembers during this single examination. Corynebacterium species 7, Neisseria perflava, Rothia dentocariosa, Streptococcus mitis, and Streptococcus salivarius were isolated from both the throat swab and the gargle sample of all three crewmembers, although these species were not isolated from any of the nasal swabs. This shows that, although directly connected, the mouth and the nares offer different habitats, each of which is able to support different microflora. As expected, Escherichia coli was recovered in high numbers from the stools of astronauts A and B but was conspicuous by its absence in the stool of astronaut C. Escherichia intermedia was isolated in high numbers from astronaut C.

Almost half of the species presented in table V belongs to the genera Corynebacterium and Micrococcus. Eleven species of corynebacterium were isolated from all samples except from the nasal swabs and stool specimens.

Anaerobic bacteria isolated from crewmembers. - A list of the anaerobic microorganisms isolated from prime crewmember samples obtained during this examination period is presented in table VI. A total of 95 different isolates was identified and quantitated when possible. In addition, 15 different isolates that expired or were otherwise not suitable for determinative studies are combined in the unidentified category.

Thirty-six different species, representing 12 genera, were identified. As expected, 71 percent of the isolates was recovered from the throat swabs, gargle samples, and fecal samples. Some peptococci and peptostreptococci were isolated from skin swabs. Propionibacterium acnes (Corynebacterium acnes) was isolated from the largest number of sites, with all areas being represented except the navel, toes, and feces. A total of 6.3×10^{10} viable anaerobic bacteria was isolated from all of the samples retrieved from the three prime crewmembers. This number is a little over 1000 times higher than that number determined for the aerobic bacteria. This indicates that there was an average of 1000 viable anaerobes for each viable aerobe recovered from each area tested. This ratio relates well to the results of recent studies reported in the literature.

Fungi isolated from crewmembers. - A list of the yeasts and filamentous fungi isolated from the three prime crewmembers is presented in table VII. Quantitative analyses were not performed, and the isolates was identified to group, genus, or species depending on the nature of the isolate. A total of 42 different categories of yeasts and fungi was identified from the 76 specimens isolated. Forty-six percent of all isolates were recovered from the throat swabs, gargele samples, or fecal samples. Members of the genera Candida, Cladosporium, and Penicillium were isolated from all three crewmembers, with some species of Candida being recovered from every sample except the nasal swabs and urine samples.

Of the 76 different fungal isolates identified, 35 (46.1 percent) were recovered from astronaut A and only 18 (23.7 percent) were recovered from astronaut C, whereas 23 (30.3 percent) were recovered from astronaut B. The relative load of each crewmember is followed throughout the entire study period, with noted variations being related to changes in the environment whenever possible.

Because of the variety of prequarantine environments contacted by the crewmembers, some very unusual fungal isolates were recovered during this sampling period. Microthecium retisporum variety inferior is a microorganism that belongs to a little known genus of Ascomycetes. This species was first described in 1968 and is extremely rare. It was isolated from the scalp of astronaut A. The genus Sterigmatomyces is also rare, with the first two species being described in 1966. The specimen isolated from the gargle sample of astronaut C may represent a previously undescribed species.

Cryptococcus albidus was isolated from all three crewmembers. Human isolations of the genus Cryptococcus are not rare, but they are important because one member of this genus, C. neoformans, is a causative agent of a very serious disease. These isolates were sent to the National Communicable Disease Center for rapid immunofluorescence testing. At the same time, in vivo testing in mice was conducted in our own laboratories. Both procedures eliminated the possibility of C. neoformans in the astronaut population long before final specific characterization was completed.

Discussion

A comparison of the number of species of fungi, aerobic bacteria, and anaerobic bacteria isolated during the F-27 day crewmember examination is presented in table VIII. Each sample site was treated as an entity so that any particular species may be counted several times. With the specimen sites isolated in this way, 52.0 percent (183) of the total 352 species reported were aerobic bacteria, 26.9 percent (95) anaerobic bacteria, and 21.5 percent (76) were fungi. If the absolute number of species is considered, 41.4 percent (55) of the 133 different species were aerobic bacteria, 27.1 percent (36) were anaerobic bacteria, and 31.5 percent (42) were fungi. By either standard, there was always a larger number of aerobic bacterial species isolated than either of the other two types. Similarly, there were always fewer fungal species isolated.

The bacterial isolates were quantitated relative to the volume of original sample. A total of 4.3×10^7 individual aerobic bacteria was isolated from all sample sites of the three astronauts. The majority of these individual bacteria from the stool specimens was Escherichia coli, Escherichia intermedia, and Streptococcus fecalis.

Streptococci in the throat and stool samples contributed significantly to these numbers. In contrast, a total of 6.3×10^{10} individual anaerobic bacteria were quantitated from all areas. This number consisted mainly of species of Bacteroides and Peptostreptococcus from the stool samples. Although there were over 1000 times more individual anaerobes than aerobes, there were fewer different species of anaerobes than aerobes.

Supporting Studies

In an effort to evaluate the effect of the premission environment on the microbiological aspects of the crewmembers, a series of supportive evaluations was conducted. These studies included a routine diagnosis of disease events among MSC personnel, a medical microbiological evaluation of the three backup astronauts, and an examination of 175 primary contacts.

MSC personnel surveillance. - Microbiological studies were conducted on MSC personnel in relation to reported illness events. These studies were conducted in cooperation with the MSC dispensary. During the 28-month period preceding the launch of Apollo 14, a total of 906 specimens was received from the MSC dispensary. Of these, 56 were stool specimens requiring parasitological examination. Although cysts of Giardia lamblia were isolated from one stool sample, parasites were not detected in the other 55 stool specimens. Of the remaining 850 specimens, 541 (63.6 percent) were throat cultures. Other specimens included nasal, eye, and skin swabs; stool, urine, and sputum samples; genital and wound exudates; drinking water samples; and so forth. The occurrence of seven microorganisms of medical importance recovered from these specimens is presented in table IX. The large number of group A β-hemolytic streptococci, Diplococcus pneumoniae, Shigella sp., and Salmonella sp. is considered representative of the incidence of these organisms in the premission environment.

The monthly occurrence of the total specimens received and of throat specimens received from the MSC clinic is presented in figure 3. A gradual increase in specimens received over the 28 months immediately preceding launch is shown in this group. This increase reflects an increased use of the MSC microbiological facilities and does not necessarily have any epidemiological significance. The number of throat specimens relative to the total number of specimens received remained relatively constant throughout this period.

Medical microbiology examinations of backup crewmembers. - A limited medical microbiological examination was conducted on the three backup crewmembers 27 days before launch. No microorganisms of possible medical importance were found during the analysis of throat swabs, urine samples, and fecal samples.

Primary contact microbial examinations. - Those persons designated as primary contacts were allowed to have contact with the astronauts the last 3 weeks of the prelaunch period. These contacts were sampled for the presence of certain medically important microorganisms as part of the Preflight Health Stabilization Program. The entire group of 175 primary contacts and six astronauts was sampled during a 2-week period that began 8 weeks before launch. Of this group of 175 primary contacts, 50 (28.6 percent) were found to harbor some microorganisms of possible medical

importance (table X). These figures are based on examination of one stool specimen and one throat swab from each subject.

Staphylococcus aureus was isolated from the throat specimens of 22 of these 50 subjects. These microorganisms were characterized by typing with strain-specific phage. The resulting data are shown in table XI. A variety of phage types was found in the group of prime contacts, and no particular phage type was isolated from more than two individuals. This reflects the diversity expected when sampling a large dispersed population. In addition to the S. aureus isolated from the prime contacts, S. aureus phage type 85 was isolated from the nasal passages of astronaut A. Staphylococcus aureus was not isolated from the other five astronauts.

A species of Shigella was isolated from the stool specimen of one prime contact. No overt pathogens were isolated from the stool specimens of the six astronauts, although Candida albicans was isolated from the stool specimen of astronaut C.

Beta-hemolytic streptococci were isolated from 25 (14 percent) of the 181 subjects tested. Of these isolates, three were of group A. None of the three β-hemolytic streptococci isolated from the six crewmembers were group A.

PREFLIGHT HEALTH STABILIZATION ENVIRONMENT

Preflight Microbial Evaluation of Astronauts

During the last 21 days preceding the launch of Apollo 14, the prime and backup crewmembers were restricted to several special areas at the NASA John F. Kennedy Space Center that had been modified so that strict control of airborne microbial contaminants could be achieved and monitored. Contact with contaminating fomites and food was guarded against, and only primary contacts were allowed access to the astronauts.

During this period, two more complete microbial analyses were conducted on the three prime crewmembers. The first of these was conducted 14 days before launch, and the second was conducted the morning of launch (F-0). As with the F-27 examination, the resulting data were evaluated for the presence of medically important microorganisms, as well as total aerobic bacteria, anaerobic bacteria, yeasts, and molds. The backup crewmembers were sampled 2 weeks before launch. The resulting specimens were analyzed only for the presence of microorganisms of possible medical importance.

F-14 medical microbiology evaluations. - The isolates recovered from the three prime and three backup crewmembers, 2 weeks before launch, are presented in tables XII and XIII, respectively. Beta-hemolytic streptococci were isolated from the samples of three of the six astronauts. As before, none of these isolates were of group A and, therefore, the isolates are considered to be only of secondary medical importance. At the 27-day preflight examination period, no β-hemolytic streptococci were recovered from the upper respiratory tracts of astronauts A and B (table III). Two weeks later, during this examination and after 1 week of close contact with each other while living in a semiquarantine mode, these microorganisms were recovered from the upper respiratory tracts of astronauts B and C.

Staphylococcus aureus was recovered only from the nasal passages of astronaut A during the 27-day preflight examination. Although the same phage type remained present in the nasal passages and 2 weeks later had invaded the throat of astronaut A, this phage was not found in the other two prime crewmembers. Four other phage types of S. aureus were recovered from the backup crewmembers during the F-14 day examination (table XIV). These additional types do not necessarily represent new transfers as all were recovered from sites not sampled previously with the backup crewmembers.

Haemophilus parainfluenzae was isolated from the throat samples of all prime crewmembers (table III) but not from the throat samples of any backup crewmembers at the 27-day preflight examination. Throat samples taken during the 14-day preflight examination revealed H. parainfluenzae from all six crewmembers. Similarly, Haemophilus parahaemolyticus was recovered only from the throats of astronauts A and C 27 days before launch. After 1 week in semiquarantine, this species was isolated from the throat specimens of all six crewmembers.

Klebsiella pneumoniae was isolated in low numbers from the nasal-passage swab of astronaut B during the F-27 day examination. It did not spread to the upper respiratory tracts of the other two prime crewmembers, although it was cultured from the stool specimens of astronauts A and C and was present in the previously unsampled nasal passages of astronaut D.

F-0 medical microbiology evaluations. - Only the three prime crewmembers were sampled the morning of launch. These individuals had been subjected to the semiquarantine environment for 3 weeks before specimen collection. The microorganisms recovered from these specimens and considered to be of possible medical importance are shown in table XV.

Beta-hemolytic streptococci (not group A) were recovered from all three prime crewmembers. The spread of this microorganism appears evident. Incidence progressed from three isolates in two astronauts (F-27) to four isolates in three astronauts (F-14) during the first 2 weeks. In most cases, these were restricted to the upper respiratory tract. However, after 3 weeks of semiquarantine, nine isolates were recovered from the three crewmembers, with incidences spreading to the navel, groin, hands, and feces.

Staphylococcus aureus was isolated from the same crewmember as before, indicating no spread of this microorganism. The isolate retained the same phage type (85) throughout the 27 days before launch.

Recovery of Haemophilus parainfluenzae and Haemophilus parahaemolyticus from the upper respiratory tracts of all prime crewmembers indicated no decrease in incidence.

Low numbers of Klebsiella pneumoniae were found in samples from astronaut B During the 27 days immediately preceding launch, this microorganism was isolated from the axilla, navel, groin, nares, urine, and stool of astronaut B with no obvious aerial spread to the other two crewmembers (although it did show up in the stool specimens of astronauts A and C).

Accumulated data indicating the occurrence of medically important microorganisms isolated from the three prime crewmember swab samples and specimens for the 27 days immediately preceding launch are presented in table XVI.

Aerobic bacteria isolated from crewmembers. - All of the aerobic microorganisms identified during the 14-day preflight and immediate preflight examinations are presented in tables XVII and XVIII, respectively. The total number of isolates gradually decreased throughout the 27-day period, dropping from 183 to 177 during the first 2 weeks and to 164 during the second 2 weeks. In contrast, the number of identified genera remained almost constant at 17 for F-27, 18 for F-14, and 16 for F-0. The number of different species changed slightly (55 at F-27, 55 at F-14, and 52 at F-0). The absolute number of isolates varied by less than one-half of a log unit around a mean of 5.7×10^7 throughout this period (4.3×10^7 at F-27, 1×10^8 at F-14, and 2.9×10^7 at F-0).

As in the F-27 day examination, the most ubiquitous microorganism was Staphylococcus epidermidis. This microorganism was recovered from all three astronauts and from all areas except the urine samples and stool specimens. By launch, this microorganism was recoverable from the urine sample of astronaut B (an area from which it had not been recovered previously).

Escherichia intermedia, previously isolated from the stool specimen of astronaut C, was not recovered from the F-14 samples but was reported in the stool of astronaut B immediately preflight. This probably does not represent actual microbial interchange. The colonies of E. intermedia and E. coli are indistinguishable by the methods used, making identification a function of random colony selection. Therefore, the stool specimens of astronauts B and C are thought to harbor a mixed population of these two species.

The incidence of Corynebacterium decreased throughout the 27-day period. These microorganisms were recovered from all areas except urine and feces at F-27 but were not recovered from scalp, urine, or feces at F-14. By F-0, members of this genus could not be recovered from urine, scalp, groin, or toes.

In general, the absolute number, genera, species, and incidence of aerobic microorganisms did not change significantly (at the 95-percent confidence level) throughout this 1-month preflight period. The advent of a 3-week health stabilization quarantine could not be shown to effect a demonstrable change in the aerobic microflora of the three astronauts.

Anaerobic bacteria isolated from crewmembers. - All of the anaerobic microorganisms identified during the 14-day preflight and immediate preflight examinations are presented in tables XIX and XX, respectively. As with the aerobes, the total number of isolates decreased slightly throughout the 27-day period from 110 (F-27) to 109 (F-14) to 102 (F-0). The number of genera (12 at F-27, 11 at F-14, and 12 at F-0) and species (36 at F-27, 34 at F-14, and 40 at F-0) remained fairly constant. The number of individual microbes quantitated varied by less than one-third of a log unit around a mean of 3.2×10^{10} viable microorganisms (6.3×10^{10} at F-27, 1.1×10^{10} at F-14, and 2.2×10^{10} at F-0). It is evident that the population of anaerobic and

aerobic bacteria remained numerically stable throughout the 1-month preflight monitoring period. The only possible change was a slight decrease in the number of different isolates of both types with time.

As with the F-27 day samples, most of the anaerobic isolates were recovered from the throat swab, gargle samples, and fecal samples (68.8 percent for F-14 and 78.4 percent for F-0). Species of Bacteroides, Peptostreptococcus, and Propionibacterium in the fecal samples accounted for the large numbers of individual microorganisms quantitated.

Fungi isolated from crewmembers. - A list of the yeasts and filamentous fungi isolated from the three prime crewmembers 14 days before launch and the morning of launch is presented in tables XXI and XXII, respectively. A sharp decrease in the number of recovered isolates occurred throughout the 27-day period. From a high of 76 total isolates at F-27, the number of isolates dropped to 48 isolates 2 weeks later (after 7 days of semiquarantine). This reduction was because of a 50-percent decrease in the number of isolates recovered from astronauts A and B while the fungal bioburden of astronaut C remained constant, at its previous low level. A similar reduction in the fungal bioburden occurred the last 2 weeks before launch. The recovery of only 38 fungal isolates probably reflects a stabilizing effect mediated by preflight semiquarantine environment.

The number of different types of isolated yeasts or filamentous fungi demonstrated a similar decrease throughout the 27 days before launch. The 42 different types isolated during the F-27 day examination period were reduced to 31 different types 2 weeks later and further reduced to 21 by the time of launch. These large reductions probably reflect selective equilibration of the abnormally expanded microflora of astronauts A and B in response to the restricted environment of the semiquarantine. Analysis of the immediate preflight samples indicate that the total fungal bioburden of all three crewmembers was further reduced to a new low of 38 total isolates in response to 2 more weeks of partial isolation.

Supporting Studies

Surveillance of primary contacts. - During the 3-week semiquarantine period, primary contacts were sampled in response to reported illness events. Illness events were reported in 26.5 percent of this group, 14 (33 percent) of which were preceded by or occurred simultaneously with a similar illness event in another member of the same family. The detailed characterization of illness events in the primary contacts and their families, conducted by the health stabilization officer, is summarized in table XXIII.

As expected, the majority of reported illness events involved the upper respiratory tract. These data correlate with a predominance of upper respiratory infections reported for the MSC personnel (table IX and fig. 3). Staphylococcus aureus was isolated from throat swabs of two primary contacts during this period. One person was harboring phage type 81 and an untypable S. aureus. The type 81 represents the introduction of a different phage type into the population (not listed on table XI). The other person was carrying phage type 52/52A/80/81 that was recovered from this same individual during the 2-week physical examination period for primary contacts (table XI

THE MISSION ENVIRONMENT

Microbial Evaluation of Astronauts at Recovery

During the flight of Apollo 14, the crewmembers were restricted to the closed spacecraft environment and EVA clothing. To help determine the effect of such a restricted environment on their microflora, an extensive evaluation of the microbial load of each astronaut was conducted within 5 hours before launch and within 2 hours following recovery. All postflight sample analyses were conducted within class III biological cabinetry of the LRL (fig. 4) to avoid possible introduction of lunar contaminants into the terrestrial biosphere.

Immediately after recovery, the crewmembers entered the sickbay aboard the U.S.S. New Orleans at which time microbiological specimens were obtained. These specimens were returned to MSC where microbial loads were studied. As with the other major examinations, the data resulting from the immediate postflight studies were evaluated for the presence of medically important microorganisms, as well as total aerobic bacteria, anaerobic bacteria, yeasts, and molds.

Medical microbiology evaluations. - Microorganisms of possible medical importance recovered from the R+0 crew samples are presented in table XXIV.

Staphylococcus aureus was not recovered from astronauts B or C preflight, and only phage type 85 was isolated from astronaut A preflight. Following 10 days of confinement, S. aureus phage type 85 was recovered from the nasal passages of astronaut B, indicating probable transfer from astronaut A. In addition, a nontypable S. aureus was recovered from the nasal passages of astronaut C.

The increase in incidence of β-hemolytic streptococci noted throughout the preflight test period was reduced drastically during the flight, after which a total of only three isolates could be recovered from only two crewmembers. As strict confinement may be expected to mediate an increased incidence of this species, the low postflight values may indicate intolerance of the microorganism to some factor or factors of the space-flight environment.

As before, Haemophilus parainfluenzae and H. parahaemolyticus were nearly ubiquitous to the upper respiratory tract, although the latter was not recovered from astronaut C.

Medically important microorganisms isolated postflight but not at any of the preflight periods included Pseudomonas stutzeri (toes), Proteus morganii (nares), Enterobacter hafnae (nares), Moraxella non-liquefaciens (throat swab and gargle), and Pseudomonas sp. (feces). Of these new isolates, the two pseudomonads presented the greatest potential threat to the health and safety of the crewmembers.

Aerobic bacteria isolated from crewmembers. - The aerobic bacteria isolated from the R+0 crew specimens are quantitated in table XXV. A total of 162 different isolates was identified, with an additional isolate from the toes expiring before identification could be made. These belonged to 56 different species representing 20 genera. A larger number of genera and species were isolated during this examination

than at any of the preflight examinations. New genera encountered postflight for t first time during the mission were Flavobacterium, Moraxella, and Sarcina. Thi crease in the numbers was not statistically significant (at the 95-percent confiden level). The data are suggestive that when the total number of aerobic genera and cies are used as the measurable parameters, the space-flight environment has no fect on the bacterial population.

If the total aerobic quantitation, measured in viable cells per sample, is tak as the indicator, a striking effect is encountered. The total number of viable cell covered from all immediate postflight crew samples was elevated significantly ($p < 0.05$) to 5.3×10^8, an 830-percent increase above the preflight mean of $5.7 \times$ Close examination of the data shows that this increase was caused by an increase the single genus Escherichia that was recovered from the stool samples. The pre mean quantitation of all Escherichia isolates was 3.2×10^7 viable cells per gram feces, whereas the postflight average was 50×10^7 viable cells per gram of feces. This represents an increase of 4.7×10^8 cells per sample. If this number is subtracted from the high total aerobic quantitation of 5.3×10^8 cells per sample obtai for all immediate postflight samples, the difference of 6×10^7 cells per sample is tained. This is close to the preflight mean, indicating that the increase was, in fa caused by this single sample type and single genus. Also, it is important to note t the increase occurred in the fecal samples from all three of the astronauts.

In all other aspects, the aerobic bacteria data appear similar to those data o tained in the preflight studies.

Anaerobic bacteria isolated from crewmembers. - The anaerobic bacteria is lated from the immediate postflight crew specimens are quantitated in table XXVI. total of 67 different isolates was identified. These isolates belonged to 34 differe species that represented 12 genera. An additional six isolates from the throat and feces were noted but did not survive long enough to be identified. These are listed the "unidentified" category of table XXVI.

As in the case of the aerobic bacteria, the total number of different anaerobi genera and species remained constant throughout the preflight and inflight periods. These data show that when the total number of identified genera and species are us an indicator, space-flight conditions cannot be shown to exert affect on the total ba terial population. However, this is not the case when the total number of anaerobi isolates is considered. This factor is decreased from a high of 110 isolates per e ination at F-27 to 102 isolates per examination at F-0. This is a decrease of 7.3 cent during the preflight semiquarantine period. Although the decrease is not statistically valid at the 95-percent confidence level, it is worth noting because the number of aerobic isolates also steadily decreased throughout this period (from 1 to 164) so that the F-0 count was 9.3 percent lower than the F-27 count.

The most striking change occurred during the flight. By the time the immed postflight samples were taken, the number of anaerobic isolates had decreased to 72 percent of the immediate preflight value. That the effect was caused by a loss only two types of anaerobic bacteria makes this significant ($p < 0.05$) decrease all

more interesting. The largest portion of the noted decrease was caused by the complete loss of Propionibacterium acnes from all sites except the gargle sample of astronaut A. Although this single species was isolated an average of 15.7 times during the three preflight sample periods, it was isolated only once postflight. Other species of the same genus apparently were unaffected by the space-flight conditions. This species is a strict anaerobe that normally inhabits all body surfaces in low numbers. The noted change may be partially caused by an intolerance for the high oxygen partial pressure, or the low concentration of reducing gases in the spacecraft environment during flight. A small portion of the loss has been shown to be the result of a defective anaerobic incubation system used with some of the samples, making exact interpretation impossible.

The rest of the reduction in total number of anaerobic isolates was caused by a species-independent reduction in members of the genus Fusobacterium. The number of isolates, which had remained stable throughout the entire preflight period, dropped to 55 percent of their former level during the flight. These microorganisms, which are almost entirely restricted to the oral cavity, possess unusually fastidious nutrient requirements for growth and survival. It is possible that the drastic reduction resulted from the exclusive use of flight foods which may lack some factor or factors critical to the survival of members of this genus. This possibility is currently being investigated by laboratory studies.

In contrast to the significant ($p < 0.05$) postflight elevation in total quantitation of aerobic bacteria, the anaerobic quantitation of 8×10^9 viable cells was only 25 percent of the preflight average of 3.2×10^{10} viable cells. This decrease follows closely, and is largely the result of, the decrease in total isolates previously outlined.

Fungi Isolated From Crewmembers

A list of the yeasts and filamentous fungi isolated from the three crewmembers immediately postflight is presented in table XXVII. The sharp decrease in fungal isolates noted during the preflight analysis period was magnified during the 10-day space flight. The preflight reduction from 76 to 38 isolates was reduced further to seven isolates postflight, five of which were recovered from stool specimens. No fungal isolates were recovered from astronaut B.

Supporting Studies

One of the major objectives of the integrated crew microbiology investigation was to attempt to monitor ways in which the space-flight environment affected the microbial ecology of the crewmembers. To accomplish this, several different segments of the environment were sampled and analyzed as outlined below.

The command module hardware. - Four different locations in the interior of the command module (fig. 5) were sampled before and after the flight. Preflight samples were taken by a member of the backup crew within 12 hours of launch. Postflight samples were collected by the MQF personnel within 12 hours after recovery. The microorganisms recovered from these areas are presented in table XXVIII. Only one anaerobic bacterial species and a single fungal species were recovered preflight, and no

anaerobes or fungi were recovered postflight. As a result, members of these two groups could not be shown to be involved in ecological transfer between the crewmembers and the areas of the CM sampled.

Quite a different situation exists with the aerobic bacteria. Some of the data presented in table XXVIII have been listed in a different format in table XXIX to demonstrate the changes occurring in the aerobic bacterial population during the flight. It will be noted from this table that, in all cases except Micrococcus species 4, those species present in a particular area preflight have been lost and replaced with a completely different flora.

Whereas the total number of isolates and the total quantitation did not change appreciably, Pseudomonas maltophilia, Gaffkya sp., Corynebacterium bovis, and the usual large number of micrococci could not be recovered postflight. Staphylococcus epidermidis and Gaffkya tetragena were not recovered from the original site, but were recovered from one or more of the other sites. Species recovered from CM hardware postflight, but not recovered preflight, included Herellea vaginicola, Klebsiella pneumoniae, Proteus merabilis, Streptococcus fecalis, and Bacillus sp. All of these species were isolated from one or more of the crewmembers during the 27 days immediately preceding launch. These data are interesting in that they indicate a reduction of micrococci and a possible transfer of small numbers of microbes from the crew to the CM hardware during flight.

Astronaut EVA clothing. - Three different samples were recovered from each of the three EVA suits. The species recovered from the shoe soles and the gloves are presented in table XXX. All of these isolates were quantitated below 50 viable microorganisms per cubic centimeter of diluent except the Corynebacterium bovis that was recovered at a concentration of 2000 viable cells per cubic centimeter from the postflight glove sample of astronaut C.

No anaerobic microorganism and only a single fungal specimen (Wallemia ichthophaga) was recovered from any of the sample sites. As in the case of the CM hardware, these two groups may be considered of no special interest to ecological transfer studies between astronauts and the sample areas of the EVA clothing.

Two major observations may be made regarding the aerobic bacterial isolates. First, there appears to have been some loss of microorganisms as a result of spaceflight conditions and a replacement with a few species of other types. This is the same pattern that was demonstrated in the CM hardware study. Second, and most interestingly, Staphylococcus epidermidis and Streptococcus mitis were not lost from sample exterior surfaces of the gloves or shoe soles of astronaut A. This is quite significant because these areas were exposed to the harsh environment of the moon and lunar exploration activities without the loss of these species. The possibility exists that these could be coincidental reinfections that occurred after the termination of the moon exploration. However, in view of the fact that S. mitis was the only microorganism recovered from the Surveyor III television camera after remaining on the moon for 2-1/2 years, either of these explanations is plausible.

Aerobic species recovered from the urine collection devices are presented in table XXXI. Analyses for the presence of fungi and anaerobic bacteria were not

performed on these specimens. These postflight samples have been given arbitrary numbers, as their individual identities could not be determined when the samples were collected. Analyses of these data revealed the pattern described above in that the species recovered from the preflight examination was lost and subsequently replaced with a total of four other species.

Cabin fan filter analysis. - The command module circulating fan filter was operated for 4 hours while lunar materials were being transferred from the lunar module (LM) to the CM. During this time, approximately 1188 cubic meters (42 000 cubic feet) of oxygen were moved through the filter material. The filter was then stored inside a Beta-fabric stowage bag (fig. 6) where it remained until it was removed within the biological cabinetry of the LRL.

Nine swatches of filter material with a surface area of approximately 10 square centimeters each were aseptically removed. Of these, three were transferred to 10 cubic centimeters of trypticase soy broth (TSB) for aerobic incubation, three were transferred to 10 cubic centimeters of TSB for anaerobic incubation, and three were transferred to 10 cubic centimeters of yeast malt broth for recovery of fungal contaminants.

The recovered isolates are outlined in table XXXII. Herellea vaginicola was recovered from only one swatch, but with a very high quantitation (more than 3 000 000 viable cells/cm^2). Staphylococcus epidermidis showed a lower quantitation per swatch but was isolated from four of the six swatches analyzed for bacteria. These two species must either have been present in high numbers preflight or they were unusually resistant to the toxic and drying effects of large concentrations of oxygen.

THE POSTMISSION ENVIRONMENT

Sixteen-Day Postflight Microbial Evaluation of Prime Crew

Upon termination of their 10-day space flight, and while aboard the U.S.S. New Orleans, the Apollo 14 astronauts entered the isolated environment of the mobile quarantine facility where they remained throughout the 58-1/2-hour trip to the Manned Spacecraft Center in Houston, Texas (fig. 7). The astronauts were then transferred to the CRA of the Lunar Receiving Laboratory (fig. 8) for the remainder of the 16 days of postflight quarantine. Just before termination of the 16-day quarantine period, the fifth (and last) complete medical microbiology evaluation was conducted in the CRA. As before, the resulting data were evaluated for the presence of medically important microorganisms as well as total aerobic bacteria, anaerobic bacteria, yeasts, and molds.

Medical microbiology evaluations. - Microorganisms of possible medical importance, recovered from the 16-day postflight samples, are presented in table XXXIII. The single phage type (85) of Staphylococcus aureus was still isolated from the nostrils of astronauts A and B, showing no loss during the CRA quarantine period. This phage type was persistent in astronaut A throughout the entire 54 days from F-27 to R+16 and probably was transferred to astronaut B during the space flight. Further transfer to any CRA or MQF personnel during the quarantine is not indicated from the data.

The incidence of β-hemolytic streptococci demonstrated some degree of recov from its postflight low. A total of five isolates was recovered from four different areas of two astronauts. Transfer to CRA and MQF personnel was not indicated, wi the possible single exception mentioned previously.

The incidence of Haemophilus parainfluenzae and Haemophilus parahaemolytic reflected no change during the isolation period.

Aerobic bacteria isolated from crewmembers. - Quantitations for the aerobic bacteria isolated from the R+16 crew specimens are shown in table XXXIV. A total 172 different isolates was identified. These belonged to 52 different species representing 17 genera. These values are not significantly (at the 95-percent confidence level) different from the values observed during the preflight monitoring period, aga contraindicating environmentally mediated changes in numbers of aerobic genera and species.

Aerobic bacteria quantitation, measured in viable cells per sample, revealed that the total microbial load for all three astronauts at R+16 was one-half the quantition obtained just before the quarantine isolation (R+0). However, the bacteria were still recovered at a level four times the preflight mean. This probably reflected a slow return downward to normal levels from the high values mediated by the space-flight environment. The quantitation of Escherichia in the stools had returned to a no normal level. Large numbers of Streptococcus fecalis in the stool specimen of astronaut A were responsible for the high values obtained for this sample period. This may have been the result of the space-flight-affected fecal imbalance.

Anaerobic bacteria isolated from crewmembers. - The anaerobic bacteria isolated from the final R+16 examination of crew specimens are quantitated as shown in table XXXV. A total of 91 different isolates was identified. These belonged to 36 different species representing 12 genera. An additional 16 isolates were noted, but did not survive for identification. These are listed as unidentified microorganisms in table XXXV.

These samples, obtained after 16 days of total quarantine in the MQF and the CRA, revealed that the number of recoverable anaerobic isolates and the total anaerobic quantitation had returned to the preflight norm. In addition, the incidence of Propionibacterium acnes returned to its average preflight value. The incidence of species of the genus Fusobacterium increased during the 16 days of postflight quarantine, although the original preflight level was not achieved.

Fungi isolated from crewmembers. - A list of the yeasts and filamentous fungi isolated from the three crewmembers at the conclusion of postflight quarantine is presented in table XXXVI. The total number of isolates had almost returned to the preflight norm of 54, and the number of different species had increased to the immediate preflight value. The recovered isolates were almost evenly distributed among the three crewmembers.

Supporting Studies

The mobile quarantine facility. - Prior to crew entry into the MQF, four sites (sink, table, floor, and telephone) were sampled. These samples were packed in ice and returned to the MSC, where they were screened for pathogens. No medically important microorganisms were found.

While in the MQF, the astronauts were attended by a flight surgeon and an engineer throughout the entire trip to the MSC. Close contact within an extremely confined area made microbial interchange possible. The MQF personnel were screened for the presence of medically important microorganisms before crew contact, and again at the end of the isolation period (table XXXVII). Comparison of these data allowed evaluation of microbial interchange.

Staphylococcus aureus isolates were recovered prior to quarantine from three different flight surgeon samples and from four different engineer samples. After 18 days of quarantine, S. aureus was recovered from only one site on each subject. Phage typing of these pre- and postquarantine isolates demonstrated total host specificity; the isolates from one subject were all type 53/77, whereas those from the other subject were all untypable (table XXXVIII).

Other isolates of special interest included those recovered from the urine and the pseudomonad from the stool specimen of the flight surgeon. Either one of these microbial types could have contributed to a serious illness event.

The crew reception area. - On arrival at the Manned Spacecraft Center, the astronauts and MQF personnel were transferred from the MQF to the Crew Reception Area of the Lunar Receiving Laboratory. Nasal swabs, throat swabs, and fecal samples were collected from each of the 12 people who would come in contact with the astronauts during their stay in the CRA. Nasal swab samples and throat swab samples were again obtained from the 12 CRA personnel at the end of the 16-day quarantine period. Comparison of the medically important microbial load recovered from these two sampling periods was required in order to monitor microbial interchange during this period.

No β-hemolytic streptococci were isolated from CRA personnel before postflight quarantine. However, on release from isolation, β-hemolytic Streptococcus sp. (not group A) was isolated from one throat culture. This could have resulted from the introduction of astronauts A and B into the environment as both carried this microorganism in their upper respiratory tracts. It is equally possible, however, that β-hemolytic streptococci were present in unsampled areas of the CRA personnel and were transferred to the throat independent of astronaut contact.

Staphylococcus aureus was recovered from one-third of the CRA personnel during both sampling periods. Phage typing (table XXXVIII) of these microbes demonstrated that those recovered after quarantine isolation were different in all cases from those recovered before quarantine isolation.

Analyses of the phage type pattern of all S. aureus cultures obtained postflight (table XXXVIII) fail to indicate any possibility of microbial interchange of this microorganism in the CRA quarantine environment.

CONCLUDING REMARKS

The data presented in this report are based on analyses of 12 different samples from each of the three prime crewmembers for each of the five sample periods. Several observations, 25 of which are listed in the following, may be concluded from the data presented in this report. Responses 13 to 25 were indicated from immediate postflight sample data.

1. A member of the genus Haemophilus was isolated repeatedly and may have contributed to a recurrent urethritis in one crewmember during the 7 months immediately preceding launch.

2. Staphylococcus epidermidis was the most ubiquitous aerobic microorganism recovered.

3. Data from throat and nasal samples clearly show that these areas, although interconnected, harbor different microbial populations.

4. Propionibacterium acnes was the most ubiquitous anaerobic microorganism recovered.

5. The anaerobe quantitation was 1000 times higher than the aerobe quantitation

6. Members of the genus Candida (a yeast) were the most ubiquitous fungi recovered.

7. Unusually diverse preflight fungal isolates reflect the extensive travel and diverse activities of the crewmembers.

8. If the number of species is used as a parameter, aerobic bacteria were the most abundant, and anaerobic bacteria, filamentous fungi, and yeasts were the second, third, and fourth most abundant, respectively.

9. An average of seven different medically important microorganisms were recovered from any individual crewmember during a single examination.

10. A spread of β-hemolytic streptococci among astronauts before launch is indicated.

11. The total number of aerobic bacterial isolates decreased slightly with the approach of launch.

12. The Preflight Health Stabilization Program quarantine exerted no significant effect on the aerobic and anaerobic microflora of each crewmember, whereas the fungal load was reduced dramatically in this environment.

13. Intercrew transfer of Staphylococcus aureus was suggested.

14. The incidence of β-hemolytic streptococci was reduced

15. There was a slight increase in the number of aerobic bacterial genera and species recovered, although the total number of isolates remained constant.

16. There was no change in the number of anaerobic bacterial genera and species recovered, although the total number of isolates was significantly less than the preflight average.

17. There was a significant reduction in both the number of different types of fungi and the number of fungal isolates.

18. The total aerobic bacterial quantitation was 830 percent higher than the preflight norm. This was largely a result of an increase in the quantitation of members of the genus Escherichia in the stool.

19. The total anaerobic bacterial quantitation was 75 percent lower than the preflight norm. Primarily, this was caused by a postflight reduction in the incidence of Propionibacterium acnes. A small portion of this loss was the result of a defective anaerobic incubation system. Also, the incidence of fusobacteria in the mouth was reduced greatly postflight.

20. Transfer of microorganisms from crewmembers to command module hardware is indicated.

21. No yeasts or fungi could be recovered from one of the astronauts postflight.

22. A loss of microorganisms from the command module interior and extravehicular activity clothing and subsequent replacement with other species are indicated.

23. Streptococcus mitis was not lost from the exterior surface of the extravehicular activity clothing during lunar traverse.

24. Very few aerobic bacteria or fungi were recovered from the command module interior and the extravehicular activity clothing.

25. In general, the microbial load returned to the preflight norm during the postflight quarantine period.

Manned Spacecraft Center
National Aeronautics and Space Administration
Houston, Texas, November 3, 1972
951-17-00-00-72

TABLE I. - SUMMARY OF TOTAL NUMERICAL ANALYSES FOR 36 PRIME ASTRONAUT SAMPLES PER SAMPLE PERIOD

Sample period	Total number of isolates			Number of genera		Number of species			Total number	
	Aerobes[a]	Anaerobes	Fungi	Aerobes	Anaerobes	Aerobes	Anaerobes	Fungi[b]	Aerobes	Anaerobes
F-27	183	110	76	17	12	55	36	42	4.3×10^7	6.3×10^{10}
F-14	177	109	48	18	11	55	34	31	1.0×10^8	1.1×10^{10}
F-0	164	102	38	16	12	52	40	21	2.9×10^7	2.2×10^{10}
R+0	163	73	7	20	12	56	34	5	5.3×10^8	8.0×10^9
R+16	172	107	48	17	12	52	36	22	2.7×10^8	1.4×10^{10}

[a]Aerobes and anaerobes refer to bacteria only.

[b]Expressed as number of different types.

TABLE II.- ISOLATES FROM URINE OF ASTRONAUT B

BEFORE APOLLO 14 LAUNCH

Microorganism	Months Prior To Launch						
	26	13	7	4	3	2	1
Micrococcus species	-	-	+	-	-	-	-
Corynebacterium species	-	-	+	-	-	-	-
Haemophilus species	-	-	+	-	+	+	+
Staphylococcus epidermidis	-	-	-	+	+	+	-
Diphtheroid	-	-	-	+	-	-	-
Streptococcus sp. (γ hemolytic)	-	-	-	+	-	-	-
Klebsiella pneumoniae	-	-	-	-	-	-	+

+ = present
- = absent

TABLE III.- TWENTY-SEVEN-DAY PREFLIGHT ISOLATES OF POSSIBLE MEDICAL IMPORTANCE

Sample	Astronaut A	Astronaut B	Astronaut C
Scalp	-	*Herellea vaginicola*	-
Ears	-	-	*Mim polymorpha*
Axilla	-	*Klebsiella pneumoniae* *Proteus mirabilis*	*Mim polymorpha*
Hands	-	-	*Mim polymorpha*
Navel	-	*Herellea vaginicola*	*Mim polymorpha*
Groin	*Streptococcus species* (β, Not Group A)	*Proteus mirabilis* *Klebsiella pneumoniae* *Escherichia coli*	-
Toes	-	*Herellea vaginicola*	*Mim polymorpha*
Nares	*Staphylococcus aureus* *Proteus mirabilis* *Paracolobactrum intermedium*	*Klebsiella pneumoniae* *Proteus mirabilis*	-
Throat Swab	*Haemophilus parainfluenzae*	*Haemophilus parainfluenzae*	*Haemophilus parainfluenzae* *Streptococcus sp.* (β, Not Group A)
Gargle	*Haemophilus parahaemolyticus* *Candida albicans*	*Haemophilus parainfluenzae*	*Haemophilus parahaemolyticus* *Haemophilus parainfluenzae* *Streptococcus sp.* (β, Not Group A) *Candida albicans*
Urine	-	*Haemophilus species*	-
Feces	-	-	*Candida albicans*

- = No medically important organism found on this site.

TABLE IV.- OCCURRENCE OF SELECTED MICROORGANISMS

IN PRIME CREW ISOLATES

Microorganism	Total Occurrence in 36 Specimens	Subject Involved
Candida albicans	3	A C
Haemophilus parainfluenzae	5	A,B,C
Proteus mirabilis	4	A,B
Klebsiella pneumoniae	3	B
Mima polymorpha	5	C
Streptococcus species (β, Not Group A)	3	A C
Haemophilus parahaemolyticus	2	A C
Haemophilus species	1	B
Herellea vaginicola	3	B
*Escherichia coli**	1	B
Paracolobacterum intermedium	1	A
Staphylococcus aureus	1	A

*Other than in stool

TABLE V.- QUANTITATION* OF AEROBIC BACTERIA FROM 27-DAY PREFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GALL	BILE	URINE	FECES
Bacillus species	A	-	-	-	-	-	-	+++	-	-			-	$2x10^4$
	B	-	-	-	+++	-	-	-	-	-			-	-
	C	-	-	$8x10^1$	-	+++	-	$2x10^1$	-	-			-	-
Bacillus cereus	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	+++
	C	-	-	-	-	-	-	-	-	-			-	-
Bacillus licheniformis	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	$7x10^4$
Bacillus species 1010	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	+++
	C	-	+++	-	-	-	-	-	-	-			-	+++
Corynebacterium species	A	+++	-	-	$1x10^2$	-	-	-	-	$1x10^4$			-	-
	B	-	-	-	-	-	-	$4x10^2$	-	$1x10^3$			-	-
	C	$2x10^2$	-	+++	-	-	-	-	-	-			-	-
Corynebacterium species 2	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	$7x10^3$	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Corynebacterium species 7	A	-	-	-	-	-	-	-	-	$1x10^4$	$3x10^4$		-	-
	B	-	-	-	-	-	-	-	-	+++	$7x10^3$		-	-
	C	-	-	-	-	-	-	-	-	$1x10^3$	$5x10^3$		-	-
Corynebacterium species 17	A	-	-	-	-	-	$4x10^2$	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Corynebacterium species 21	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-	$1x10^3$		-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Corynebacterium species 33	A	-	-	-	-	-	-	-	-	-			-	-
	B	$2x10^2$	-	-	-	-	-	-	$1x10^2$	-			-	-
	C	-	-	-	-	-	$3x10^2$	-	+++	-			-	-
Corynebacterium species 36	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	+++	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Corynebacterium species Group IV	A	-	-	-	-	-	-	-	$2x10^4$	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Corynebacterium bovis	A	-	$2x10^5$	-	-	-	-	-	-	-			-	-
	B	-	$2x10^4$	-	-	-	-	-	-	-			-	-
	C	-	-	-	+++	$2x10^1$	-	-	-	-			-	-
Corynebacterium hoagii	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	$1x10^2$	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Corynebacterium xerosis	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	$3x10^2$	-	-	-	-	-	-	-	-			-	-
Enterobacter cloacae	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	$3x10^5$
Escherichia coli	A	-	-	-	-	-	-	-	-	-			-	$2x10^5$
	B	-	-	-	-	-	$1x10^2$	-	-	-			-	$1x10^7$
	C	-	-	-	-	-	-	-	-	-			-	-
Escherichia intermedia	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	$1x10^7$

* Organisms per milliliter of broth or gram of feces
† = Astronauts A,B,or C
+++ = Organisms present but not quantitated

TABLE V.- QUANTITATION* OF AEROBIC BACTERIA FROM 27-DAY PREFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Continued

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Haemophilus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	$1x10^2$	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Haemophilus parahaemolyticus	A	-	-	-	-	-	-	-	-	-	+++	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	+++	-	-
Haemophilus parainfluenzae	A	-	-	-	-	-	-	-	-	+++	-	-	-
	B	-	-	-	-	-	-	-	-	+++	+++	-	-
	C	-	-	-	-	-	-	-	-	+++	+++	-	-
Herellea species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	+++	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Herellea vaginicola	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	+++	-	-	-	+++	-	+++	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Klebsiella pneumoniae	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	+++	-	-	$1x10^2$	-	+++	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus casoasius	A	-	-	-	-	-	-	-	-	-	$2x10^1$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$2x10^2$	-	-
Lactobacillus plantarum	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^5$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	$3x10^3$	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 1	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	+++	-	-	-	$8x10^4$	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 8	A	-	-	-	-	-	-	$2x10^5$	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 11	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	$2x10^1$	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 15	A	-	-	-	-	-	$1x10^4$	$3x10^4$	-	-	-	+++	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	$8x10^2$	-	-	-	-	-	-
Micrococcus species 17	A	-	-	-	-	$4x10^2$	-	-	-	-	-	+++	-
	B	-	-	-	-	$8x10^1$	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 19	A	-	-	-	$2x10^1$	-	-	-	-	-	-	-	-
	B	-	-	-	$4x10^1$	-	-	-	-	-	$1x10^3$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 20	A	-	$1x10^4$	-	-	-	-	-	-	-	-	-	-
	B	-	$3x10^4$	-	-	$2x10^1$	-	-	-	-	-	-	-
	C	-	$3x10^4$	-	-	-	-	-	-	-	-	-	-
Micrococcus species 25	A	-	-	-	-	$6x10^2$	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 26	A	-	-	-	-	-	-	-	-	$5x10^5$	-	-	-
	B	-	+++	-	-	-	$2x10^2$	-	-	-	-	-	-
	C	-	-	-	$2x10^1$	$4x10^1$	$4x10^1$	-	-	-	-	-	-
Micrococcus species 29	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	$2x10^1$	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces
† = Astronauts A,B,or C
+++ = Organisms present but not quantitated

TABLE V. - QUANTITATION* OF AEROBIC BACTERIA FROM 27-DAY PREFLIGHT SPECIMEN FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GINGLE	URINE	FECES
Micrococcus species 30	A	-	-	-	-	$8x10^3$	-	-	-	-		-	-
	B	$2x10^2$	-	-	$2x10^2$	-	-	-	-	-		+++	-
	C	$6x10^1$	-	-	-	$1x10^2$	-	-	-	-		-	-
Micromonospora species	A	-	-	-	-	-	-	-	-	-		-	+++
	B	-	-	-	-	-	-	+++	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Mima polymorpha	A	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	+++	+++	+++	$2x10^1$	-	+++	-	-		-	-
Neisseria flava	A	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-	$1x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Neisseria perflava	A	-	-	-	-	-	-	-	-	$1x10^4$	$2x10^5$	-	-
	B	-	-	-	-	-	-	-	-	$1x10^5$	$6x10^4$	-	-
	C	-	-	-	-	-	-	-	-	$2x10^3$	$1x10^4$	-	-
Neisseria sicca	A	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	$1x10^4$	$8x10^3$	-	-
	C	$4x10^2$	-	-	-	-	-	-	-	$2x10^3$		-	-
Paracolobactrum aerogenoides	A	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	+++
Paracolobactrum intermedium	A	-	-	-	-	-	-	-	+++	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Proteus mirabilis	A	-	-	-	-	-	-	-	+++	-		-	-
	B	-	-	+++	-	-	$6x10^1$	-	+++	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Rothia dentocariosa	A	-	-	-	-	-	-	-	-	+++	+++	-	-
	B	-	-	-	-	-	-	-	-	+++	+++	-	-
	C	-	-	-	-	-	-	-	-	+++	+++	-	-
Staphylococcus aureus	A	-	-	-	-	-	-	-	$6x10^2$	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Staphylococcus epidermidis	A	$2x10^2$	$3x10^4$	$6x10^1$	-	$6x10^3$	$4x10^3$	$8x10^4$	$1x10^3$	+++	$7x10^1$	-	-
	B	$6x10^2$	$3x10^2$	$7x10^2$	$8x10^1$	-	-	-	$2x10^3$	+++		-	-
	C	$4x10^2$	$2x10^2$	$9x10^2$	$2x10^1$	$4x10^2$	-	$1x10^2$	$5x10^4$	+++		-	-
Streptococcus species (α hem.)	A	$2x10^1$	-	-	$7x10^2$	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-	$3x10^5$	-	-
	C	$4x10^3$	-	-	-	-	-	-	-	$6x10^3$	$4x10^4$	-	-
Streptococcus species (β hem.)	A	-	-	-	-	-	+++	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	+++	+++	-	-
Streptococcus species (γ hem.)	A	+++	-	-	-	-	-	-	-	-		-	-
	B	+++	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	$1x10^4$		-	$2x10^5$
Streptococcus fecalis	A	-	-	-	-	-	-	-	-	-		-	$1x10^7$
	B	-	-	-	-	-	-	-	-	-		-	$8x10^4$
	C	-	-	-	-	-	-	-	-	-		-	-
Streptococcus mitis	A	-	$2x10^2$	-	-	-	-	-	-	$9x10^5$	$1x10^6$	+++	-
	B	-	-	-	-	-	-	-	-	$3x10^6$	$1x10^5$	-	$1x10^4$
	C	-	-	-	-	-	-	-	-	$6x10^3$	$6x10^5$	-	$2x10^6$
Streptococcus salivarius	A	-	-	-	$2x10^1$	-	-	-	-	$1x10^6$	$4x10^5$	-	-
	B	-	-	-	-	-	-	-	-	$4x10^4$	$1x10^4$	-	+++
	C	-	-	-	-	-	-	-	-	$5x10^3$	$4x10^4$	-	$6x10^5$
Unidentified**	A	-	-	-	-	-	-	+++	-	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	$2x10^1$	-	-	-	-		-	-

* Organisms per milliliter of broth or gram of feces
† = Astronauts A,B,or C
** Organisms not suitable for determinative studies
+++ = Organisms present but not quantitated

TABLE VI.- QUANTITATION* OF ANAEROBIC BACTERIA FROM 27-DAY PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Bacteroides species	A	-	-	-	-	-	-	-	-	$3x10^3$	-	-	-
	B	-	-	-	-	-	-	-	-	$7x10^4$	$4x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides biacutus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^3$	-	-
Bacteroides capillosus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$4x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides corrodens	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$9x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$3x10^8$
Bacteroides fragilis	A	-	-	-	-	-	-	-	-	-	$2x10^5$	-	$2x10^9$
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^{10}$
	C	-	-	-	-	-	-	-	-	-	$2x10^4$	-	$1x10^8$
B.fragilis ss.thetaiotaomicron	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^9$
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^9$
	C	-	-	-	-	-	-	-	-	-	-	-	$1x10^{10}$
B.melaninogenicus ss.asaccharolyticus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	$2x10^4$	$2x10^3$	-	-
B.melaninogenicus ss.intermedius	A	-	-	-	-	-	-	-	-	-	$8x10^2$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides oralis	A	-	-	-	-	-	-	-	-	$1x10^3$	-	-	-
	B	-	-	-	-	-	-	-	-	$2x10^5$	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides pneumosintes	A	-	-	-	-	-	-	-	-	$2x10^5$	-	-	-
	B	-	-	-	-	-	-	-	-	$1x10^5$	$1x10^5$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides praecutus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$9x10^9$
Bacteroides putredinis	A	-	-	-	-	-	-	-	-	-	-	-	$9x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bifidobacterium adolescentis	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$5x10^4$
Clostridium perfringens	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Clostridium plagarum	A	-	-	-	-	-	-	-	-	-	-	-	+++
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Clostridium ramosum	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Corynebacterium pyogenes	A	-	-	-	-	-	-	-	$1x10^2$	-	-	-	-
	B	-	-	-	-	-	-	-	$5x10^1$	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Eubacterium lentum	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$6x10^8$

* Organisms per milliliter of broth or gram of feces

† = Astronauts A,B, or C

+++ = Microorganisms present but not quantitated

TABLE VI.- QUANTITATION* OF ANAEROBIC BACTERIA FROM 27-DAY PREFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	+	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Fusobacterium species	A	-	-	-	-	-	-	-	-	$4x10^4$	$6x10^3$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Fusobacterium fusiforme	A	-	-	-	-	-	-	-	-	$3x10^5$	$2x10^5$	-	-
	B	-	-	-	-	-	-	-	-	$2x10^5$	$1x10^4$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^4$	$4x10^2$	-	-
Fusobacterium naviforme	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$1x10^2$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Fusobacterium nucleatum	A	-	-	-	-	-	-	-	-	-	$2x10^4$	-	-
	B	-	-	-	-	-	-	-	-	-	$5x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^4$	-	-
Fusobacterium praumitzii	A	-	-	-	-	-	-	-	-	-	$1x10^3$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus catenaforme	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$2x10^2$	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^3$	-	$3x10^5$
Leptotrichia species	A	-	-	-	-	-	-	-	-	$4x10^4$	-	-	-
	B	-	-	-	-	-	-	-	-	$3x10^3$	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Leptotrichia buccalis	A	-	-	-	-	-	-	-	-	-	$3x10^4$	-	-
	B	-	-	-	-	-	-	-	-	-	$9x10^2$	-	-
	C	-	-	-	-	-	-	-	-	-	$2x10^2$	-	-
Peptococcus asaccharolyticus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	$4x10^3$	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Peptococcus prevotii	A	-	-	-	-	$6x10^3$	-	-	-	-	-	-	-
	B	-	-	-	$2x10^1$	-	-	-	-	-	-	-	-
	C	-	-	-	-	$1x10^2$	$1x10^2$	-	-	-	-	-	-
Peptostreptococcus anaerobius	A	-	-	-	-	-	-	-	-	-	-	-	$7x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^{10}$
	C	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
Peptostreptococcus intermedius	A	-	-	-	$1x10^2$	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$2x10^5$	-	-
	C	-	-	-	-	-	$1x10^2$	-	-	-	-	-	-
Peptostreptococcus magnus	A	-	-	-	-	-	-	-	-	-	-	$1x10^1$	+++
	B	-	-	-	-	-	-	-	$3x10^1$	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Propionibacterium acnes	A	$4x10^2$	$2x10^4$	-	$1x10^2$	-	-	-	$4x10^3$	$9x10^4$	-	$3x10^2$	-
	B	$5x10^2$	$3x10^3$	$4x10^1$	$1x10^2$	-	$6x10^3$	-	$1x10^3$	$3x10^4$	$2x10^4$	-	-
	C	-	-	-	-	-	-	-	$1x10^3$	$3x10^4$	-	$2x10^1$	-
Propionibacterium avidum	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	$4x10^1$	-	-	-	-	-	-
Propionibacterium thoenii	A	-	-	-	-	-	$2x10^2$	-	-	-	-	-	$7x10^6$
	B	-	-	-	-	-	-	-	-	-	$4x10^2$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Veillonella alcalescens	A	-	-	-	-	-	-	-	-	-	$7x10^4$	-	-
	B	-	-	-	-	-	-	-	-	$2x10^5$	$8x10^4$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^3$	-	-	-
Veillonella parvula	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$8x10^2$	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^5$	-	-
Unidentified**	A	-	-	-	-	-	$2x10^2$	-	-	$8x10^5$	$2x10^5$	$1x10^2$	$1x10^9$
	B	-	-	-	-	-	-	$3x10^4$	-	$2x10^5$	$2x10^5$	+++	$6x10^9$
	C	-	-	$2x10^3$	$2x10^1$	-	-	-	-	$9x10^4$	$2x10^5$	-	$1x10^{10}$

* Organisms per milliliter of broth or gram of feces
\+ = Astronauts A,B, or C
+++ = Microorganisms present but not quantitated
** Microorganisms not suitable for determinative studies

TABLE VII.- FUNGI FROM 27-DAY PREFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

CATEGORIES	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Alternaria species	-	-	-	-	-	-	-	-	C	-	-	-
Arthrinium sacchri	-	B	-	-	-	-	-	-	-	-	-	-
*Candida albicans**	-	-	-	-	-	-	-	-	-	C	-	C
*Candida guilliermondii**	-	-	-	-	-	-	-	-	B	-	-	-
*Candida parapsilosis**	-	-	-	B	-	-	-	-	-	-	-	A
*Candida solani**	-	A	A	-	-	-	A	-	-	-	-	-
*Candida species**	-	-	-	-	-	A	-	-	-	-	-	-
*Candida tropicalis**	B	-	-	A,C	A,B	-	-	-	A,C	B	-	-
Cladorrhinum species	-	-	-	A	-	-	-	-	-	-	-	-
Cladosporium cladosporoides	-	-	-	-	-	-	-	B	-	B	-	-
Cladosporium cucumerinum	-	-	-	-	-	-	-	C	-	-	-	-
Cladosporium elatum	-	-	-	-	-	-	-	-	A	-	-	-
Cladosporium sphaerospermum	-	-	-	-	-	-	-	A	A	-	-	A
Coniella species	-	-	-	-	-	-	-	C	-	-	-	-
Coniothyrium species	-	-	-	-	-	-	-	A	C	-	-	-
*Cryptococcus albidus**	C	-	-	A	-	-	C	-	A	B	-	B
Emericellopsis minima	-	-	B	-	-	-	-	-	-	-	-	-
Epicoccum nigrum	-	B	-	-	-	-	-	-	-	-	-	-
Fusidium species	B	-	-	-	-	-	-	-	-	-	-	-
Geotrichum species	-	-	-	-	-	A	-	-	-	-	A	A
Microthecium retisporum var. *inferior*	A	-	-	-	-	-	-	-	-	-	-	-
Mucor species	-	-	-	-	-	-	-	-	-	-	-	C
Nigrospora species	-	-	-	-	-	-	-	-	-	A	-	-
Oidiodendron species	-	-	-	-	-	-	-	-	-	A	-	-
Paecilomyces griseoviridis	-	-	-	-	-	-	-	-	-	-	-	B
Paecilomyces species	-	-	-	-	-	-	-	-	A	-	-	-
Paecilomyces varioti	-	-	-	-	-	-	-	-	-	-	-	A
Penicillium duclauxi	-	A	-	-	-	C	-	-	A	A	-	-
Penicillium italicum	-	-	-	-	-	B	-	-	-	B	-	-
Penicillium purpurogenum	-	-	-	-	-	-	A	-	-	C	-	C
Periconia venesuelana	-	-	-	-	-	-	-	-	-	-	-	A
Pithomyces atro-olivaceus	-	-	-	-	-	-	-	B	-	-	-	-
Pityrosporum ovale *	-	-	-	-	B,C	B	B,C	-	-	-	-	-
Rhodotorula mucilaginosa *	-	A	-	-	-	-	-	-	-	-	-	A
Phoma species	-	-	-	-	-	-	A	A	-	-	-	-
Scolecobasidium verruculosum	B	-	-	-	-	-	-	-	-	-	-	-
Septonema species	-	-	-	-	-	-	-	-	C	-	-	-
Staphylotrichum coccosporum	-	-	-	-	-	-	-	-	-	-	-	B
Sterigmatomyces species *	-	-	-	-	-	-	-	-	-	C	-	-
Sterile mycelium	-	-	-	-	-	-	-	-	-	-	-	A
Torula species	-	-	-	A	-	-	-	-	-	-	-	-
Torulomyces lagena	-	-	-	-	-	-	-	-	B	-	-	-

* = Yeasts (all others filamentous fungi)

- = Absent

TABLE VIII.- SPECIES ISOLATED FROM F-27 DAY EXAMINATION

Sample	Aerobic		Anaerobic		Fungi		Total	
	No.	%	No.	%	No.	%	No.	%
Scalp	16	8.8	2	1.8	5	6.6	23	6.3
Ear	12	6.6	2	1.8	5	6.6	19	5.1
Axilla	9	4.9	2	1.8	2	2.6	13	3.6
Hand	13	7.1	5	4.4	6	7.9	24	6.5
Navel	15	8.2	2	1.8	4	5.3	21	5.7
Groin	14	7.7	7	6.2	5	6.6	26	7.1
Toes	12	6.6	1	0.9	6	7.9	19	5.1
Nares	11	6.0	6	5.3	7	9.2	24	6.5
Throat Swab	29	15.8	21	20.0	12	15.8	62	17.0
Gargle	29	15.8	32	29.0	10	13.1	71	19.0
Urine	5	2.7	5	4.4	1	1.3	11	3.0
Feces	18	9.8	25	22.6	13	17.1	56	15.1
Total	183	100.0	110	100.0	76	100.0	69	100.0

TABLE IX.- MEDICALLY IMPORTANT BACTERIA ISOLATED FROM 850 CLINICAL SPECIMENS FROM MSC PERSONNEL

Marker Microorganisms	Occurrence By Sample Type*				
	Throat	Nares	Stool	Other	Total
Streptococcus species (β, Group A)	14.6	0	0	22.0	9.4
Streptococcus species (β, Not Group A)	10.7	0	0	0.4	6.6
Staphylococcus aureus	19.6	8.9	0	8.9	14.6
Haemophilus influenzae	0.4	0	0	0.4	0.3
Diplococcus pneumoniae	5.4	15.6	0	0	4.0
Shigella species	0	0	5.0	0	0.2
Salmonella species	0	0	7.5	0	0.3

*Expressed in percent occurrence of each species in each sample type.

TABLE X.- MICROORGANISMS OF POSSIBLE MEDICAL IMPORTANCE ISOLATED FROM STOOL SPECIMENS AND THROAT SWABS OF 175 PRIME CONTACTS

Species	Number of isolations	Percent of total
Staphylococcus aureus	22	13
Streptococcus sp. (β, not group A)	22	13
Staphylococcus epidermidis	10	6
Streptococcus sp. (β, group A)	3	2
Haemophilus parainfluenzae	2	1
Haemophilus parahaemolyticus	1	1
Proteus mirabilis	1	1
Pseudomonas aeruginosa	1	1
Shigella sp.	1	1

TABLE XI. - STAPHYLOCOCCUS AUREUS PHAGE TYPES FROM 175 PRIME CONTACT PHYSICALS

RTD[a]	1000 × RTD	Number represented
52/52A/80/81	--[b]	2
187	--	2
84	--	1
85	--	1
83A	--	1
3C/71	--	1
3A	--	1
6/54/75/85	--	1
Nontypable	--	2
0[c]	3A	1
0	187	1
0	53/54/77	1
0	75/77/187	1
0	47/53/54/75	1
0	29/152/79/80/81	1

[a]Routine test dilution.

[b]Test not required.

[c]No reaction at RTD.

TABLE XII.- FOURTEEN-DAY PREFLIGHT ISOLATES OF POSSIBLE MEDICAL IMPORTANCE FROM PRIME CREWMEMBERS

Sample	Astronaut A	Astronaut B	Astronaut C
Scalp	*Proteus mirabilis*	*Enterobacter cloacae*	-
Ear	-	*Mima polymorpha* var. *oxidans*	*Aspergillus pseudoglaucus*
Axilla	*Philophora jeanselmi*	*Klebsiella pneumoniae* *Proteus mirabilis*	-
Hands	*Paracolobactrum intermedium*	*Enterobacter cloacae*	-
Navel	*Paracolobactrum intermedium*	-	-
Groin	*Streptococcus species* (β, Not Group A)	-	-
Toes	-	-	-
Nares	*Paracolobactrum intermedium* *Proteus mirabilis* *Staphylococcus aureus*	-	-
Throat Swab	*Haemophilus parainfluenzae* *Haemophilus parahaemolyticus* *Enterobacter aerogenes*	*Haemophilus parainfluenzae* *Streptococcus species* (β, Not Group A)	*Haemophilus parainfluenzae* *Streptococcus species* (β, Not Group A) *Candida albicans*
Gargle	*Haemophilus parainfluenzae* *Paracolobactrum intermedium* *Proteus mirabilis* *Staphylococcus aureus* *Candida albicans*	*Haemophilus parainfluenzae* *Haemophilus parahaemolyticus* *Aspergillus versicolor* *Streptococcus species* (β, Not Group A)	*Haemophilus parainfluenzae* *Haemophilus parahaemophilus* *Candida albicans*
Urine	-	-	-
Feces	*Klebsiella pneumoniae* *Candida albicans*	*Candida albicans*	*Klebsiella pneumoniae* *Candida albicans*

- = No medically important organism found on this site.

TABLE XIII.- FOURTEEN-DAY ISOLATES OF POSSIBLE MEDICAL IMPORTANCE FROM BACKUP CREWMEMBERS

Sample	Astronaut D	Astronaut E	Astronaut F
Scalp	*Staphylococcus aureus*	-	*Staphylococcus aureus*
Ear	-	-	-
Axilla	-	-	-
Hands	-	*Staphylococcus aureus*	*Pseudomonas maltophilia*
Navel	-	-	-
Groin	-	-	*Streptococcus species* (β, Not Group A)
Toes	-	-	-
Nares	*Staphylococcus aureus* *Klebsiella pneumoniae*	*Staphylococcus aureus* *Paracolobactrum intermedium*	*Staphylococcus aureus* *Enterobacter aerogenes*
Throat Swab	NA*	NA*	NA*
Gargle	*Haemophilus parahaemolyticus* *Haemophilus parainfluenzae*	*Haemophilus parahaemolyticus* *Haemophilus parainfluenzae*	*Haemophilus parahaemolyticus* *Haemophilus parainfluenzae* *Enterobacter aerogenes*
Urine	-	-	-
Feces	-	*Pseudomonas aeruginosa* *Pseudomonas fluorsecens* *Pseudomonas species*	-

* Throat swabs not performed on these individuals.

- = No medically important microorganism found on this site.

TABLE XIV.- PHAGE TYPES OF STAPHYLOCOCCUS AUREUS ISOLATED FROM 14-DAY PREFLIGHT SAMPLES

Area	Astronaut A	Astronaut D	Astronaut E	Astronaut F
Nasal	85	187	47	52
Gargle	85	-	-	-
Scalp	-	187	-	52
Hands	-	-	6/47/53/83A	-

- = No *S. aureus* isolated

TABLE XV.- IMMEDIATE PREFLIGHT ISOLATES OF POSSIBLE MEDICAL IMPORTANCE

Sample	Astronaut A	Astronaut B	Astronaut C
Scalp	-	*Aspergillus species*	-
Ear	-	-	-
Axilla	-	*Klebsiella pneumoniae* *Proteus mirabilis*	-
Hands	-	*Streptococcus species* (β, Not Group A)	*Aspergillus species*
Navel	*Streptococcus species* (β, Not Group A)	*Klebsiella pneumoniae*	-
Groin	*Streptococcus species* (β, Not Group A)	*Streptococcus species* (β, Not Group A) *Klebsiella pneumoniae*	-
Toes	-	-	-
Nares	*Proteus mirabilis* *Paracolobactrum intermedium*	-	-
Throat Swab	*Haemophilus parainfluenzae*	*Haemophilus parainfluenzae* *Haemophilus parahaemolyticus*	*Haemophilus parainfluenzae* *Haemophilus parahaemolyticus* *Enterobacter cloacae* *Candida albicans* *Streptococcus species* (β, Not Group A)
Gargle	*Haemophilus parainfluenzae* *Haemophilus parahaemolyticus* *Staphylococcus aureus* *Streptococcus species* (β, Not Group A)	*Haemophilus parainfluenzae* *Haemophilus parahaemolyticus* *Candida albicans*	*Haemophilus parainfluenzae* *Streptococcus species* (β, Not Group A) *Candida albicans* *Aspergillus species* *Enterobacter cloacae*
Urine	-	*Klebsiella pneumoniae*	-
Feces	*Candida albicans* *Klebsiella pneumoniae* *Streptococcus species* (β, Not Group A) *Aspergillus species*	*Klebsiella pneumoniae* *Streptococcus species* (β, Not Group A)	*Candida albicans*

- = No medically important organism found on this site.

TABLE XVI.- ACCUMULATED OCCURRENCES OF MEDICALLY IMPORTANT MICROORGANISMS ISOLATED FROM PRIME ASTRONAUTS UP TO LAUNCH

	F-27*			F-14			F-0		
Microorganisms	A	B	C†	A	B	C	A	B	C
Aspergillus flavus	-	-	-	-	-	-	-	-	1
Aspergillus nidulans	-	-	-	-	-	-	-	1	1
Aspergillus pseudoglaucus	-	-	-	-	-	1	-	-	-
Aspergillus sydowi	-	-	-	-	-	-	1	-	1
Aspergillus versicolor	-	-	-	-	1	-	-	-	-
Candida albicans	1	-	2	2	1	3	2	1	3
Enterbacter aerogenes	-	-	-	1	-	-	-	-	-
Enterobacter cloacae	-	1	1	-	2	-	-	-	2
Escherichia coli‡	-	1	-	-	-	-	-	-	-
Haemophilus species	-	1	-	-	-	-	-	-	-
Haemophilus parahaemolyticus	-	-	1	-	1	1	1	2	1
Haemophilus parainfluenzae	2	2	2	1	1	2	2	2	2
Herellea vaginicola	-	3	-	-	-	-	-	-	-
Klebsiella pneumoniae	-	3	-	1	1	1	1	5	-
Mima polymorpha	-	-	5	1	-	-	-	-	-
Paracolobactrum intermedium	1	-	-	5	-	1	1	-	-
Philophora jeanselmei	-	-	-	1	-	-	-	-	-
Proteus mirabilis	1	3	-	4	1	-	1	1	-
Staphylococcus aureus	1	-	-	2	-	-	1	-	-
Streptococcus species	1	-	2	1	2	1	4	3	2

LEGEND: *Sample time ‡Location other than stool †Astronaut designation

TABLE XVII.- QUANTITATION* OF AEROBIC BACTERIA FROM 14-DAY PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Bacillus species	A	2×10^{3}	-	-	-	-	-	+++	-	-	-	-	-
	B	-	-	-	+++	-	-	+++	-	-	-	-	2×10^{4}
	C	+++	-	-	-	-	-	+++	-	-	-	-	-
Bacillus cereus	A	-	-	-	-	-	-	-		-	-	-	-
	B	-	-	-	-	-	-	-	+++	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacillus lentus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	+++
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacillus mycoides	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	1×10^{4}
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacillus subtilis	A	-	-	1×10^{1}	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacillus species 1010	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-		-	-	-	+++
	C	+	-	-	-	-	+++	-	-	-	-	-	+++
Corynebacterium species	A	-	-	8×10^{3}	-	-	-	-	-	-	1×10^{2}	-	-
	B	-	-	-	-	-	2×10^{2}	8×10^{3}	-	-	4×10^{4}	-	-
	C	-	-	-	-	-	-	-	-	-	7×10^{4}	-	-
Corynebacterium species 4	A	-	-	-	-	-	-	-	-	4×10^{4}	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 7	A	-	-	-	-	-	-	-	-	1×10^{4}	1×10^{5}	-	-
	B	-	-	-	-	-	-	-	-	5×10^{3}	1×10^{4}	-	-
	C	-	-		-	-	-	-	-	1×10^{4}	1×10^{4}	-	-
Corynebacterium species 17	A	-	-	-	-	-	4×10^{2}	-	-	-	-	-	-
	B	-	-	-	-	-	-		-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 18	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	1×10^{1}	-	-	-	-	-	-	-
Corynebacterium species 21	A	-	-	-	-	-	-	-		-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	+++	-	-	-		-	-	-	-
Corynebacterium species 33	A	-	-	-	-	-	4×10^{2}	-	-	-	-	-	-
	B	-	-	-	-	-	-	-		-	-	-	-
	C	-	-	-	-	-	-	2×10^{1}		-	-		-
Corynebacterium species Group IV	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-		-	-	-	-
	C	-	-		-	-	-	-	-	-	-	-	-
Corynebacterium bovis	A	-	4×10^{1}	-	-	-	-	-		-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	1×10^{1}	-	-	+++	-	-			-	-	-
Corynebacterium hoagii	A	-	-		-	-	-	-			-	-	-
	B	-	-	-	-	-	+++	-				-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Enterobacter aerogenes	A	-	-	-	-	-	-	-	-	+++	-	-	-
	B	-	-	-	-	-	-	-		-	-	-	-
	C	-	-	-	-	-	-	-	-		-	-	
Enterobacter cloacae	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	+++	-	-	+++	-	-	-				-	
	C	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of urine or gram of feces

† = Astronauts A, B, and C

+++ = Microorganisms present but not quantitated

TABLE XVII.- QUANTITATION* OF AEROBIC BACTERIA FROM 14-DAY PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Continued

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Escherichia coli	A	-	-	-	-	-	-	-	-	-	-	-	9×10^{5}
	B	-	-	-	-	-	-	-	-	-	-	-	1×10^{6}
	C	-	-	-	-	-	-	-	-	-	-	-	8×10^{7}
Gaffkya species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	5×10^{2}	-	-	-	-
Gaffkya tetragena	A	-	-	-	-	-	-	-	-	1×10^{2}	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Haemophilus parahaemolyticus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	+++	-	-
	C	-	-	-	-	-	-	-	-	-	+++	-	-
Haemophilus parainfluensae	A	-	-	-	-	-	-	-	-	-	+++	-	-
	B	-	-	-	-	-	-	-	-	-	+++	-	-
	C	-	-	-	-	-	-	-	-	+++	+++	-	-
Klebsiella pneumoniae	A	-	-	-	-	-	-	-	-	-	-	-	6×10^{5}
	B	-	-	6×10^{1}	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	2×10^{6}
Lactobacillus species	A	-	-	-	-	-	-	-	-	-	3×10^{3}	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	5×10^{5}
	C	-	-	-	-	-	-	-	-	+++	-	-	-
Lactobacillus lactis	A	-	-	-	-	-	-	-	-	-	-	-	2×10^{4}
	B	-	-	-	-	-	-	-	-	-	2×10^{2}	-	-
	C	-	-	-	-	-	-	-	-	-	3×10^{3}	-	3×10^{5}
Micrococcus species	A	-	-	-	-	-	2×10^{4}	-	-	-	-	-	-
	B	-	-	-	-	-	-	1×10^{1}	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 2	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	1×10^{2}	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 8	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	2×10^{2}	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 11	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	1×10^{4}	-	-
	C	-	-	-	-	-	-	2×10^{1}	-	-	-	-	-
Micrococcus species 15	A	-	-	-	-	-	1×10^{4}	-	-	-	-	-	-
	B	-	-	-	-	-	1×10^{3}	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 17	A	-	-	-	-	-	5×10^{3}	1×10^{2}	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 19	A	-	-	2×10^{2}	-	6×10^{1}	4×10^{2}	-	-	-	-	-	-
	B	+++	-	-	-	-	1×10^{4}	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 20	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	2×10^{3}	-	-	-	-	-	-	-	-	-	-
	C	-	1×10^{4}	-	-	-	-	-	-	-	-	-	-
Micrococcus species 26	A	-	4×10^{3}	4×10^{1}	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	+++	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 30	A	-	-	2×10^{1}	-	-	-	-	9×10^{3}	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Mima polymorpha	A	-	-	-	-	-	-	-	1×10^{4}	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces

† = Astronauts A, B, or C

+++ = Microorganisms present but not quantitated

TABLE XVII.- QUANTITATION* OF AEROBIC BACTERIA FROM 14-DAY PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
M. polymorpha var. *oxidans*	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	+++	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Neisseria perflava	A	-	-	-	-	-	-	-	-	$>1x10^6$	$4x10^5$	-	-
	B	-	-	-	-	-	-	-	-	$>1x10^6$	$2x10^5$	-	-
	C	-	-	-	-	-	-	-	-	$>1x10^6$	$2x10^5$	-	-
Neisseria sicca	A	-	-	$4x10^2$	-	-	-	-	-	$1x10^6$	-	-	-
	B	-	-	-	-	-	-	-	-	$8x10^5$	-	-	-
	C	-	-	-	-	-	-	-	-	$1x10^6$	-	-	-
Paracolobactrum intermedium	A	-	-	-	+++	$1x10^2$	-	-	$1x10^6$	+++	$1x10^1$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Proteus mirabilis	A	+++	-	-	-	-	-	-	$1x10^1$	-	+++	-	+++
	B	-	-	+++	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Pseudomonas maltophilia	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	$2x10^1$	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Rothia species	A	-	-	-	-	-	-	-	-	+++	-	-	-
	B	-	-	-	-	-	-	-	-	+++	+++	-	-
	C	-	-	-	-	-	-	-	-	-	+++	-	-
Rothia dentocariosa	A	-	-	-	-	-	-	-	-	-	+++	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Staphylococcus aureus	A	-	-	-	-	-	-	-	$8x10^1$	-	$9x10^1$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Staphylococcus epidermidis	A	$6x10^2$	$9x10^3$	$>1x10^4$	$>1x10^4$	$>1x10^4$	$4x10^3$	$8x10^4$	$>1x10^4$	$>1x10^4$	$>1x10^4$	-	-
	B	$8x10^1$	$2x10^3$	$>1x10^4$	$8x10^3$	+++	-	$>1x10^4$	$5x10^3$	-	$1x10^3$	-	-
	C	$2x10^2$	$2x10^3$	$>1x10^4$	+++	-	$8x10^1$	$4x10^3$	$1x10^3$	+++	$>1x10^4$	-	-
Streptococcus species (α hem.)	A	-	-	-	-	-	-	-	-	-	$>1x10^4$	-	$2x10^4$
	B	-	-	-	-	-	-	-	-	$>1x10^4$	-	-	-
	C	-	-	-	-	-	-	-	-	$1x10^4$	-	-	$4x10^2$
Streptococcus species (β hem.)	A	-	-	-	-	-	+++	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	+++	+++	-	-
	C	-	-	-	-	-	-	-	-	+++		-	
Streptococcus species (γ hem.)	A	-	-	-	-	-	-	-	-	$>1x10^4$	-	-	-
	B	-	-	-	-	-	-	-	-	-	$6x10^4$	-	$>1x10^5$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Streptococcus fecalis	A	-	-	-	-	-	-	-	-	-	-	-	$>1x10^4$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
S. fecalis var. *liquificiens*	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^4$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Streptococcus mitis	A	-	-	$>1x10^4$	+++	-	-	-	-	$>1x10^4$	-	-	$4x10^6$
	B	-	-	-	-	-	-	-	-	$>1x10^4$	$>1x10^4$	-	-
	C	-	-	-	-	-	$>1x10^1$	-	-	$1x10^4$	$>1x10^4$	-	$7x10^5$
Streptococcus salivarius	A	-	-	-	-	-	-	-	-	$>1x10^4$	$5x10^5$	-	$>1x10^4$
	B	-	-	-	-	-	-	-	-	$>1x10^4$	$>1x10^5$	-	$1x10^4$
	C	-	-	-	-	-	-	-	-	$>1x10^4$	$5x10^4$	-	$>1x10^4$
Streptomyces species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	+++	-	-	-	-	-
Unidentified**	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	+++	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of tissue

† = Astronauts A, B, or C

+++ = Microorganisms present but not quantitated

** Microorganisms not suitable for determination of identity

TABLE XVIII.- QUANTITATION* OF AEROBIC BACTERIA FROM IMMEDIATE PREFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	EAR 2	URINE	FECES
Bacillus species	A	-	-	-	+++	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-		-	-	$1x10^5$
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^4$
Bacillus [illegible] *cus*	A	-	-	-	-	-	-	-	-		-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	+++		-	-	-
Corynebacterium species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	$6x10^3$	-	-	-
	C	-	-	$1x10^1$	-	-	-	-	-	-	-	-	-
Corynebacterium species 4	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	$2x10^2$	-	-	-	-	-	-	-	-	-
Corynebacterium species 7	A	-	-	-	-	-	-	-	-	$7x10^3$	$1x10^$	-	-
	B	-	-	-	-	-	-	-	-	-	$5x10^$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^4$	-	-	-
Corynebacterium species 11	A	-	-	-	-	-	-	-	-	-	$1x10^$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 20	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	$1x10^1$	-	-	-	-	-	-	-	$1x10^5$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 21	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^$	-	-
Corynebacterium species Group III	A	-	-	-	-	-	-	-	$2x10^3$	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-				-	-	-	-
Corynebacterium bovis	A	-	$1x10^4$	-	-	$3x10^$	-	-	-	-	-	-	-
	B	-	$6x10^3$	-	-	-	-	-	-	-	-	-	-
	C	-	$1x10^5$	-	-	-	-	-	-	-	-	-	-
Corynebacterium hofmanni	A	-	-	-	-	$7x10^2$	-	-	-	$8x10^3$	$4x10^$	-	-
	B	-	-	-	-	-	-	-	-	$1x10^3$	$2x10^$	-	-
	C	-	-	$3x10^1$	-	-	-	-	-	-	$4x10^$	-	-
Enterobacter cloacae	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	+++	+++	-	-
Escherichia coli	A	-	-	-	-	-	-	-	-	-	-	-	$2x10^5$
	B	-	-	-	-	-	-	-	-	-	-	-	$4x10^5$
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^6$
Escherichia intermedia	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$2x10^6$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Gaffkya species	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^4$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Gaffkya homari	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	+++	-	-	-	-	-	-	-	-	-	-	-
Gaffkya tetragena	A	-	-	-	-	$2x10^1$	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Haemophilus parahaemolyticus	A	-	-	-	-	-	-	-	-	-	+++	-	-
	B	-	-	-	-	-	-	-	-	$1x10^$	$3x10^4$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^$	-	-	-

* Organisms per milliliter of broth or gram of feces

† = Astronauts A,B, or C

+++ = Microorganisms present but not quantitated

TABLE XVIII.- QUANTITATION* OF AEROBIC BACTERIA FROM IMMEDIATE PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Continued

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARE	THROAT	GARGLE	URINE	FECES
Haemophilus parainfluenzae	A	-	-	-	-	-	-	-	-	$4x10^{5}$	+++	-	-
	B	-	-	-	-	-	-	-	-	$2x10^{4}$	$1x10^{5}$	-	-
	C	-	-	-	-	-	-	-	-	$4x10^{4}$	$4x10^{4}$	-	-
Klebsiella pneumoniae	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^{4}$
	B	-	-	$6x10^{3}$	-	+++	+++	-	-	-	-	$6x10^{3}$	$2x10^{4}$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$4x10^{4}$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus casei	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$2x10^{5}$	-	-
Lactobacillus lactis	A	-	-	-	-	-	-	-	-	-	$4x10^{2}$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	$1x10^{1}$	+++	-	-
Lactobacillus vulgaricus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	+++	-	-	-
Micrococcus species	A	-	-	-	-	-	$2x10^{2}$	-	-	-	-	-	-
	B	-	-	-	-	-	$6x10^{1}$	-	-	-	-	-	-
	C	-	-	-	-	-	$4x10^{1}$	$2x10^{2}$	-	-	-	-	-
Micrococcus species 2	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	$2x10^{3}$	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 8	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	$4x10^{2}$	-	-	-	-	-
	C	-	-	-	-			-	-	-			
Micrococcus species 10	A	-	-	-	-	-	-	$1x10^{3}$	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 15	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	+++	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 17	A	-	-	-	-	+++	-	-	-	-	-	-	-
	B	-	-	-	$4x10^{3}$	+++	$9x10^{3}$	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 18	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	$6x10^{3}$	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 19	A	-	-	-	-	$7x10^{3}$	-	-	-	-	-	-	-
	B	+++	-	-	+++	$1x10^{2}$	-	-	-	$4x10^{3}$	$1x10^{3}$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 20	A	-	$2x10^{4}$	-	-	-	-	-	-	-	-	-	-
	B	-	$1x10^{5}$	-	-	-	-	-	-	-	-	-	-
	C	-	$1x10^{5}$	-	-	-	-	-	-	-	-	-	-
Micrococcus species 25	A	-	-	-	-	-	$4x10^{3}$	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	$1x10^{3}$	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 26	A	-	$3x10^{3}$	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	$1x10^{1}$	-	-	-	-	-	-	-
Micrococcus species 30	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	$9x10^{4}$	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces

† = Astronauts A, B, or C

+++ = Microorganisms present but not quantitated

TABLE XVIII.- QUANTITATION* OF AEROBIC BACTERIA FROM IMMEDIATE PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GAR[illegible]E	URINE	FECES
Neisseria species	A	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	1×10^{3}		-	-
Neisseria perflava	A	-	-	-	-	-	-	-	-	4×10^{4}	1×10^{3}	-	-
	B	-	-	-	-	-	-	-	-	6×10^{4}	4×10^{4}	-	-
	C	-	-	-	-	-	-	-	-	5×10^{3}	2x	-	-
Neisseria sicca	A	-	-	-	-	-	-	-	-	1×10^{4}		-	-
	B	-	-	-	-	-	-	-	-	6×10^{3}		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Paracolobactrum intermedium	A	-	-	-	-	-	-	-	1×10^{1}	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Proteus mirabilis	A	-	-	-	-	-	-	-	+++	-		-	-
	B	-	-	+++	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Rothia species	A	-	-	-	-	-	-	-	-	+++	+[illegible]	-	-
	B	-	-	-	-	-	-	-	-	+++	+[illegible]	-	-
	C	-	-	-	-	-	-	-	-	+++	+[illegible]	-	-
Staphylococcus aureus	A	-	-	-	-	-	-	-	-	-	2x [illegible]^{3}	-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Staphylococcus epidermidis	A	3×10^{2}	2×10^{2}	1×10^{1}	1×10^{1}	+++	1×10^{2}	1×10^{2}	8×10^{3}	-		-	-
	B	+++	+++	1×10^{1}	6×10^{1}		2×10^{1}	6×10^{1}	1×10^{2}	+++	8x [illegible]^{1}	1×10^{1}	-
	C	+++	-	2×10^{1}	-	+++	2×10^{2}	1×10^{1}	3×10^{2}	-		-	-
Streptococcus species (α hem.)	A	-	-	-	-	-	-	-	-	-	4x [illegible]^{5}	-	-
	B	-	-	-	-	-	-	-	-	-	1x [illegible]^{4}	-	-
	C	-	-	-	-	-	-	-	-	-	9x [illegible]^{4}	-	-
Streptococcus species (β hem.)	A	-	-	-	-	+++	+++	-	-	-	2x [illegible]^{4}	-	3×10^{4}
	B	-	-	-	+++	-	+++	-	-	-		-	1×10^{5}
	C	-	-	-	-	-	-	-	-	1×10^{2}	4x [illegible]^{3}	-	-
Streptococcus species (γ hem.)	A	-	-	-	-	-	-	-	-	1×10^{5}		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Streptococcus fecalis	A	-	-	-	-	-	-	-	-	-		-	1×10^{3}
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
S. fecalis var. *liquificiens*	A	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	2×10^{4}
	C	-	-	-	-	-	-	-	-	-		-	-
Streptococcus mitis	A	2×10^{1}	-	-	-	-	-	+++	-	2×10^{6}	9x [illegible]^{6}	-	3×10^{5}
	B	-	-	-	-	-	-	-	-	3×10^{5}	2x [illegible]^{6}	1×10^{1}	7×10^{5}
	C	-	-	-	-	-	-	-	-	2×10^{5}	4x [illegible]^{5}	-	3×10^{5}
Streptococcus salivarius	A	-	-	-	-	-	-	-	-	1×10^{6}	3x [illegible]^{6}	-	9×10^{5}
	B	-	-	-	-	-	-	-	-	9×10^{4}	2x [illegible]^{5}	-	5×10^{4}
	C	-	-	-	-	-	-	-	-	2×10^{4}	4x [illegible]^{4}	-	6×10^{4}
Streptomyces species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	+++	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces

† = Astronauts A,B, or C

+++ = Microorganisms present but not quantitated

TABLE XIX.- QUANTITATION* OF ANAEROBIC BACTERIA FROM 14-DAY PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Bacteroides capillosus	A	-	-	-	-	-	-	-	-	-	-	-	$2x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides coagulans	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$1x10^9$
Bacteroides corrodens	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$1x10^3$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^6$
Bacteroides fragilis	A	-	-	-	-	-	-	-	-	-	$9x10^3$	-	$1x10^9$
	B	-	-	-	-	-	-	-	-	$4x10^4$	-	-	$4x10^9$
	C	-	-	-	-	-	-	-	-	-	$6x10^4$	-	$9x10^7$
B.fragilis ss.*fragilis*	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$4x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
B.fragilis ss.*thetaiotaomicron*	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	$5x10^7$
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^9$
Bacteroides furcosus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$7x10^6$
	C	-	-	-	-	-	-	-	-	-	-	-	-
B.melaninogenicus ss.*asaccharolyticus*	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$1x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides pneumosintes	A	-	-	-	-	-	-	-	-	$4x10^4$	$2x10^4$	-	-
	B	-	-	-	-	-	-	-	-	$1x10^4$	$4x10^4$	-	-
	C	-	-	-	-	-	-	-	-	$2x10^3$	$9x10^4$	-	-
Clostridium species	A	-	-	-	-	-	-	-	-	-	-	-	+++
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Clostridium beijerinckii	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Clostridium plagarum	A	-	-	-	-	-	-	-	-	-	-	-	+++
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium pyogenes	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	$4x10^3$	-	-	-	-
	C	-	-	-	-	-	-	-	$2x10^3$	-	-	-	-
Eubacterium lentum	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^5$
	B	-	-	-	-	-	-	-	-	-	-	-	+++
	C	-	-	-	-	-	-	-	-	-	-	-	
Eubacterium rectale	A	-	-	-	-	-	-	-	-	-	-	-	$2x10^7$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Fusobacterium species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$1x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Fusobacterium fusiforme	A	-	-	-	-	-	-	-	-	$1x10^3$	$1x10^3$	-	-
	B	-	-	-	-	-	-	-	-	$5x10^3$	$5x10^3$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^4$	$1x10^4$	-	-
Fusobacterium nucleatum	A	-	-	-	-	-	-	-	-	-	$5x10^3$	-	-
	B	-	-	-	-	-	-	-	-	$9x10^3$	-	-	-
	C	-	-	-	-	-	-	-	-	$1x10^4$	$1x10^4$	-	-

* Organisms per milliliter of urine or per gram of feces

† = Astronauts A, B, C

+++ = Many organisms present but not quantitated

TABLE XIX.- QUANTITATION* OF ANAEROBIC BACTERIA FROM 14-DAY PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	ANUS	URINE	FECES
Fusobacterium russii	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus catenaforme	A	-	-	-	-	-	-	-	-	$3x10^1$	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus disciformans	A	-	-	-	-	-	-	-	-	-	$x10^3$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$x10^4$	-	-
Lactobacillus minutus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	$4x10^4$	-	-	-
	C	-	-	-	-	-	-	-	-	$4x10^3$	$x10^4$	-	-
Leptotrichia species	A	-	-	-	-	-	-	-	-	$1x10^2$	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Leptotrichia buccalis	A	-	-	-	-	-	-	-	-	-	$<10^3$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$<10^3$	-	-
Peptococcus asaccharolyticus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	$6x10^1$	-	-	-	-	-
Peptococcus prevotii	A	-	-	-	-	$3x10^3$	-	-	+++	-	-	-	-
	B	$5x10^2$	-	-	$2x10^1$	-	-	$6x10^2$	$8x10^2$	-	-	-	-
	C	-	-	-	-	-	$2x10^1$	$1x10^2$	$1x10^2$	-	-	-	-
Peptostreptococcus anaerobius	A	-	-	-	-	-	-	-	-	+++	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Peptostreptococcus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	$2x10^1$	-	-	-	-	-	-
Peptostreptococcus intermedius	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$1x10^9$
Peptostreptococcus magnus	A	-	-	-	-	-	-	-	-	-	-	-	$6x10^8$
	B	-	-	-	-	-	-	-	-	-	10^4	-	$4x10^8$
	C	-	-	-	-	-	-	-	-	-	10^4	-	-
Propionibacterium acnes	A	$4x10^2$	$4x10^4$	$1x10^2$	$5x10^2$	-	-	$2x10^3$	-	-	-	-	-
	B	$8x10^1$	$2x10^3$	$1x10^2$	$1x10^2$	-	-	-	-	-	10^4	-	$2x10^2$
	C	$2x10^1$	-	$2x10^1$	$2x10^1$	-	-	-	-	-	10^5	$1x10^1$	$1x10^8$
Propionibacterium granulosum	A	-	-	-	-	-	-	-	$1x10^2$	-	-	-	-
	B	-	-	-	-	-	-	-	$2x10^2$	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Veillonella alcalescens	A	-	-	-	-	-	-	-	-	$2x10^3$	10^4	-	-
	B	-	-	-	-	-	-	-	-	$4x10^3$	10^4	-	-
	C	-	-	-	-	-	-	-	-	$5x10^4$	10^5	-	-
Veillonella parvula	A	-	-	-	-	-	-	-	-	-	10^2	-	-
	B	-	-	-	-	-	-	-	-	-	10^4	-	-
	C	-	-	-	-	-	-	-	-	-	10^2	-	-
Unidentified**	A	-	$2x10^2$	-	-	-	-	-	-	$x10^4$	10^5	-	$3x10^9$
	B	-	-	-	-	-	$1x10^3$	-	-	-	10^4	+++	$5x10^7$
	C	-	-	-	-	-	$2x10^1$	$6x10^1$	-	$3x10^3$	10^4	-	$2x10^4$

* Organisms per milliliter of broth or gram of feces

† = Astronauts A, B, or C

+++ = Microorganisms present but not quantitated

** Microorganisms not suitable for determinative studies

TABLE XX.- QUANTITATION* OF ANAEROBIC BACTERIA FROM IMMEDIATE PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECAL
Actinomyces israelii	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$1x10^{2}$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides species	A	-	-	-	-	-	-	-	-	-	-	-	$2x10^{7}$
	B	-	-	-	-	-	-	-	-	-	$2x10^{5}$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides capillosus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$7x10^{8}$
	C	-	-	-	-	-	-	-	-	-	-	-	$4x10^{8}$
B.clostridiiformis ss.clostridiiformis	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^{8}$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides coagulans	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$3x10^{8}$
Bacteroides corrodens	A	-	-	-	-	-	-	-	-	-	$7x10^{4}$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$4x10^{8}$
Bacteroides fragilis	A	-	-	-	-	-	-	-	-	-	$3x10^{5}$	-	$3x10^{8}$
	B	-	-	-	-	-	-	-	-	-	-	-	$2x10^{9}$
	C	-	-	-	-	-	-	-	-	-	$1x10^{3}$	-	$1x10^{9}$
B.fragilis ss.thetaiotaomicron	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$5x10^{9}$
	C	-	-	-	-	-	-	-	-	-	-	-	$9x10^{8}$
Bacteroides furcosus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$3x10^{8}$
	C	-	-		-	-	-	-	-	-	-	-	-
B.melaninogenicus ss.asaccharolyticus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^{4}$	-	-
Bacteroides putredinis	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$9x10^{8}$
Bacteroides pneumosintes	A	-	-	-	-	-	-	-	-	$1x10^{4}$	$4x10^{4}$	-	-
	B	-	-	-	-	-	-	-	-	$3x10^{4}$	$3x10^{4}$	-	-
	C	-	-	-	-	-	-	-	-	$6x10^{3}$	$9x10^{4}$	-	-
Clostridium species	A	-	-	-	-	-	-	-	-	-	-	-	+++
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Clostridium perfringens	A	-	-	-	-	-	-	-	-	-	-	-	+++
	B	-	-	-	-	-	-	-	-	-	-	-	+++
	C	-	-	-	-	-	-	-	-	-	-	-	-
Clostridium plagarum	A	-	-	-	-	-	-	-	-	-	-	-	+++
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Clostridium ramosum	A	-	-	-	-	-	-	-	-	-	-	-	+++
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Corynebacterium pyogenes	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	$2x10^{3}$	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Eubacterium aerofaciens	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^{8}$

* Organisms per milliliter of specimen = 10^{x}

† = Astronauts A, B, or C

+++ = Microorganisms present, but not quantitated

TABLE XX.- QUANTITATION* OF ANAEROBIC BACTERIA FROM IMMEDIATE PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Continued

ORGANISM	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NASAL	THROAT	ANGLE	URINE	FECES
Eubacterium biforme	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$4x10^8$
Fusobacterium fusiforme	A	-	-	-	-	-	-	-	-	$1x10^2$	$<10^3$	-	-
	B	-	-	-	-	-	-	-	-	$1x10^3$	$<10^3$	-	-
	C	-	-	-	-	-	-	-	-	-	$<10^3$	-	-
Fusobacterium mortiferum	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$<10^2$	-	-
Fusobacterium naviforme	A	-	-	-	-	-	-	-	-	$1x10^2$	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Fusobacterium nucleatum	A	-	-	-	-	-	-	-	-	$3x10^2$	-	-	-
	B	-	-	-	-	-	-	-	-	$1x10^2$	$<10^3$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^2$	$<10^3$	-	-
Fusobacterium prausnitzii	A	-	-	-	-	-	-	-	-	-	-	-	$7x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	$2x10^1$	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus acidophilus	A	-	-	-	-	-	-	-	-	$2x10^2$	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus catenaforme	A	-	-	-	-	-	-	-	-	-	-	-	$3x10^7$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Leptotrichia species	A	-	-	-	-	-	-	-	-	-	10^4	-	-
	B	-	-	-	-	-	-	-	-	-	10^3	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Leptotrichia buccalis	A	-	-	-	-	-	-	-	-	$7x10^1$	-	-	-
	B	-	-	-	-	-	-	-	-	$6x10^2$	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Peptococcus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	10^5	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Peptococcus asaccharolyticus	A	-	-	-	-	$2x10^1$	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Peptococcus prevotii	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	$6x10^1$	$2x10^3$	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Peptostreptococcus anaerobius	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	$1x10^2$	-	-	-	-	-	-	-	-	-	-	$4x10^4$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Peptostreptococcus intermidius	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	$2x10^2$	-	-	-
Peptostreptococcus magnus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	$4x10^1$	$4x10^1$	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	10^3	-	-
Propionibacterium species	A	-	-	-	-		-	$2x10^2$	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces

† = Astronauts A, B, or C

+++ = Microorganisms present but not quantitated

TABLE XX.- QUANTITATION* OF ANAEROBIC BACTERIA FROM IMMEDIATE PREFLIGHT SPECIMENS

FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Propionibacterium acnes	A	-	$1x10^{2}$	-	$2x10^{2}$	-	-	-	$5x10^{3}$	-	$1x10^{5}$	-	-
	B	$4x10^{1}$	-	-	$8x10^{3}$	-	$4x10^{2}$	-	-	$1x10^{5}$	-	$1x10^{1}$	$2x10^{8}$
	C	$2x10^{1}$	-	-	$4x10^{2}$	-	-	-	$1x10^{3}$	-	-	-	-
Propionibacterium granulosum	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	$5x10^{3}$	-	$7x10^{5}$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Veillonella alcalescens	A	-	-	-	-	-	-	-	-	$3x10^{3}$	$3x10^{5}$	-	-
	B	-	-	-	-	-	-	-	-	$2x10^{6}$	$1x10^{3}$	-	-
	C	-	-	-	-	-	-	-	-	$4x10^{3}$	$5x10^{1}$	-	-
Veillonella parvula	A	-	-	-	-	-	-	-	-	$1x10^{4}$	$4x10^{5}$	-	$1x10^{5}$
	B	-	-	-	-	-	-	-	-	-	$6x10^{4}$	-	-
	C	-	-	-	-	-	-	-	-	$6x10^{2}$	-	-	-
Unidentified**	A	-	-	-	-	-	-	-	-	-	$3x10^{4}$	$5x10^{1}$	$2x10^{9}$
	B	-	-	-	-	-	-	$1x10^{1}$	$4x10^{3}$	$6x10^{4}$	$1x10^{4}$	-	$2x10^{8}$
	C	-	-	-	-	-	-	-	-	$3x10^{2}$	$1x10^{3}$	-	$1x10^{8}$

* Organisms per milliliter of broth or gram of feces

† = Astronauts A, B, or C

+++ = Microorganisms present but not quantitated

** Microorganisms not suitable for determinative studies

TABLE XXI.- FUNGI FROM 14-DAY PREFLIGHT SAMPLINGS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GAR	E	URINE	FECES
Acremonium species	B	-	-	-	-	-	-	-	-			-	-
Aspergillus pseudoglaucus	-	C	-	-	-	-	-	-	-			-	-
Aspergillus versicolor	-	-	-	-	-	-	-	-	-			-	-
Bipolaris species	-	-	-	-	-	-	-	C	-			-	-
*Candida albicans**	-	-	-	-	-	-	-	-	C	A		-	A,B,C
*Candida krusei**	-	-	-	-	-	-	-	-	-	-		-	C
*Candida parapsilosis**	-	A	-	-	-	-	-	-	-	-		-	-
Cephalosporium species	-	A	-	-	-	-	A	-	-	-		-	-
Cladosporium colocasiae	-	-	B	-	A	-	-	-	-	-		-	-
Cladosporium elatum	-	-	-	-	-	-	-	-	-	-		-	C
Cladosporium herbarum	-	-	-	C	-	-	C	-	C	-		-	B,C
Cladosporium sphaerospermum	-	-	-	-	-	-	-	-	C	-		-	-
Diplococcium species	-	-	-	-	-	A	-	-	-	-		-	-
Fusarium species	-	-	-	-	-	-	-	-	A	-		-	-
Geotrichum species	-	-	-	-	-	A	-	-	-	-		-	A
Haplobasidion species	-	C	-	-	-	-	-	-	-	-		-	-
Penicillium chrysogenum	-	-	-	B	-	-	-	-	-	C		-	-
Penicillium notatum	-	-	-	-	-	-	-	-	A	-		-	A
Periconia igniaria	-	-	-	-	-	-	-	-	A	-		-	-
Periconia minutissima	-	A	-	-	-	-	C	C	-	-		-	-
Philophora jeanselmei	-	-	A	-	-	-	-	-	-	-		-	-
*Pityrosporum ovale**	-	-	-	-	-	-	B	-	-	-		-	-
Scolecobasidium varruculosum	-	-	-	-	-	A	-	-	-	-		-	-
Sporothrix species	-	-	-	B	-	-	-	-	-	-		-	-
Sterile mycelium	-	-	-	-	-	-	A	B	A	-		-	-
Stilbum species	-	-	-	C	-	-	-	-	-	-		-	-
Syncephalastrum racemosum	-	-	B	-	-	-	-	-	-	-		A	-
Thysanophora penicilloides	-	-	-	-	-	-	-	-	-	-		-	-
Torula herbarum	-	C	-	-	-	-	-	-	-	-		-	-
*Torulopsis aeria**	-	-	-	-	-	-	-	-	A	-		-	-
Wallemia ichthyophaga	B	-	-	-	-	-	-	-	-	-		-	B

* = Yeast (all others filamentous fungi)

- = Absent

TABLE XXII.- FUNGI FROM IMMEDIATE PREFLIGHT SPECIMENS FROM SOURCE MATERIAL FROM ASTRONAUTS A, B, AND C

	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	SALIVA	URINE	FECES
Aspergillus flavus var. columnaris	-	-	-	-	-	-	-	-	-	C	-	-
Aspergillus nidulans	B	-	-	-	-	-	-	-	-	-	-	-
Aspergillus ochraceus	-	-	-	C	-	-	-	-	-	-	-	A
Aureobasidium pullulans	-	-	-	-	-	-	-	-	-	-	-	B
Bipolaris species	-	-	-	B	-	-	-	-	-	-	-	-
*Candida albicans**	-	-	-	-	-	-	-	-	-	A,B,C	-	A,C
*Candida species**	-	-	-	-	-	-	-	-	A	-	-	-
Cephalosporium species	A	-	-	-	-	-	-	-	-	-	-	-
Cladosporium cladosporioides	-	-	-	-	-	-	-	-	-	-	-	-
Cladosporium herbarum	-	-	-	B	-	-	-	-	B	-	-	-
Cladosporium sp.	-	-	-	-	-	-	-	-	-	-	-	-
Cladosporium herbarum	-	-	-	-	-	-	A	-	-	-	-	A
Filamentous fungi	-	-	-	-	-	B	-	-	-	-	-	-
Geotrichum species	-	-	-	A	-	A	-	A	-	-	A	-
Penicillium chrysogenum	-	-	-	-	-	-	-	-	-	-	-	A
Penicillium funiculosum	-	-	-	-	-	-	-	-	-		-	-
Penicillium purpurogenum	-	-	-	-	-	-	-	-	-	-	-	-
*Phycomyces sp.**	-	-	-	-	-	-	-	-	-	-	-	-
*Saccharomyces cerevisiae**	-	-	-	-	-	-	-	-	-	-	-	-
Sclerobasidium vermiculare	-	-	-	-	-	-	-	-	-	-	-	-
Sporotrichum species	B	-	-	-	-	-	-	-	-	A	-	-

* = Yeast (all other filamentous fungi)
- = Absent

TABLE XXIII.- CHARACTERIZATION OF ILLNESS EVENTS IN PRIMARY CONTACTS AND THEIR FAMILIES

Illness Type	No. of Occurrences	% of Total
Upper Respiratory Infection	153	84.4
Gastrointestinal Infection	12	6.6
Ear Infection	7	3.9
Influenzae	3	1.7
Chicken Pox	3	1.7
Bronchitis and Pneumonia	3	1.7
Total	181	100.0

*These data were supplied by the Apollo 14 Health Stabilization Officer.

TABLE XXIV.- IMMEDIATE POSTFLIGHT ISOLATES OF POSSIBLE MEDICAL IMPORTANCE

Sample	Astronaut A	Astronaut B	Astronaut C
Scalp	-	-	-
Ear	-	-	-
Axilla	-	-	-
Hands	-	-	-
Navel	-	-	-
Groin	*Klebsiella pneumoniae* *Proteus mirabilis*	*Klebsiella pneumoniae* *Proteus mirabilis* *Paracolobactrum intermedium*	-
Toes	*Pseudomonas stutzeri*	-	*Escherichia coli*
Nares	*Staphylococcus aureus* *Proteus morganii* *Enterobacter hafniae* *Enterobacter aerogenes*	*Staphylococcus aureus*	*Staphylococcus aureus*
Throat Swab	*Haemophilus parainfluensae* *Staphylococcus aureus* *Mima polymorpha*	*Haemophilus parainfluenzae* *Herellea species*	*Haemophilus parainfluenzae* *Moraxella nonliquefaciens*
Gargle	*Haemophilus parainfluensae* *Haemophilus parahaemolyticus* *Proteus mirabilis* *Streptococcus species* (β, Not Group A) *Candida albicans*	*Haemophilus parainfluensae* *Haemophilus parahaemolyticus* *Herellea vaginicola* *Moraxella nonliquefaciens* *Streptococcus species* (β, Not Group A)	*Haemophilus parainfluensae* *Herellea vaginicola*
Urine	*Herellea vaginicola* *Klebsiella pneumoniae*	*Klebsiella pneumoniae* *Proteus mirabilis* *Herellea vaginicola*	*Herellea vaginicola* *Escherichia coli*
Feces	*Proteus mirabilis* *Candida albicans*	*Streptococcus species* (β, Not Group A)	*Proteus mirabilis* *Pseudomonas species* *Candida albicans*

- = No significantly increased organism found in this site.

TABLE XXV.- QUANTITATION* OF AEROBIC BACTERIA FROM IMMEDIATE POSTFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GAR[illegible]E	URINE	FECES
Bacillus species	A	-	-	-	-	-	-	+++	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	+++
	C	-	-	-	+++	-	-	-	-	-	-	-	-
Bacillus species 1040	A	-	-	-	$1x10^{1}$	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacillus subtilis	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	+++	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species	A	-	-	$1x10^{1}$	-	-	$5x10^{4}$	-	-	-	$5x10^{5}$	-	-
	B	-	-	-	-	-	$2x10^{4}$	-	+++	-	$1x10^{5}$	-	-
	C	-	-	$3x10^{1}$	-	-	-	$3x10^{2}$	-	-	-	$2x10^{2}$	-
Corynebacterium species 1	A	-	-	-	-	$2x10^{1}$	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 7	A	-	-	-	-	-	-	$2x10^{2}$	-	$1x10^{3}$	$1x10^{4}$	-	-
	B	-	-	-	-	-	-	-	-	$5x10^{3}$	$2x10^{3}$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 19	A	-	-	-	-	-	-	-	-	-	-	$2x10^{1}$	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 21	A	-	-	-	-	-	-	-	$5x10^{5}$	-	$4x10^{5}$	-	-
	B	-	-	-	-	-	-	-	-	-	$2x10^{3}$	-	-
	C	-	-	-	-	-	-	-	$8x10^{3}$	-	-	-	-
Corynebacterium species 22	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^{5}$	-	-
Corynebacterium species 33	A	-	-	-	-	$3x10^{1}$	-	-	-	-	$5x10^{4}$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium bovis	A	-	$1x10^{5}$	-	-	$1x10^{2}$	-	-	-	-	-	-	-
	B	-	$6x10^{4}$	-	-	-	$8x10^{4}$	-	-	-	-	-	-
	C	-	$7x10^{3}$	-	$2x10^{1}$	-	-	-	-	-	-	-	-
Enterobacter aerogenes	A	-	-	-	-	-	-	-	$1x10^{1}$	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Enterobacter cloacae	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	$2x10^{2}$	-
Enterobacter hafnae	A	-	-	-	-	-	-	-	+++	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Escherichia coli	A	-	-	-	-	-	-	-	-	-	-	-	$2x10^{8}$
	B	-	-	-	-	-	-	-	-	-	-	-	$2x10^{8}$
	C	-	-	-	-	-	-	+++	-	-	-	-	$1x10^{8}$
Flavobacterium species	A	-	-	$8x10^{2}$	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Haemophilus parahaemolyticus	A	-	-	-	-	-	-	-	-	-	$7x10^{2}$	-	-
	B	-	-	-	-	-	-	-	-	-	$1x10^{1}$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Haemophilus parainfluenzae	A	-	-	-	-	-	-	-	-	$7x10^{2}$	$2x10^{4}$	-	-
	B	-	-	-	-	-	-	-	-	$3x10^{2}$	$9x10^{4}$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^{3}$	$4x10^{3}$	-	-
Herellea species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	+++	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces

† Astronauts A,B, or C

+++ = Microorganisms present but not quantitated

TABLE XXV.- QUANTITATION* OF AEROBIC BACTERIA FROM IMMEDIATE POSTFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Continued

SPECIES	+	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Herellea vaginicola	A	-	-	-	-	-	-	-	-	-	-	2×10^{1}	-
	B	-	-	-	-	-	-	-	-	-	1×10^{1}	9×10^{2}	-
	C	-	-	-	-	-	-	-	-	-	+++	3×10^{2}	
Klebseilla pneumoniae	A	-	-	-	-	-	3×10^{1}	-	-	-	-	+++	-
	B	-	-	-	-	-	2×10^{1}	-	-	-	-	9×10^{1}	
	C	-	-	-	-	-	-	-	-	-	-	-	1×10^{6}
Lactobacillus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	3×10^{4}	-	-	-
Micrococcus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	1×10^{5}	-	-
	C	-	-	4×10^{2}	-	-	+++	-	-	-	-	-	-
Micrococcus species 2	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	2×10^{1}	-	-	-	1×10^{2}	-	+++	-	-	-
Micrococcus species 4	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	9×10^{2}	-	-	-	-	-
Micrococcus species 5	A	-	-	-	-	-	-	4×10^{3}	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 8	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	7×10^{1}	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 11	A	-	-	-	-	-	-	-		-	-	-	-
	B	-	-	-	-	-	-	-		-	-	-	-
	C	-	-	-	3×10^{1}	-	-	-	-	-	-	-	-
Micrococcus species 17	A	-	-	-	-	2×10^{2}	-	-		-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 18	A	-	-	-	-	-	-	$\times10^{3}$	-	-	-	-	-
	B	-	-	+++	-	-	-	-		-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 19	A	2×10^{2}	-	-	2×10^{2}	-	7×10^{4}	-	-	-	-	-	-
	B	-	-	-	-	-	3×10^{4}	-	-	$\times10^{4}$	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 20	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	3×10^{5}	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 22	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	3×10^{4}	-	-	-	-	-	-	-	-	-	-
Micrococcus species 25	A	-	-	1×10^{2}	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 26	A	-	1×10^{6}	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	1×1	-	-	-	-	-	-	-
	C	-	-	-	4×10^{1}	-	-	-	-	-	-	-	-
Micrococcus species 30	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	3×10^{2}	-	-	-	-	-	-	-	-	-
Mima polymorpha	A	-	-	-	-	-	-	-	-	+++	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Moraxella non-liquefaciens	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	1×10^{5}	-	-
	C	-	-	-	-	-	-	-	-	$\times1$	-	-	-

* Organisms per milliliter of broth or gram of feces
+ = Astronauts A,B, or C
+++ = Microorganisms present but not quantitated

TABLE XXV.- QUANTITATION* OF AEROBIC BACTERIA FROM IMMEDIATE POST-FLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GI	LE	URINE	FECES
Neisseria species	A	-	-	-	-	-	-	-	-	-	2x	^{5}	-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	$\times 10^{5}$			-	-
Neisseria perflava	A	-	-	-	-	-	-	-	-	$\times 10^{3}$	2x	^{5}	-	-
	B	-	-	-	-	-	-	-	-	$\times 10^{4}$	7x	^{5}	-	-
	C	-	-	-	-	-	-	-	-	-	5x	^{5}	-	-
Neisseria sicca	A	-	-	-	-	-	-	-	-	$\times 10^{1}$			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Paracolobactrum intermedium	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	6×10^{1}	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Proteus mirabilis	A	-	-	-	-	-	+++	-	-	-	9x	^{3}	-	+++
	B	-	-	-	-	-	+++	-	-	-			2×10^{1}	-
	C	-	-	-	-	-	-	-	-	-			-	+++
Proteus morganii	A	-	-	-	-	-	-	-	+++	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Pseudomonas species	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	+++
Rothia species	A	-	-	-	-	-	-	-	-	+++	+	+	-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Sarcina species	A	-	-	-	-	-	-	-	-	-			2×10^{2}	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
Staphylococcus aureus	A	-	-	-	-	-	-	-	1×10^{4}	+++			-	-
	B	-	-	-	-	-	-	-	4×10^{2}	-			-	-
	C	-	-	-	-	-	-	-	1×10^{2}	-			-	-
Staphylococcus epidermidis	A	3×10^{3}	6×10^{4}	-	9×10^{1}	-	3×10^{4}	-	2×10^{4}	-	2x	0^{1}	-	-
	B	5×10^{1}	5×10^{2}	-	2×10^{1}	-	3×10^{4}	-	1×10^{3}	1×10^{2}	+	+	-	-
	C	5×10^{2}	2×10^{2}	-	-	6×10^{1}	-	-	2×10^{4}	-	+	+	1×10^{1}	-
Streptococcus species (α hem.)	A	-	-	-	-	-	-	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			2×10^{2}	-
	C	-	-	-	-	-	-	-	-	-	2x	0^{6}	-	-
Streptococcus species (β hem.)	A	-	-	-	-	-	-	-	-	-	2x	0^{4}	-	-
	B	-	-	-	-	-	-	-	-	-	1x	0^{4}	-	1×10^{5}
	C	-	-	-	-	-	-	-	-	-			-	-
Streptococcus species (γ hem.)	A	-	-	-	-	-	-	-	-	1×10^{4}			4×10^{1}	-
	B	-	-	-	-	-	-	-	-	-			2×10^{2}	-
	C	-	-	-	-	-	-	-	-	-			-	2×10^{4}
Streptococcus fecalis	A	-	-	-	-	+++	+++	-	-	-			-	-
	B	-	-	-	-	-	-	-	-	-			-	-
	C	-	-	-	-	-	-	-	-	-			-	-
S. fecalis var. *liquificiens*	A	-	-	-	-	-	-	-	-	-			-	4×10^{5}
	B	-	-	-	-	-	-	-	-	-			-	1×10^{4}
	C	-	-	-	-	-	-	-	-	-			-	3×10^{2}
Streptococcus mitis	A	-	-	-	-	-	-	-	-	2×10^{4}		10^{7}	-	-
	B	-	-	-	+++	-	-	-	-	1×10^{5}		10^{6}	-	9×10^{4}
	C	-	-	-	-	-	-	-	-	2×10^{5}		10^{6}	-	-
Streptococcus salivarius	A	-	-	-	-	-	-	-	-	9×10^{3}		10^{5}	-	-
	B	-	-	-	-	-	-	-	-	1×10^{5}		10^{3}	-	3×10^{4}
	C	-	-	-	-	-	-	-	-	9×10^{3}		10^{4}	-	-
Unidentified**	A	-	-	-	-	-	-	+++	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces
† = Astronauts A, B, or C
+++ = Microorganisms present but not quantitated
** Microorganisms not suitable for determinative studies

TABLE XXVI.- QUANTITATION* OF ANAEROBIC BACTERIA FROM IMMEDIATE POSTFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Bacteroides	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^9$
species	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	$3x10^7$
Bacteroides	A	-	-	-	-	-	-	-	-	-	-	-	-
capillosus	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$4x10^7$
B.clostridiiformis	A	-	-	-	-	-	-	-	-	-	-	-	-
ss.*clostridiiformis*	B	-	-	-	-	-	-	-	-	-	-	-	$4x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides	A	-	-	-	-	-	-	-	-	-	-	-	-
coagulans	B	-	-	-	-	-	-	-	-	-	-	-	$8x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^8$
Bacteroides	A	-	-	-	-	-	-	-	-	-	-	-	-
corrodens	B	-	-	-	-	-	-	-	-	-	$1x10^3$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides	A	-	-	-	-	-	-	-	-	-	-	-	-
fragilis	B	-	-	-	-	-	-	-	-	-	-	-	$3x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
B.fragilis	A	-	-	-	-	-	-	-	-	-	-	-	-
ss.*fragilis*	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^9$
	C	-	-	-	-	-	-	-	-	-	-	-	$1x10^7$
B.fragilis	A	-	-	-	-	-	-	-	-	-	-	-	$2x10^8$
ss.*thetaiotaomicron*	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^9$
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^8$
B.fragilis	A	-	-	-	-	-	-	-	-	-	-	-	-
ss.*vulgatis*	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^7$
Bacteroides	A	-	-	-	-	-	-	-	-	-	-	-	$2x10^8$
furcosus	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
B.melaninogenicus	A	-	-	-	-	-	-	-	-	-	-	-	-
ss.*asaccharolyticus*	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^1$	-	-
Bacteroides	A	-	-	-	-	-	-	-	-	$8x10^3$	$5x10^2$	-	-
pneumosintes	B	-	-	-	-	-	-	-	-	$9x10^3$	$1x10^2$	-	-
	C	-	-	-	-	-	-	-	-	-	$4x10^3$	-	-
Bifidobacterium	A	-	-	-	-	-	-	-	-	-	-	-	+++
adolescentis	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Clostridium	A	-	-	-	-	-	-	-	-	-	-	-	+++
species	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Clostridium	A	-	-	-	-	-	-	-	-	-	-	-	-
perfringens	B	-	-	-	-	-	-	-	-	-	-	-	+++
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium	A	-	-	-	-	-	-	-	-	-	-	-	-
pyogenes	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	$9x10^7$	-	-	-	-
Eubacterium	A	-	-	-	-	-	-	-	-	-	-	-	-
cylindroides	B	-	-	-	-	-	-	-	-	-	-	-	$8x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Eubacterium	A	-	-	-	-	-	-	-	-	-	-	-	-
lentum	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$2x10^7$

* Organisms per milliliter of broth or gram of feces
† = Astronauts A, B, or C
+++ = Microorganisms present but not quantitated

TABLE XXVI.- QUANTITATION* OF ANAEROBIC BACTERIA FROM IMMEDIATE POSTFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GAR[illegible]	E	URINE	FECES
Fusobacterium fusiforme	A	-	-	-	-	-	-	-	-	$2x10^3$	8x1[illegible]		-	-
	B	-	-	-	-	-	-	-	-	-	2x1[illegible]		-	-
	C	-	-	-	-	-	-	-	-	-	1x1[illegible]		-	-
Fusobacterium nucleatum	A	-	-	-	-	-	-	-	-	$4x10^3$	-		-	-
	B	-	-	-	-	-	-	-	-	$8x10^2$	-		-	-
	C	-	-	-	-	-	-	-	-	-	3x1[illegible]		-	-
Lactobacillus species	A	-	-	-	-	-	-	-	-	-	1x1[illegible]		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Lactobacillus disciformans	A	-	-	-	-	-	-	-	-	$3x10^1$	-		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Leptotrichia species	A	-	-	-	-	-	-	-	-	$4x10^3$	2x1[illegible]		-	-
	B	-	-	-	-	-	-	-	-	$1x10^2$	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Leptotrichia buccalis	A	-	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-	3x1[illegible]		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Peptococcus species	A	-	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	$3x10^3$	-	-		-	-
	C	-	-	-	-	-	$4x10^2$	-	-	-	-		-	-
Peptococcus prevotii	A	-	-	-	-	$3x10^2$	-	-	-	-	-		-	-
	B	$1x10^2$	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Peptostreptococcus anaerobius	A	-	-	-	-	$1x10^1$	-	-	-	-	-		-	-
	B	-	-	-	-	$2x10^1$	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Peptostreptococcus intermidius	A	-	-	-	-	-	-	-	-	-	-		-	$9x10^8$
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	+++	-		-	$9x10^8$
Peptostreptococcus magnus	A	-	-	-	-	-	-	-	-	-	5x1[illegible]		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Propionibacterium acnes	A	-	-	-	-	-	-	-	-	-	2x1[illegible]		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Propionibacterium granulosum	A	-	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	$8x10^4$	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	5x1[illegible]		-	-
Propionibacterium jensenii	A	-	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	4x1[illegible]		-	-
Veillonella alcalescens	A	-	-	-	-	-	-	-	-	$3x10^2$	4x1[illegible]		-	-
	B	-	-	-	-	-	-	-	-	$2x10^3$	1x1[illegible]		-	-
	C	-	-	-	-	-	-	-	-	-	1x1[illegible]		-	-
Veillonella parvula	A	-	-	-	-	-	-	-	-	$2x10^3$	6x1[illegible]		-	-
	B	-	-	-	-	-	-	-	-	$8x10^2$	2x1[illegible]		-	-
	C	-	-	-	-	-	-	-	-	-	7x1[illegible]		-	-
Unidentified**	A	-	-	-	-	-	-	-	-	$3x10^1$	6x1[illegible]		-	$2x10^8$
	B	-	-	-	-	-	-	-	-	-	1x1[illegible]		-	$2x10^8$
	C	-	-	-	-	-	-	-	-	-	4x1[illegible]		-	-

* Organisms per milliliter of broth or gram of feces
† = Astronauts A,B, or C
+++ = Microorganisms present but not quantitated
** Microorganisms not suitable for determinative studies

TABLE XXVII.- FUNGI FROM IMMEDIATE POSTFLIGHT SAMPLINGS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Candida albicans	-	-	-	-	-	-	-	-	-	A	-	A,C
Candida species	-	-	-	-	-	-	-	-	-	-	-	C
Geotrichum species	-	-	-	-	-	A	-	-	-	-	-	-
Penicillium lilacinum	-	-	-	-	-	-	-	-	-	-	-	C
Penicillium notatum	-	-	-	-	-	-	-	-	-	-	-	C

- = Absent

TABLE XXVIII.- QUANTITATION OF MICROORGANISMS FROM SAMPLINGS OF SOURCE MATERIAL

FROM SPACECRAFT HARDWARE

GENUS AND SPECIES	FLOOR		HEAD STRUT		R.H.C.*		DRINK GUN	
	F-0	R+0	F-0	R+0	F-0	R+0	F-0	R+0
Aerobes								
Bacillus species	-	-	-	+++	-	-		-
Corynebacterium bovis	-	-	-	-	-	-	2×10^1	-
Gaffkya species	-	-	-	-	-	-	1×10^1	-
Gaffkya tetragena	-	-	1×10^1	-	-	-		+++
Herellea vaginicola	-	1×10^2	-	-	-	-		-
Klebsiella pneumoniae	-	5×10^1	-	-	-	-		-
Micrococcus species 3	1×10^1	-	-	-	-	-		-
Micrococcus species 4	-	-	-	-	-	-	3×10^1	+++
Micrococcus species 5	2×10^2	-	-	-	-	-		-
Micrococcus species 10	-	-	-	-	+++	-		-
Micrococcus species 14	3×10^1	-	-	-	-	-		-
Micrococcus species 19	-	-	-	-	+++	-		-
Micrococcus species 29	-	-	-	-	-	-	3×10^1	-
Proteus mirabilis	-	+++	-	-	-	-	-	-
Pseudomonas maltophilia	+++	-	-	-	-	-	-	-
Staphylococcus epidermidis	1×10^2	-	-	+++	-	5×10^1	-	+++
Streptococcus fecalis	-	5×10^1	-	-	-	-	-	-
Anaerobes								
Propionibacterium acnes	-	-	-	-	5×10^2	-	-	-
Fungi								
Rhodotorula minuta	+++	-	-	-	-	-	-	-

* R.H.C = Rotational Hand Controller

+++ = Present but not quantitated

- = Absent

TABLE XXIX.- ANALYSES OF AEROBIC SPECIES FOUND ON COMMAND MODULE HARDWARE

Sample Site	Microorganisms Recovered	
	Preflight	Postflight
Floor	*Micrococcus species* 3	-
	Micrococcus species 5	-
	Micrococcus species 14	-
	Pseudomonas maltophilia	-
	Staphylococcus epidermidis	-
	-	*Herellea vaginicola*
	-	*Klebsiella pneumoniae*
	-	*Proteus mirabilis*
	-	*Streptococcus fecalis*
Head Strut	*Gaffkya tetragena*	-
	-	*Staphylococcus epidermidis*
	-	*Bacillus species*
Rotational Hand Controller	*Micrococcus species* 10	-
	Micrococcus species 19	-
	-	*Staphylococcus epidermidis*
Drink Gun	*Corynebacterium bovis*	-
	Gaffkya species	-
	Micrococcus species 4	*Micrococcus species* 4
	Micrococcus species 29	-
	-	Gaffkya tetragena
	-	Staphylococcus epidermidis

- = No medically important organism found on this site.

TABLE XXX.- MICROBIAL ANALYSES OF SWAB SAMPLES FROM EVA CLOTHING

	Microorganism Recovered					
	Astronaut A		Astronaut B		Astronaut C	
Sample Site	Preflight	Postflight	Preflight	Postflight	Preflight	Postflight
Gloves	*Staphylococcus epidermidis*	*Staphylococcus epidermidis*	*Staphylococcus epidermidis*	-	*Staphylococcus epidermidis*	*Staphylococcus epidermidis*
			-	*Corynebacterium bovis*	-	*Corynebacterium bovis*
			-	*Corynebacterium* species 7	*Wallemia* ** *ichthyophaga*	-
			-	*Staphylococcus aureus*		
Shoe Soles	*Staphylococcus epidermidis*	*Staphylococcus epidermidis*	*Staphylococcus epidermidis*	-	*Staphylococcus epidermidis*	*Staphylococcus epidermidis*
	Streptococcus mitis	*Streptococcus mitis*	-	*Mima polymorpha*	*Micrococcus* species	-
	-	*Micrococcus* species 5			*Micrococcus* species 1	-
					-	*Bacillus* species

** = Fungal isolate

- = No medically important microorganism found on this site.

TABLE XXXI.- ANALYSES OF AEROBIC SPECIES FOUND IN SAMPLES FROM URINE COLLECTION DEVICES

Preflight			Postflight		
Astronaut A	Astronaut B	Astronaut C	Sample 1	Sample 2	Sample 3
Staphylococcus epidermidis	*Staphylococcus epidermidis*	-	*Klebsiella pneumoniae*	*Klebsiella pneumoniae*	*Klebsiella pneumoniae*
			Pseudomonas maltophilia	-	*Pseudomonas maltophilia*
			-	*Bacillus species*	-
			-	-	*Proteus mirabilis*

- = No medically important organism found on this site.

TABLE XXXII.- MICROORGANISMS ISOLATED FROM CABIN FA FILTER

Species	Highest Quantitation (in CFU/CM^2)	No. of positive samples*
Bacteria		
Herellea vaginicola	3.1×10^6	1
Staphylococcus epidermidis	1.7×10^3	4
Corynebacterium species 29	1.1×10^2	1
Paracolobactrum aerogenoides	6.5×10^1	1
Corynebacterium species 5	5.1×10^1	1
Bacillus species 1065	5.1×10^1	1
Bacillus mycoides	4.5×10^1	1
Streptomyces species	+++	1
Fungi		
Aureobasidium pullulous	+++	1
Rhodotorula minuta	+++	1
Torulopsis candida	+++	1
Geotrichum candidum	+++	1
Aspergillus sydowi	+++	1
Penicillium italicum	+++	1
Penicillium notatum	+++	1

* Maximum of 6 for bacteria and 3 for fungi.
+++ = Microorganism isolated but not quantitated
CFU = Colony Forming Units

TABLE XXXIII.- SIXTEEN-DAY POSTFLIGHT ISOLATES OF POSSIBLE MEDICAL IMPORTANCE

Sample	Astronaut A	Astronaut B	Astronaut C
Scalp	-	-	*Aspergillus amsteladomi*
Ear	-	-	-
Axilla	-	-	-
Hands	-	-	-
Navel	*Streptococcus species* (β, Not Group A)	-	-
Groin	*Streptococcus species* (β, Not Group A)	*Streptococcus species* (β, Not Group A) *Klebsiella pneumoniae*	-
Toes	*Aspergillus ruber* *Herellea vaginicola* *Streptococcus species* (β, Not Group A)	*Aspergillus unguis*	-
Nares	*Staphylococcus aureus* *Paracolobactrum intermedium* *Proteus mirabilis*	*Staphylococcus aureus*	-
Throat	*Haemophilus parainfluenzae*	*Haemophilus parainfluenzae*	*Haemophilus parainfluenzae* *Candida albicans*
Gargle	*Staphylococcus aureus* *Haemophilus parainfluenzae* *Candida albicans*	*Haemophilus parainfluenzae* *Haemophilus parahaemolyticus*	*Haemophilus parainfluenzae* *Candida albicans*
Urine	*Haemophilus parainfluenzae* *Haemophilus parahaemolyticus*	*Haemophilus species*	-
Feces	*Candida albicans*	*Streptococcus species* (β, Not Group A)	*Candida albicans*

- = No medically important organisms found on this site.

TABLE XXXIV.- QUANTITATION OF AEROBIC BACTERIA FROM 16-DAY POSTFLIGHT SPECIMEN FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	AGLE	URINE	FECES
Bacillus species	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^4$
	B	+++	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$9x10^4$
Bacillus species 1040	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	+++	-	-	-	-
Corynebacterium species	A	-	-	-	-	-	$8x10^1$	-	-	$3x10^3$	10^6	-	-
	B	-	-	-	-	-	-	-	-	-	10^5	-	-
	C	-	-	-	-	-	$3x10^1$	$4x10^1$	-	-	10^5	-	$3x10^4$
Corynebacterium species 2	A	-	-	-	$3x10^1$	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	$1x10^4$	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 7	A	-	-	-	-	-	-	-	$4x10^3$	$2x10^3$	10^5	-	-
	B	-	-	-	-	-	-	-	$1x10^4$	$5x10^3$	10^4	-	-
	C	-	-	-	-	-	-	-	$1x10^4$	$4x10^2$	-	-	-
Corynebacterium species 18	A	$1x10^2$	-	-	-	$3x10^4$	-	-	-	-	-	-	-
	B	-	-	-	$1x10^1$	-	$4x10^3$	-	-	-	-	-	$2x10^5$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 21	A	-	-	-	-	$1x10^1$	-	-	-	-	-	-	-
	B	-	-	-	$1x10^1$	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	10^5	-	-
Corynebacterium species 25	A	+++	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species 33	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	$1x10^1$	-	$1x10^2$	-	$2x10^2$	-	-	-	-
	C	-	-	-	-	$1x10^3$	$4x10^1$	-	-	-	-	-	-
Corynebacterium species Group III	A	-	-	-	-	-	-	-	$4x10^3$	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium species Group VII	A	-	-	-	-	-	-	-	$3x10^3$	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Corynebacterium bovis	A	-	$2x10^5$	-	-	-	-	$7x10^2$	-	-	-	$?x10^1$	-
	B	-	$5x10^4$	-	$5x10^2$	$4x10^1$	$5x10^5$	$4x10^4$	-	-	-	-	-
	C	-	$2x10^4$	-	-	-	$1x10^4$	-	$8x10^2$	-	-	$4x10^2$	-
Corynebacterium hofmanni	A	-	-	-	-	-	$2x10^4$	-	$2x10^2$	-	-	-	-
	B	-	-	-	-	-	-	-	$3x10^1$	-	-	-	-
	C	-	-	-	-	-	-	-	$3x10^1$	-	-	-	-
Corynebacterium striatum	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	$3x10^2$	-	-	-
Escherichia coli	A	-	-	-	-	-	-	-	-	-	-	-	$7x10^5$
	B	-	-	-	-	-	-	-	-	-	-	-	$3x10^7$
	C	-	-	-	-	-	-	-	-	-	-	-	$3x10^4$
Escherichia intermedia	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^4$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$3x10^4$
Gaffkya species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	$1x10^2$	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Gaffkya tetragena	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$<10^1$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces
† = Astronauts A,B, or C
+++ = Microorganisms present but not quantitated

TABLE XXXIV.- QUANTITATION OF AEROBIC BACTERIA FROM 16-DAY POSTFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Continued

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Haemophilus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	$2x10^1$	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Haemophilus haemolyticus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	$6x10^1$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Haemophilus parahaemolyticus	A	-	-	-	-	-	-	-	-	-	-	$9x10^1$	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Haemophilus parainfluenzae	A	-	-	-	-	-	-	-	-	$2x10^3$	$2x10^6$	$6x10^1$	-
	B	-	-	-	-	-	-	-	-	$9x10^2$	$1x10^5$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^1$	$4x10^4$	-	-
Herellea vaginicola	A	-	-	-	-	-	-	+++	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Klebsiella pneumoniae	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	$2x10^1$	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus species	A	-	-	-	-	-	-	-	-	-	$2x10^4$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	$1x10^1$	-	-	-
Lactobacillus delbrueckii	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	$1x10^2$	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus fermenti	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$6x10^3$	-	-
Lactobacillus lactis	A	-	-	-	-	-	-	-	-	$6x10^3$	-	-	-
	B	-	-	-	-	-	-	-	-	$1x10^1$	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Lactobacillus leichmanni	A	-	-	-	-	-	-	-	-	$2x10^1$	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	+++	-	-	-	-	-	-	-	-	-
Micrococcus species 5	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	+++	-	-	-	-	-
Micrococcus species 8	A	-	-	-	-	-	-	-	-	-	$2x10^5$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 10	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	$2x10^2$	-	-	-	-	-
Micrococcus species 17	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	$2x10^3$	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 19	A	-	-	-	-	$1x10^1$	$3x10^2$	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	$2x10^3$	$1x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Micrococcus species 20	A	-	$1x10^3$	-	-	-	-	-	-	-	-	-	-
	B	-	$3x10^2$	-	-	-	-	-	-	-	-	-	-
	C	-	$6x10^3$	-	-	-	-	-	-	-	-	-	-

* Organisms per milliliter of broth or gram of feces
† = Astronauts A, B or C
+++ = Microorganisms present but not quantitated

TABLE XXXIV.- QUANTITATION OF AEROBIC BACTERIA FROM 16-DAY POSTFLIGHT SPECIMENS F M

SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GAR	E	URINE	FECES
Micrococcus species 26	A	-	$3x10^4$	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	$1x10^1$	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Neisseria perflava	A	-	-	-	-	-	-	-	-	$5x10^3$	2x1		-	-
	B	-	-	-	-	-	-	-	-	$1x10^4$	8x1		-	-
	C	-	-	-	-	-	-	-	-	$2x10^1$	1x1		-	-
Neisseria sicca	A	-	-	-	-	-	-	-	-	-	7x1		-	-
	B	-	-	-	-	-	-	-	-	$1x10^3$	1x1		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Paracolobacterium intermedium	A	-	-	-	-	-	-	-	$3x10^3$	-	-		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Proteus mirabilis	A	-	-	-	-	-	-	-	+++	-	-		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Rothia dentocariosa	A	-	-	-	-	-	-	-	-	+++	-		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Sarcina lutea	A	-	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	+++	-	-		-	-
Staphylococcus aureus	A	-	-	-	-	-	+++	-	$2x10^3$	-	7x1	1	-	-
	B	-	-	-	-	-	-	-	$1x10^2$	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-
Staphylococcus epidermidis	A	$3x10^2$	$1x10^3$	+++	-	-	$2x10^2$	$6x10^4$	$8x10^3$	-	3x	1	-	-
	B	$1x10^2$	+++	+++	+++	$6x10^1$	$2x10^3$	$3x10^2$	$3x10^1$	$2x10^3$	-	2	$1x10^1$	-
	C	$3x10^2$	-	-	$2x10^1$	$3x10^3$	$2x10^2$	-	$8x10^1$	-	1x		$1x10^1$	-
Streptococcus species (α hem.)	A	-	-	-	-	$2x10^2$	-	-	-	-	-	3	-	-
	B	-	-	-	-	-	-	-	-	-	2x		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	$7x10^4$
Streptococcus species (β hem.)	A	-	-	-	-	+++	+++	+++	-	-	-		-	-
	B	-	-	-	-	-	$3x10^1$	-	-	-	-		-	$5x10^6$
	C	-	-	-	-	-	-	-	-	-	-		-	-
Streptococcus species (γ hem.)	A	-	-	-	-	-	-	-	-	$4x10^3$	-		-	-
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	$3x10^3$	-		-	-
Streptococcus fecalis	A	-	-	-	-	-	-	-	-	-			-	$2x10^8$
	B	-	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	$1x10^5$
Streptococcus mitis	A	-	-	+++	+++	-	-	-	-	$1x10^4$	8x		$3x10^1$	-
	B	-	-	-	-	-	-	-	-	$1x10^3$	3x		-	$1x10^5$
	C	-	-	-	-	$7x10^2$	-	-	-	$6x10^3$	2x		-	$6x10^5$
Streptococcus salivarius	A	-	-	+++	$1x10^1$	-	-	-	-	$3x10^3$	3x		-	$3x10^4$
	B	-	-	-	-	-	-	-	-	$4x10^3$	7x		-	+++
	C	-	-	-	-	-	-	-	-	$1x10^3$	3x		-	$3x10^4$
Streptomyces species	A	-	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-	++		-	-
	C	-	-	-	-	-	-	-	-	-	-		-	-

* Organisms per milliliter of broth or gram of feces
† = Astronauts A,B or C
+++ = Microorganisms present but not quantitated

TABLE XXXV.- QUANTITATION OF ANAEROBIC BACTERIA FROM 16-DAY POSTFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Bacteroides capillosus	A	-	-	-	-	-	-	-	-	-	$1x10^5$	-	-
	B	-	-	-	-	-	-	-	-	-	$7x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
B.clostridiiformis ss.*clostridiiformis*	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Bacteroides coagulans	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	$1x10^4$	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides corrodens	A	-	-	-	-	-	-	-	-	-	$3x10^5$	-	-
	B	-	-	-	-	-	-	-	-	$7x10^4$	$1x10^3$	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Bacteroides fragilis	A	-	-	-	-	-	-	-	-	-	-	-	$2x10^9$
	B	-	-	-	-	-	-	-	-	-	-	-	$2x10^9$
	C	-	-	-	-	-	-	-	-	-	-	-	$6x10^7$
B. fragilis ss. *fragilis*	A	-	-	-	-	-	-	-	-	-	-	-	$5x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
B. fragilis ss. *thetaiotaomicron*	A	-	-	-	-	-	-	-	-	-	-	-	$3x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	$2x10^9$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides furcosus	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
B.melaninogenicus ss.*asaccharolyticus*	A	-	-	-	-	-	-	-	-	-	$1x10^5$	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	$1x10^5$	-	-
Bacteroides putredinis	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$5x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Bacteroides pneumosintes	A	-	-	-	-	-	-	-	-	$1x10^5$	$1x10^5$	-	-
	B	-	-	-	-	-	-	-	-	$1x10^4$	$3x10^4$	-	-
	C	-	-	-	-	-	-	-	-	$1x10^4$	$1x10^4$	-	-
Bifidobacterium adolescentis	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
Clostridium perfringens	A	-	-	-	-	-	-	-	-	-	-	-	+++
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Corynebacterium acnes	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	$1x10^4$	-	-	-	-	-	-
Corynebacterium pyogenes	A	-	-	-	-	-	-	-	$1x10^4$	-	-	-	-
	B	-	-	-	-	-	-	-	$1x10^4$	-	-	-	-
	C	-	-	-	-	-	-	-	$1x10^4$	-	-	-	-
Eubacterium cylindroides	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
	C	-	-	-	-	-	-	-	-	-	-	-	-
Eubacterium biforme	A	-	-	-	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	+++
Eubacterium rectale	A	-	-	-	-	-	-	-	-	-	-	-	$1x10^8$
	B	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-

* [illegible]
= Astronaut A, B, or C
+++ = [illegible]

TABLE XXXV.- QUANTITATION OF ANAEROBIC BACTERIA FROM 16-DAY POSTFLIGHT SPECIMENS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C - Concluded

SPECIES	†	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GENITAL	URINE	FECES
Fusobacterium species	A	-	-	-	-	-	-	-	-	$1x10^3$	.	-	-
	B	-	-	-	-	-	-	-	-	-	.	-	-
	C	-	-	-	-	-	-	-	-	-	.	-	-
Fusobacterium fusiforme	A	-	-	-	-	-	-	-	-	$1x10^2$	$2x10^4$	-	-
	B	-	-	-	-	-	-	-	-	+++	$8x10^3$	-	-
	C	-	-	-	-	-	-	-	-	-	$4x10^2$	-	-
Fusobacterium nucleatum	A	-	-	-	-	-	-	-	-	$1x10^3$	.	-	-
	B	-	-	-	-	-	-	-	-	-	$2x10^4$	-	-
	C	-	-	-	-	-	-	-	-	-	$8x10^4$	-	-
Lactobacillus catenaforme	A	-	-	-	-	-	-	-	-	-	$4x10^3$	-	-
	B	-	-	-	-	-	-	-	-	-	$2x10^3$	-	-
	C	-	-	-	-	-	-	-	-	-	.	-	-
Lactobacillus discoformans	A	-	-	-	-	-	-	-	-	$1x10^1$	.	-	-
	B	-	-	-	-	-	-	-	-	-	.	-	-
	C	-	-	-	-	-	-	-	-	-	.	-	-
Leptotrichia species	A	-	-	-	-	-	-	-	-	$2x10^1$	.	-	-
	B	-	-	-	-	-	-	-	-	$3x10^2$	.	-	-
	C	-	-	-	-	-	-	-	-	$1x10^3$	.	-	-
Leptotrichia buccalis	A	-	-	-	-	-	-	-	-	$5x10^1$	.	-	-
	B	-	-	-	-	-	-	-	-	$2x10^4$	.	-	-
	C	-	-	-	-	-	-	-	-	$2x10^2$	.	-	-
Peptococcus species	A	-	-	-	-	-	-	-	-	-	.	-	-
	B	-	-	-	$6x10^1$	-	-	-	-	$4x10^4$	.	-	-
	C	-	-	-	-	-	-	-	-	-	.	-	-
Peptococcus prevotii	A	-	-	-	-	$1x10^2$	-	-	-	-	.	-	-
	B	-	-	-	-	-	-	-	-	-	.	-	$1x10^8$
	C	-	-	-	-	-	-	-	-	-	.	-	-
Peptostreptococcus anaerobius	A	-	-	-	-	-	-	-	-	-		-	$2x10^9$
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Peptostreptococcus species	A	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	$1x10^2$	-	-	-	-		-	-
Peptostreptococcus intermedius	A	-	-	-	-	-	-	-	-	-		$1x10^2$	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Peptostreptococcus magnus	A	-	-	-	-	-	-	-	$4x10^1$	-		+++	-
	B	-	-	-	-	-	-	-	$3x10^1$	-	$7x10^4$	-	$1x10^8$
	C	-	-	-	-	-	-	-	-	-		-	-
Propionibacterium acnes	A	-	$2x10^3$	$1x10^2$	-	$1x10^2$	-	-	$9x10^1$	-	$1x10^5$	-	-
	B	$1x10^1$	$2x10^4$	+++	-	-	$6x10^3$	-	$3x10^2$	-		-	$2x10^9$
	C	-	-	+++	$3x10^1$	-	$4x10^2$	-	$1x10^3$	-		-	-
Propionibacterium granulosum	A	-	-	-	-	-	-	-	$3x10^1$	-		-	-
	B	-	-	-	-	-	-	-	$1x10^2$	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Propionibacterium magnus	A	-	-	-	-	-	-	-	$4x10^1$	-		-	-
	B	-	-	-	-	-	-	-	-	-		-	-
	C	-	-	-	-	-	-	-	-	-		-	-
Veillonella alcalescens	A	-	-	-	-	-	-	-	-	-		-	-
	B	-	-	-	-	-	-	-	-	$3x10^4$	$1x10^5$	-	-
	C	-	-	-	-	-	-	-	-	-	$2x10^5$	-	-
Veillonella parvula	A	-	-	-	-	-	-	-	-	$9x10^3$	$3x10^5$	-	-
	B	-	-	-	-	-	-	-	-	-	$4x10^5$	-	-
	C	-	-	-	-	-	-	-	-	$7x10^3$	-	-	$3x10^8$
Unidentified**	A	-	-	-	+++	-	-	-	-	$8x10^2$	$1x10^4$	$2x10^1$	$1x10^8$
	B	-	-	-	$1x10^1$	$4x10^3$	-	-	$2x10^2$	$4x10^4$	$2x10^3$	-	$8x10^8$
	C	$7x10^2$	-	-	-	$4x10^2$	-	-	-	$2x10^3$	$1x10^3$	-	$8x10^8$

* Organisms per milliliter of broth or gram of feces
† = Astronauts A,B, or C
+++ = Microorganisms present but not quantitated
** Microorganisms not suitable for determinative studies

TABLE XXXVI.- FUNGI FROM 16-DAY POSTFLIGHT SAMPLINGS FROM SOURCE MATERIAL OF ASTRONAUTS A, B, AND C

	SCALP	EAR	AXILLA	HAND	NAVEL	GROIN	TOES	NARES	THROAT	GARGLE	URINE	FECES
Alternaria species	-	-	-	-	-	-	-	-	-	C	-	-
Aspergillus amsteladomi	C	-	-	-	-	-	-	-	-	-	-	-
Aspergillus ruber	-	-	-	-	-	-	A	-	-	-	-	-
Aspergillus unguis	-	-	-	-	-	-	B	-	-	-	-	-
*Candida albicans**	-	-	-	-	-	-	-	-	C	A,C	-	C
Cephaloascus fragrans	-	-	-	-	-	-	-	-	-	-	C	-
Cladosporium cladosporioides	-	-	-	-	C	-	-	-	C	B	-	-
Cladosporium elatum	-	C	-	-	-	-	-	B	-	-	-	A
Cladosporium herbarum	-	-	-	-	B	-	-	-	B,C	B	A	B
Cladosporium macrocarpum	-	-	-	-	-	-	A,B	-	A,B,C	B	-	A
Coniothyrium species	B	-	-	-	-	-	-	-	-	-	-	-
Dematiaceous fungus	-	-	-	B	-	-	-	-	-	-	-	-
Filamentous fungus	-	-	-	-	-	-	-	-	C	-	-	-
Fusarium species	-	-	-	-	-	-	-	-	-	B	-	-
Geotrichum species	-	-	A	-	-	A	-	-	-	-	-	-
Kabatiella species	-	-	-	-	-	-	-	-	C	-	-	-
Oidiodendron species	-	-	-	-	-	-	-	-	A,B,C	-	-	B
Paecilomyces ochroceus	-	-	A	-	-	-	-	-	-	-	-	-
Penicillium chrysogenum	-	-	-	-	-	-	-	-	-	-	-	-
Penicillium duclauxi	-	-	-	-	-	-	-	-	-	-	-	A
Penicillium italicum	-	-	-	-	-	-	-	-	-	-	-	A
Penicillium notatum	-	-	-	-	-	-	B	-	-	-	-	A
Periconia species	-	-	-	B	-	-	-	-	-	-	-	-
Scolecobasidium varriculosum	C	-	-	-	-	-	-	-	-	-	-	-
Sterile mycelium	-	-	-	-	-	A	-	-	A,B	A,C	-	A,C
Tilletiopsis species	-	-	-	-	-	-	-	-	-	B	-	-

* = Yeast (all others filamentous fungi)
- = Absent

TABLE XXXVII.- MICROORGANISMS OF POSSIBLE MEDICAL IMPORTANCE ISOLATED FROM MQF PERSONNEL

Sample Area	Engineer		Flight Surgeon	
	Preisolation	Postisolation	Preisolation	Postisolation
Throat Swab	*Haemophilus parainfluenzae* *Staphylococcus aureus*	*Haemophilus parainfluenzae*	*Haemophilus parainfluenzae* *Staphylococcus aureus*	*Haemophilus parahaemolyticus*
Gargle	*Haemophilus parainfluenzae*	*Haemophilus parainfluenzae*	*Staphylococcus aureus*	*Haemophilus parainfluenzae* *Staphylococcus aureus*
Nares	*Staphylococcus aureus*	*Staphylococcus aureus*	*Staphylococcus aureus*	-
Urine	*Staphylococcus aureus*	-	*Herellea vaginicola*	-
Feces	-	-	*Pseudomonas species*	-

TABLE XXXVIII.- APOLLO 14 POSTFLIGHT STAPHYLOCOCCUS AUREUS

PHAGE TYPES

Subject	Sample Area	Phage Type* Prequarantine	Postquarantine
Astronaut A	Nares	I/II/III/29/79/55/85/53/54	-
	Nares	III/85	III/85
	Gargle	III/85	III/85
Astronaut B	Nares	Non-typable	III/85
	Glove	III/6	III/6
Astronaut C	Nares	Non-typable	Non-typable
MQF	Throat	III/53/77	-
Engineer	Nares	III/53/77	III/47/53/77
	Urine	III/53/77	-
MQF	Throat	Non-typable	-
Flight	Gargle	Non-typable	Non-typable
Surgeon	Nares	Non-typable	-
CRA No. 1	Throat	III/85/75	III/47/54/75
CRA No. 2	Nares	Not typed	-
CRA No. 3	Nares	Non-typable	II/71
	Throat	-	II/71
CRA No. 4	Nares	III/53/81/77/47	III/53
	Throat	-	III/53
CRA No. 5	Nares	-	Non-typable

*Types evaluated at routine test dilution

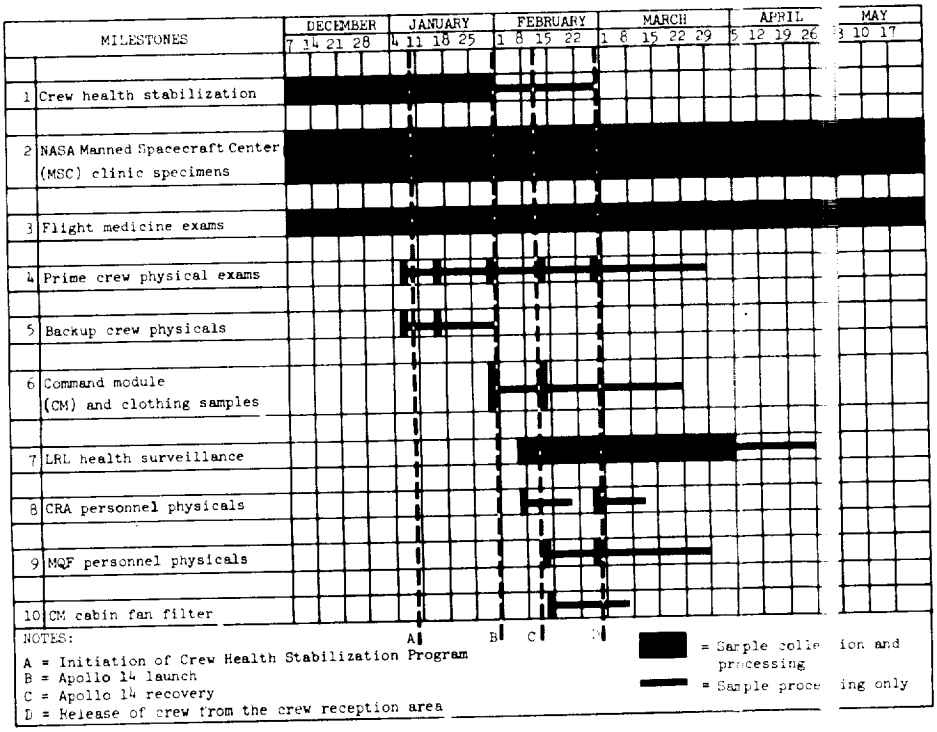


Figure 1. - Apollo 14 microbiology milestone for major activities.

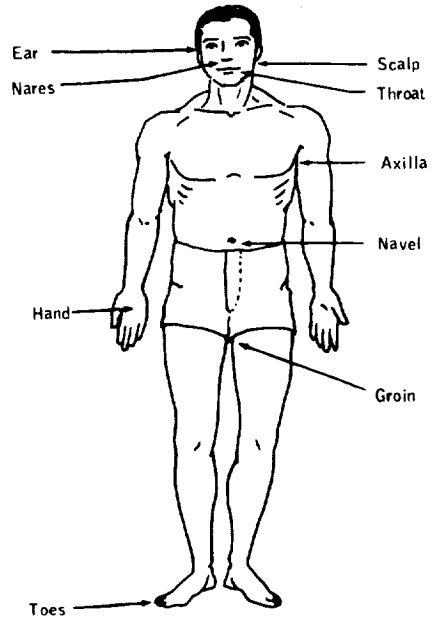


Figure 2. - Swab sampling areas.

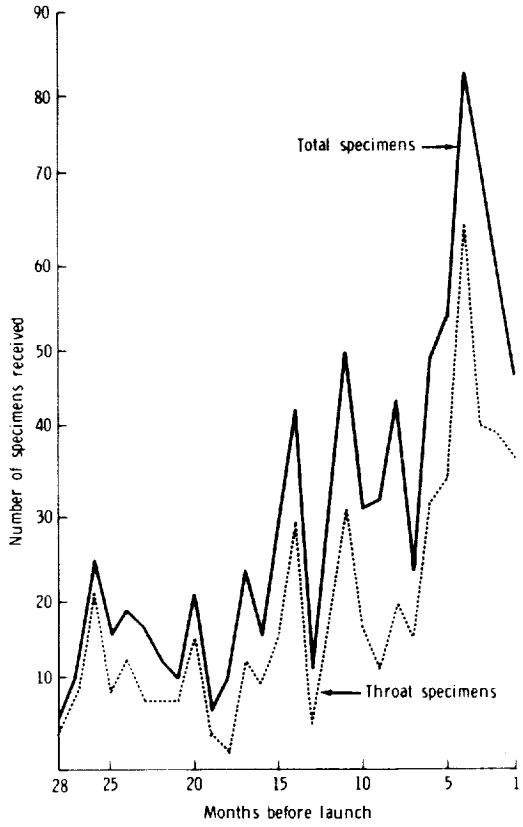


Figure 3. - Monthly occurrence of specimens received from the MSC dispensary for culturing, identification, and antibiotic sensitivity testing.

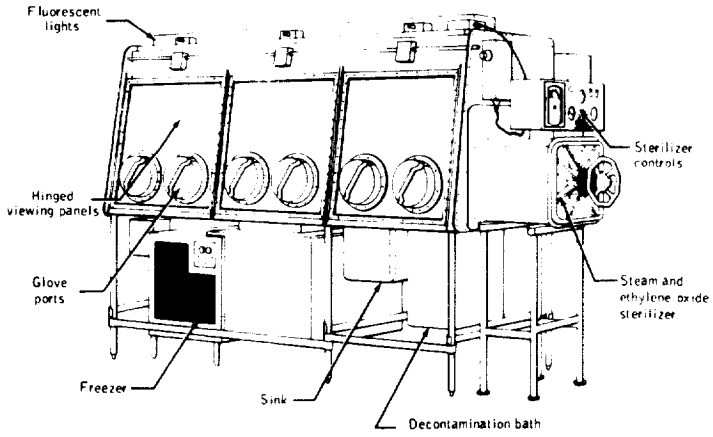
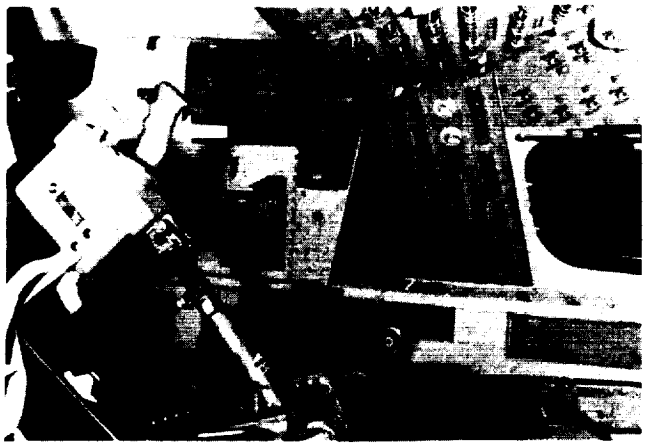
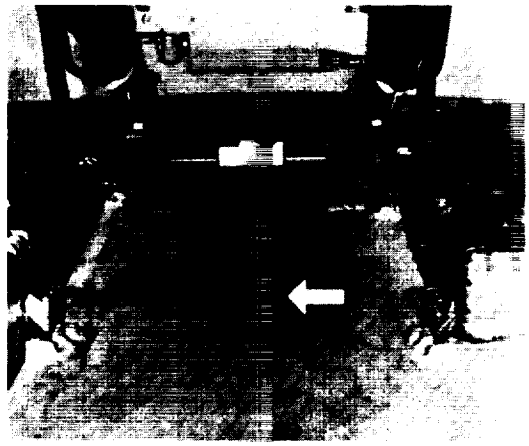


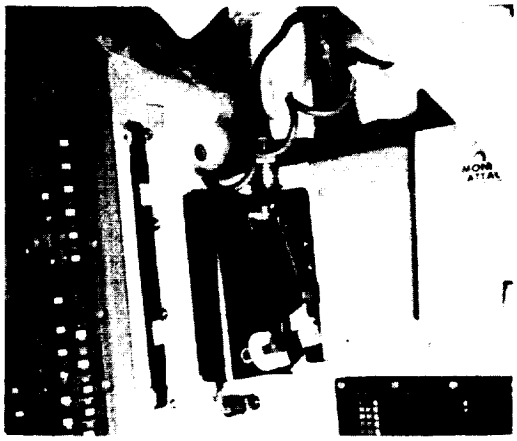
Figure 4. - Biological cabinetry.



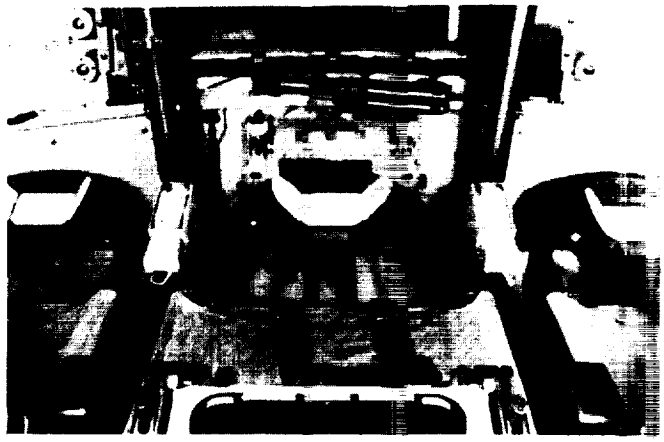
(a) Rotational hand controller.



(b) Floor.



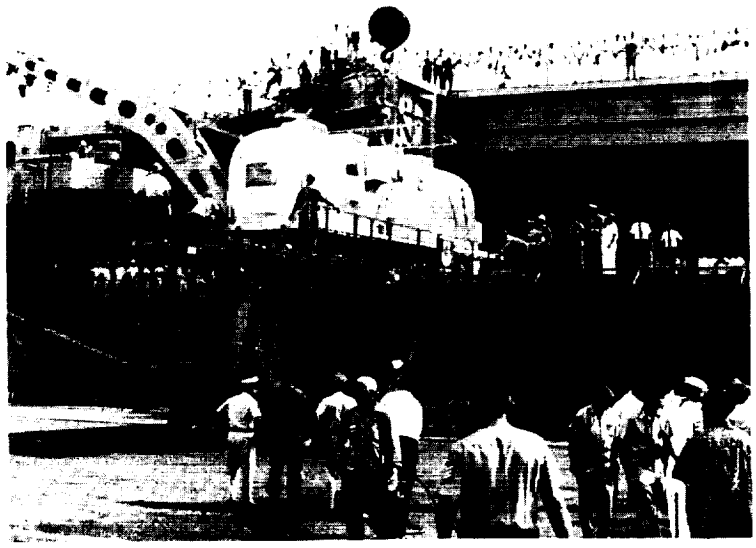
(c) Drink gun.



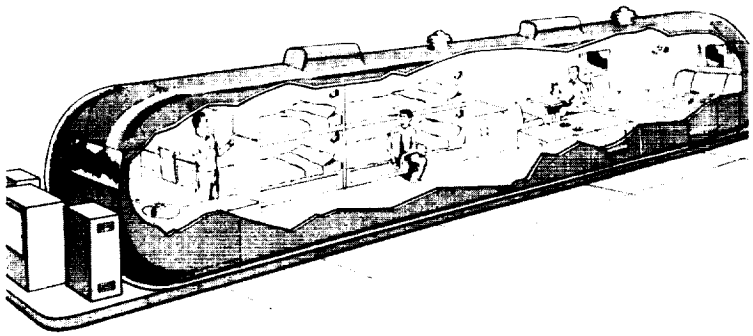
(d) Headstrut.

Figure 5. - Sampling sites and command module hardware.

Figure 6. - Cabin fan filter in stowage area.

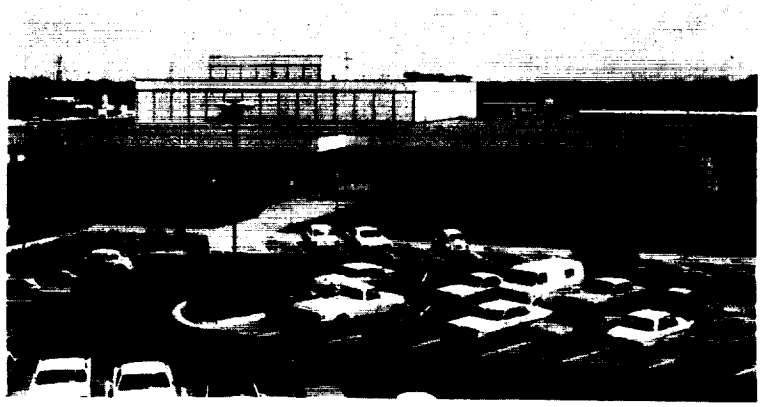


(a) Being loaded aboard a carrier.

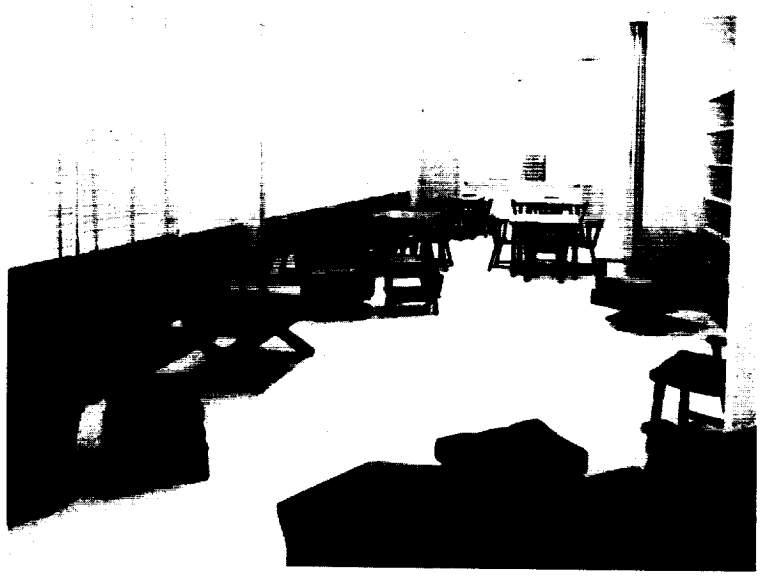


(b) Cutaway view.

Figure 7. - A mobile quarantine facility.



(a) Exterior view.



(b) Lounge and dining area of the crew reception area.

Figure 8. - The Lunar Receiving Laboratory.

APPENDIX A

INTEGRATED CREW MICROBIOLOGY PROTOCOLS

SCOPE

Samples were obtained from specified sample areas of the three prime crewmembers, their extravehicular activity clothing, and the interior of the command module. The samples were assayed for their microbial content, with each of the resulting microbial isolates being identified to species and quantitated where applicable.

SAMPLE COLLECTION

As shown in table A-I, 12 areas were sampled from each astronaut during each of the five collection periods. Two calcium alginate swabs that were wet in phosphate buffer were used to sample the nostrils and each external body surface area. One of each pair of swabs was placed in trypticase soy broth (TSB) that served as the sample transport medium preceding aerobic identification and quantitation. The other member of the pair of swabs was placed in veal infusion broth (VIB) for sample transport preceding anaerobic identification and quantitation. All specimens were maintained at 277° K (4° C) for 10 hours before processing in order to eliminate the time differential resulting from different times that were required to transport the specimens from the collection facility to the NASA Manned Spacecraft Center. The only exception to this was the immediate postflight sample, which was processed 60 hours after collection. All specimens obtained at other collection facilities were packaged within cooled microbial sample return containers for transport to the Lunar Receiving Laboratory (LRL) where they were analyzed.

SAMPLE PROCESSING

The general outline followed for analysis of all samples is illustrated in figure A-1. The various samples were diluted to the extent dictated by the normal microbial load of the area sampled. Dilutions that were used are outlined in table A-II. Trypticase soy broth was the diluent used for identification of aerobic microorganisms and VIB was the diluent used for identification of anaerobic microorganisms.

The TSB sample and dilution tubes were incubated at 308° K (35° C) for 24 hours. All of the TSB samples and dilutions were quantitated to blood agar (BA). In addition, more specialized aerobic quantitative media were used, as shown in table A-III.

The VIB sample and dilution tubes were incubated at 308° K (35° C) for 96 hours. All of the VIB samples and dilutions were quantitated to blood agar with vitamin K and hemin. In addition, other more specialized anaerobic quantitative media were used as shown in table A-IV.

After incubation at 308° K (35° C) for 48 or 96 hours, colony counts of the inoculated quantitative agar were made. The remainder of the materials in the sample and dilution tubes was incubated at 308° K (35° C) for 24 hours. This was followed by the transfer, with the aid of an inoculating loop, of aliquots of the TSB or VIB sample and dilution tubes to selected aerobic and anaerobic isolation media, respectively. At this time, one loopful of tetrathionate culture was used to inoculate Salmonella-Shigella agar (SS), as appropriate.

The isolation streak was used in an attempt to recover microorganisms that may have been present in such low numbers that they would not appear on the quantitation media at the dilutions used. After streaking or after inoculation, the isolation media plates and tubes were incubated at 308° K (35° C) for either 48 or 96 hours, under aerobic or anaerobic conditions. All resulting colonies that were different from those isolated previously on quantitation media were subsequently identified to species by appropriate protocols.

Isolated colonies were picked to TSB (for aerobic isolates) or thioglycolate broth (for anaerobic isolates). These broth tubes were incubated at 308° K (35° C) until turbid. The pure cultures from these tubes were used for staining procedures and inoculation of biochemical media. All material remaining in the sample and dilution tubes after completion of each of these procedures was stored at 277° K (4° C) for 1 week. The two additional tests that were conducted on each stool specimen were as follows.

1. A formalin-ether preparation was made from a small portion of each stool sample for identification of ova, cysts, and other parasitic forms.

2. An unweighed portion of each stool sample was placed in 10.0 cubic centimeters of thioglycolate broth and heated at 353° K (80° C) for 15 minutes. This heat-shock procedure was used to kill vegetative cells and to stimulate spore germination, making possible the isolation of spore forming bacteria after 24 hours of incubation at 308° K (35° C).

Portions of the TSB sample and dilution tubes were removed for mycological analyses that were initiated after collection. Measured aliquots of each sample and dilution tube were removed and streaked to specified mycological agar media, and then were incubated at 298° K (25° C) for 120 hours. Other aliquots of the diluted and undiluted TSB sample broth were centrifuged at 5000 rpm (12 000g) for 15 minutes; the supernatant in the centrifuge tube was added to the broth phase and the sediment used to streak agar plates containing isolation media and antibiotics. The plates and tubes were incubated at 298° K (25° C) for 120 to 144 hours. All resulting colonies that were different from those isolated in the original plates were picked from the agar surface and grouped according to the identification scheme for fungi presented in figures A-2(a), A-2(b), and A-2(c). All isolates were subsequently identified to species by appropriate protocols.

SAMPLE PROCESSING

External Body Swabs

Two calcium alginate swabs dampened with phosphate buffer were used to sample each of the designated areas: scalp, ears, axillae, navel, groin, toes, and hands (table A-I and fig. 2). One swab was placed into a screwcap tube containing 15.0 cubic centimeters of sterile trypticase soy broth. The second swab was placed into a screwcap tube containing 15.0 cubic centimeters of sterile veal infusion broth. The broth tubes were maintained at 277° K (4° C) during transport to the Lunar Receiving Laboratory, where they were kept at the same temperature with the aid of an ice bath during dilution procedures.

Nasal Passages and Throat Swabs

Each nostril of each crewmember was sampled with two separate swabs that had been previously wet with phosphate buffer. One swab was placed into a screwcap tube containing 5.0 cubic centimeters of sterile TSB. The second swab was placed into a screwcap tube containing 5.0 cubic centimeters of sterile VIB. The broth tubes were maintained at 277° K (4° C) during transportation to the LRL and during dilution procedures. Processing was initiated 10 hours after collection.

The surfaces of the tonsils and the posterior pharyngeal vault were sampled with each of two dry calcium alginate swabs. One swab was placed into a screwcap tube containing 5.0 cubic centimeters of sterile TSB. The second swab was placed into a screwcap tube containing 5.0 cubic centimeters of sterile VIB. The broth tubes were maintained at 277° K (4° C) during transportation to the LRL and during dilution procedures. Processing was initiated 10 hours after collection.

Aerobic bacteria isolation scheme used with nasal and throat swabs (fig. A-3) Serial dilutions were made on all TSB sample tubes used for aerobic identification and quantitation. The tubes were vortexed for 5 seconds and then immersed in an ice bath and maintained at 277° K (4° C) during the dilution process. Serial dilutions were prepared by transferring a 1.0-cubic-centimeter aliquot of each new dilution of 9.0 cubic centimeters of sterile TSB, with 10^0 and 10^1 representing the undiluted sample tube and the first dilution after the sample tube, respectively. The nasal passage and throat swab samples were diluted serially through 10^4 with TSB (table A-II). One-tenth cubic centimeter was transferred aseptically from each sample and dilution tube to aerobic quantitative media (that is, blood agar and Staphylococcus-110 agar) and spread on the agar plate with a glass rod. The plates were incubated at 308° K (35° C) for 48 hours. Colony counts were made after incubation.

After the aerobic quantitative agar media had been plated, 4 cubic centimeters from each TSB sample tube and dilution tubes 10^1 to 10^3 were transferred to a labeled sterile screwcap tube for mycological analysis. Then, the materials remaining in the TSB sample and dilution tubes were incubated at 308° K (35° C) for 24 hours. After incubation, a loop was used to transfer culture from each sample tube to each of four

isolation media (fig. A-3): blood agar, Staphylococcus-110 agar, MacConkey agar, and chocolate agar. The streaked isolation media were incubated at 308° K (35° C) for 48 hours under an appropriate atmosphere. Chocolate agar medium was incubated in an 8- to 10-percent concentration of carbon dioxide (CO_2) gas in air. All resulting colonies that were different from those isolated previously were identified subsequently by appropriate protocols. After the nasal passage and throat swab sample tubes were used for quantitation and isolation, they were stored at 277° K (4° C) for 1 week.

Anaerobic bacteria isolation scheme used with nasal and throat swabs (fig. A-3): Serial dilutions were made on all VIB sample tubes used for anaerobic identification and quantitation. The tubes first were vortexed for 5 seconds and then immersed in an ice bath and maintained at 277° K (4° C) during the dilution process. Serial dilutions were made with VIB in the same fashion as that described for aerobic dilution, with the dilution carried through 10^4 (table A-II). The anaerobic quantitative media (fig. A-3) used included blood agar with vitamin K and hemin, Paromomycin-Vancomycin-Menadione (PVM) agar (only 10^0 and 10^1 dilutions were used with PVM), and Rogosa agar at 308° K (35° C) for 96 hours under an atmosphere of hydrogen. Colony counts were made after incubation.

The materials remaining in the VIB sample and dilution tubes were incubated at 308° K (35° C) for 24 hours. After incubation, a loop was used to transfer culture from each sample tube to each of three isolation media: blood agar with vitamin K and hemin, PVM, and Rogosa agar. The streaked isolation media were incubated at 308° K (35° C) for 96 hours under an atmosphere of hydrogen. All resulting colonies that were different from those isolated previously were identified by appropriate protocols. After the materials from the nasal sample and throat swab tubes had been used for quantitation and isolation, they were stored at 277° K (4° C) for 1 week.

Mycology isolation scheme used with nasal and throat swabs: Four cubic centimeters from each 10^1 TSB dilution tube were transferred aseptically to a sterile centrifuge tube and centrifuged at 5000 rpm (12 000g) for 15 minutes. The supernatant from each centrifuge tube was poured into individual tubes containing 10 cubic centimeters yeast-malt broth plus antibiotics (YMB+). A separate swab was used to sample the bottom of each centrifuge tube and to streak corn meal-malt-yeast extract agar plus antibiotics (CMMYA+), Sabouraud's dextrose agar plus antibiotics (SAB+), and Czapek-Dox agar (CD) isolation media. The swab then was broken off in a tube containing 10 cubic centimeters YMB+. The streaked plates and two YMB+ tubes were incubated at 298° K (25° C) for 120 hours.

Gargle Sample Processing

Each crewmember gargled with 60.0 cubic centimeters of phosphate buffer. The gargle was rinsed through the oral cavity three times and then collected in a wide-mouth bottle. The wash containers were maintained at 277° K (4° C) during transportation to the LRL and during dilution procedures. Processing, as indicated in figure A-4, was initiated 10 hours after collection.

Aerobic isolation scheme used with gargle samples (fig. A-4): Serial dilutions in the TSB (table A-II) for aerobic quantitation included gentle swirling of the gargle sample before transfer of the 1.0-cubic-centimeter aliquots to the 9.0 cubic centimeters of sterile TSB. The sample and dilution tubes were maintained in an ice bath at 277° (4° C) during the dilution procedures. Dilutions were made to include 10^5 dilution. One-tenth cubic centimeter of each sample and dilution tube was transferred to aerobic quantitative media and spread with a glass rod. The aerobic quantitative media (fig. A-4) for gargle sample included blood agar, Staphylococcus-110 agar, and Mitis Salivarius agar. The aerobic quantitative media were incubated at 308° K (35° C) for 48 hours. Colony counts were made after incubation.

Four cubic centimeters from each sample tube and TSB dilution tubes through 10^3 were transferred to individually labeled screwcap tubes for mycological analyses. After the aliquots had been removed for mycology, the remainder of the materials in the sample bottles and dilution tubes was incubated at 308° K (35° C) for 24 hours. The 10^1 TSB dilution tube was used to inoculate isolation media. The gargle sample isolation media included blood agar. Staphylococcus-110 agar, MacConkey agar, Fiddes enrichment agar (FEA), and chocolate agar. The streaked isolation media were incubated at 308° K (35° C) for 48 hours under an appropriate atmosphere. Chocolate agar medium was incubated under a concentration of 8 to 10 percent CO_2. After the gargle samples were used for isolation, the rest of the materials was incubated at 308° K (35° C) for 24 hours and stored for 1 week.

Anaerobic isolation scheme used with gargle samples (fig. A-4): Serial dilutions of gargle (table A-II) were made with VIB for anaerobic quantitation and included all dilutions through 10^5. The sample and dilution tubes were kept in an ice bath at 277° (4° C) during the dilution procedure. The gargle was swirled gently before the 1.0-cubic-centimeter aliquot of sample was transferred to the 9.0 cubic centimeters of VIB diluent. One-tenth-cubic-centimeter aliquots were transferred from each sample and dilution tube to anaerobic quantitative agar media and spread with a glass rod. The anaerobic quantitative media for the gargle sample were blood agar with vitamin K and hemin, Paromomycin-Vancomycin-Menadione agar, and Rogosa agar. The plates were incubated at 308° K (35° C) for 96 hours under an atmosphere of hydrogen gas. Colony counts were made after incubation.

The rest of the gargle sample and dilution materials was incubated at 308° K (35° C) for 24 hours and then used to make isolation streaks. A loop was used to transfer culture from each 10^1 dilution tube to the isolation medium. The isolation media were blood agar with vitamin K and hemin, Paromomycin-Vancomycin-Menadione agar, and Rogosa agar. The streaked isolation media were incubated at 308° K (35° C) for 96 hours under an appropriate atmosphere. After gargle samples had been used for quantitation and isolation, they were stored at 277° K (4° C) for 1 week.

Mycology isolation scheme used with gargle sample: One-tenth-cubic-centimeter aliquots of gargle samples were removed from the undiluted sample bottle and 10^1 to 10^3 dilution tubes and transferred to CMMYA+, SAB+, and CD for quantitation. The plates were spread with a glass rod and incubated at 298° K (25° C) for 120 hours.

Four cubic centimeters of the gargle samples each were transferred aseptically to a sterile centrifuge tube and centrifuged at 5000 rpm (12 000g) for 15 minutes. The supernatant from each centrifuge tube was poured into a separate tube containing 10 cubic centimeters YMB+. A swab was used to sample the bottom of each centrifuge tube and, subsequently, to streak each of three isolation agar media: CMMYA+, SAB+, and CD.

After the plates containing isolation media had been streaked, the swab was broken off into a second tube of YMB+. The streaked plates and two YMB+ tubes were incubated at 298° K (25° C) for 120 to 144 hours, at which time all colonies were picked from the CMMYA+, SAB+, and CD. At the end of the 120- to 144-hour incubation period, all YMB+ cultures were streaked to CMMYA+ and SAB+. These plates also were incubated at 298° K (25° C) for 120 to 144 hours.

Urine Sample Processing

From each crewmember, a 60-cubic-centimeter midstream urine specimen was collected in a sterile container. The urine was maintained at 277° K (4° C) during transportation to the LRL and during dilution procedures. Processing, as indicated in figure A-5, was initiated 10 hours after collection.

Aerobic isolation scheme used with urine specimens (fig. A-5): All urine samples used for aerobic identification and quantitation were diluted serially to 10^2 dilution with TSB (table A-II). The urine samples and dilution tubes were maintained in an ice bath at 277° K (4° C) during the dilution procedure. Before the 1.0-cubic-centimeter aliquots were removed for transfer, the tubes were swirled gently.

One-tenth cubic centimeter of each TSB sample and dilution tube was transferred to aerobic quantitative media (table A-III) and spread with a glass rod. The aerobic quantitative media included blood agar, Staphylococcus-110 agar, and MacConkey agar. These plates were incubated at 308° K (35° C) for 48 hours. Colony counting followed the incubation.

Four cubic centimeters from each sample and dilution tube were transferred to sterile screwcap tubes for mycological analyses. After mycological samples were removed, the remaining materials were incubated at 308° K (35° C) for 24 hours and then used for isolation streaking. A loop was used to transfer culture from each urine sample to the isolation medium. The isolation media for the urine samples included blood agar, Staphylococcus-110 agar, and MacConkey agar. The streaked isolation media were incubated at 308° K (35° C) for 48 hours and under an appropriate atmosphere. After urine samples had been used for quantitation and isolation, they were stored at 277° K (4° C) for 1 week.

Anaerobic isolation scheme used with urine specimens (fig. A-5): All urine samples used for anaerobic identification and quantitation were diluted serially with VIB. The urine sample and dilution tubes were maintained in an ice bath at 277° K (4° C) during the dilution procedure. The urine sample was swirled gently before the 1.0-cubic-centimeter aliquots were transferred to 9.0 cubic centimeters of VIB diluent. Dilutions were made to include 10^2.

One-tenth cubic centimeter was transferred from each urine ample and VIB dilution tube to the anaerobic quantitative agar medium and spread ith a glass rod The anaerobic quantitative media for urine samples included blood gar with vitami and hemin and Rogosa agar. These plates were incubated at 308° K (35° C) for 96 h under an atmosphere of hydrogen gas. Colony counts were made fo lowing incubati All of the remaining materials in the sample and dilution tubes wer incubated at 308° K (35° C) for 24 hours and then were used for isolation streak ig. A loop was used to transfer cultures from each urine sample to the isolation m dia, which incl blood agar with vitamin K and hemin and Rogosa agar. The isolati n media were i cubated at 308° K (35° C) for 96 hours and under an appropriate at osphere. Afte the urine samples had been used for quantitation and isolation, they were stored at 277° K (4° C) for 1 week.

Mycology isolation scheme used with urine samples: Four c ic centimeters the undiluted urine samples were transferred aseptically to a steril centrifuge tub centrifuged at 5000 rpm (12 000g) for 15 minutes. The supernatan was poured int 10 cubic centimeters YMB+, and a swab was used to sample the bot om of the centr fuge tube. The swab was used to streak each of three isolation me a: CMMYA+, and CD. The swab was broken off into a tube containing 10 cubic c itimeters of YM The streaked plates and the two YMB+ tubes were incubated at 298 K (25° C) for 120 hours.

Stool Sample Procedure

A stool sample was obtained from each crewmember and coll cted in a stool lection device. One-tenth-gram aliquots were taken from the cente of the fecal sp mens, weighed, and diluted with 9.9 cubic centimeters of sterile T B for identificat of aerobic microorganisms or with 9.9 cubic centimeters of steril VIB for identific tion of anaerobic microorganisms (fig. A-6). These TSB and VIB ample tubes we vortexed for 30 seconds and diluted serially (table A-II) into dilutio tubes immers an ice bath and maintained at 277° K (4° C) during the dilution proc dures. Serial d lutions were prepared by transferring a 1.0-cubic-centimeter aliqu t of each new d tion to 9.0 cubic centimeters of sterile TSB or VIB, with 10^0 and 10^2 representing t undiluted sample and the first dilution after the sample tube, respe tively. The TSB lution range included 10^2 to 10^8; the VIB dilution range included 10^2 to 10^{10} (table A

In addition, specialized tests were conducted. An unweighed portion, taken f the center of the stool specimen, was placed in 9.0 cubic centimete s of tetrathion t broth. Another unweighed portion was placed in 10.0 cubic centim ters of thioglyc broth and heat shocked at 353° K (80° C) for 15 minutes to kill all vegetative cells to stimulate spore germination. This procedure provided data rel tive to the pres of bacterial spores in the sample. A formalin-ether preparation w s made of each stool sample for analysis for the presence of ova, cysts, or parasi es.

Aerobic isolation scheme used with stool samples (fig. A-6): One-tenth cub c centimeter taken from each of the 10^3 to 10^8 dilution tubes was tra sferred to aer b quantitative agar media (table A-III). These media included blood gar, MacConke y agar, and Mitis-Salivarius agar.

The agar was spread with an alcohol-flamed glass rod. The streaked aerobic quantitative agar plates were incubated at 308° K (35° C) for 48 hours. Colony counts were made following incubation.

Inoculated tetrathionate broth tubes were incubated at 308° K (35° C) for 24 hours. Four cubic centimeters, taken from each of the 10^2 to 10^5 TSB dilution tubes, were collected into sterile screwcap tubes, labeled, and transferred for mycological analysis.

After aliquots had been removed for mycological analysis, the rest of the TSB material remaining in the 10^2 dilution tube was incubated at 308° K (35° C) for 24 hours. After incubation, this material was used to streak isolation media. All remaining materials were stored at 277° K (4° C) for 1 week.

A loop was used to transfer stool culture to each of four isolation media: blood agar, MacConkey agar, Mitis-Salivarius agar, and Salmonella-Shigella agar (from tetrathionate preparation only). The streaked isolation agar plates were incubated at 308° K (35° C) for 48 hours.

Anaerobic isolation scheme used with stool specimens (fig. A-6): One-tenth cubic centimeter of each 10^3 to 10^8 VIB dilution tube was transferred to anaerobic Rogosa agar. One-tenth cubic centimeter from the 10^5 to 10^{10} VIB dilution tubes was transferred to anaerobic BA+ and PVM. The anaerobic quantitative agar media (table A-IV) included blood agar with vitamin K and hemin, Paromomycin-Vancomycin-Menadione agar, and Rogosa agar. The agar was spread with an alcohol-flamed glass rod, and these anaerobic quantitative agar plates were incubated at 308° K (35° C) for 96 hours under an atmosphere of hydrogen gas. Colony counts were made following the incubation period.

The material remaining in each 10^2 dilution tube was incubated at 308° K (35° C) for 24 hours. A loop was used to transfer culture from each of these tubes to isolation media. Four isolation media were used: blood agar with vitamin K and hemin, Paromomycin-Vanocomycin-Menadione agar, egg yolk agar, and Rogosa agar. The streaked isolation plates were incubated at 308° K (35° C) for 96 hours under an appropriate atmosphere. All resulting colonies that were different from those isolated previously were identified to species by appropriate protocols. All remaining materials in the TSB and VIB dilution tubes then were stored at 277° K (4° C) for 1 week.

The thioglycolate broth that had been heat shocked at 353° K (80° C) for 15 minutes was incubated for 24 hours at 310° K (37° C) after incubation isolation streaks were performed on SAB+ and egg yolk agar (EYA). These plates were incubated at 310° K (37° C) for 96 hours under anaerobic conditions. Any isolate not identified previously was picked and identified by appropriate protocols.

Mycology isolation scheme used with stool samples: One-tenth-cubic-centimeter aliquots from each 10^2 to 10^5 TSB stool dilution tubes were removed and transferred to each of three quantitative media: CMMYA+, SAB+, and CD. The plates were spread with a glass rod and incubated at 298° K (25° C) for 120 hours.

Four-cubic-centimeter aliquots from each 10^2 TSB stool dilution tube were transferred aseptically to an individual sterile centrifuge tube. These samples were centrifuged at 5000 rpm (12 000g) for 15 minutes. The supernatant was poured into tubes containing 10 cubic centimeters of YMB+. A separate swab was used to sample the bottom of each centrifuge tube and streak CMMYA+, SAB+, and CD isolation media. Then the swab was broken off in a second tube containing YMB+. The streaked plates and two YMB+ tubes were incubated at 298° K (25° C) for 120 hours.

MICROBIOLOGICAL ANALYSES OF SPACECRAFT HARDWARE AND EXTRAVEHICULAR ACTIVITY CLOTHING

Swab samples from the spacecraft floor, rotational hand controller, drink gun, X-X headstrut, urine collection device (UCD), gloves, and shoe soles were treated as indicated in figure A-7. All TSB sample tubes used for aerobic identification and quantitation were diluted serially in sterile TSB. All VIB samples used for anaerobic identification and quantitation were diluted serially in sterile VIB. The sample and dilution tubes were maintained at 277° K (4° C) by the use of an ice bath during the dilution procedures. The sample TSB and VIB tubes were vortexed for 5 seconds. Serial dilutions were prepared by transferring 1.0-cubic-centimeter aliquots to 9.0 cubic centimeters of sterile TSB or VIB. All preflight samples were diluted to 10^2, and all postflight samples were diluted to 10^4.

One-tenth cubic centimeter was transferred aseptically from each sample and dilution TSB tube to the aerobic quantitative agar media. One-tenth cubic centimeter was transferred aseptically from each sample and dilution VIB tube to the anaerobic quantitative agar media. The agar surfaces were spread with a glass rod. The aerobic quantitative media included blood agar and MacConkey agar. Only blood agar with vitamin K and hemin was used for anaerobic quantitation.

Four cubic centimeters from each TSB sample tube were transferred aseptically to a labeled sterile screwcap tube for mycological analysis. The aerobic quantitative media were incubated at 308° K (35° C) for 48 hours. The anaerobic quantitative media was incubated at 308° K (35° C) for 96 hours under an atmosphere of hydrogen gas. Colony counts were performed on all quantitative media after incubation. All TSB and VIB dilution tubes were incubated at 308° K (35° C) for 24 hours and stored at 277° K (4° C) for 1 week. After mycological samples had been removed from the TSB sample tubes, the TSB and VIB sample tubes were incubated for 24 hours at 308° K (35° C).

After incubation, a loop was used to transfer culture from each sample tube to the isolation media. An isolation streak was made on each medium. The isolation media used for the hardware and clothing samples included blood agar, MacConkey agar, and blood agar with vitamin K and hemin (anaerobic). The streaked isolation media were incubated for 48 or 96 hours at 308° K (35° C) under an appropriate atmosphere. After the hardware and clothing sample tubes had been used for quantitation and isolation, they were stored at 277° K (4° C) for 1 week.

For mycological analyses, 4 cubic centimeters of each of the 10^1 TSB dilution tubes were transferred aseptically to a sterile centrifuge tube. The samples were

centrifuged at 5000 rpm (12 000g) for 15 minutes. The supernatant was poured into 10 cubic centimeters of YMB+, and a swab was used to sample the bottom of the centrifuge tube and to streak each of three isolation media: CMMYA+, SAB+, and CD. The swab was broken off into 10 cubic centimeters of YMB+. The streaked plates and the two YMB+ tubes were incubated at 298° K (25° C) for 120 hours.

Isolation and Identification

After quantitation, isolated colonies from each aerobic plate (quantitative and isolation media) were transferred to sterile TSB. All tubes were identified properly and incubated at 308° K (35° C) until turbid. The TSB pure cultures were used for staining procedures, inoculation of biochemical media, and storage at 277° K (4° C).

After quantitation, isolated colonies from each anaerobic plate (quantitative and isolation media) were transferred to sterile thioglycolate broth. All tubes were identified properly and incubated at 308° K (35° C) until turbid. The thioglycolate pure cultures were used for staining procedures, inoculation of biochemical media, and storage at 277° K (4° C).

The isolation streak was used to culture microorganisms that were too few to be isolated from the high dilutions used to inoculate the quantitative media. Only those organisms that were not isolated on the quantitative media were identified.

TABLE A-I. - CREW SAMPLE COLLECTION

Sample designation	Area sampled
Scalp	Above hairline at base of neck, 12.8 cm^2 (2 in^2)
Ears	Right and left external auditory canals with two revolutions of each swab in each canal
Axillae	Below hair area on each side, 6.4 cm^2 (in^2)
Hands	On right and left palms, 6.4 cm^2 (1 in^2)
Navel	The internal area of the umbilicus and a surrounding 12.8-cm^2 (2 in^2) area, with at least two revolutions made with each swab
Groin	Strip from rear to front on right and left inguinal area between legs, 5.08 cm (2 in)
Toes	Area between large and first toe of each foot
Nares (nasal swab)	Both nostrils
Throat swab	Surfaces of tonsils and posterior pharyngeal vault swabbed with each of two dry calcium alginate swabs
Gargle	Sixty cm^3 phosphate buffer used as gargle and washed through oral cavity three times
Urine	Sixty cm^3 midstream sample
Feces	Two samples of 100 milligrams each taken from center of the fecal specimen

TABLE A-II. - DILUTIONS USED (LOG_{10}) FOR EACH CREW SAMPLE

Sample designation	Diluent	
	TSB	VIB
Body surface swabs	10^1 to 10^4	10^1 to 10^4
Nasal swab	10^1 to 10^4	10^1 to 10^4
Throat swab	10^1 to 10^5	10^1 to 10^5
Gargle	10^1 to 10^5	10^1 to 10^5
Urine	10^1 to 10^2	10^1 to 10^2
Feces	10^2 to 10^8	10^2 to 10^{10}

TABLE A-III. - AEROBIC QUANTITATIVE AGAR

Sample designation	Media
Body surface swabs	Blood agar (BA) Staphylococcus-110 agar (S-110)
Nasal swabs	Blood agar
Throat swabs	Blood agar Staphylococcus-110 agar
Gargle	Blood agar Staphylococcus-110 agar Mitis-Salivarius agar (MSA)
Urine	Blood agar Staphylococcus-110 agar MacConkey agar (MAC)
Feces	Blood agar Mitis-Salivarius agar MacConkey agar Tetrathionate broth (TTH)

TABLE A-IV.- ANAEROBIC QUANTITATIVE AGAR

Sample designation	Media used
Body surface swabs	Blood agar with vitamin K and hemin (BA+)
Nasal swabs	Paromomycin-Vancomycin-Menadione agar (PVM) Blood agar with vitamin K and hemin Rogosa agar (RA)
Throat swabs	Blood agar with vitamin K and hemin Paromomycin-Vancomycin-Menadione agar Rogosa agar
Gargle	Paromomycin-Vancomycin-Menadione agar Blood agar with vitamin K and hemin Rogosa agar
Urine	Blood agar with vitamin K and hemin Rogosa agar
Feces	Paromomycin-Vancomycin-Menadione agar Blood agar with vitamin K and hemin Rogosa agar

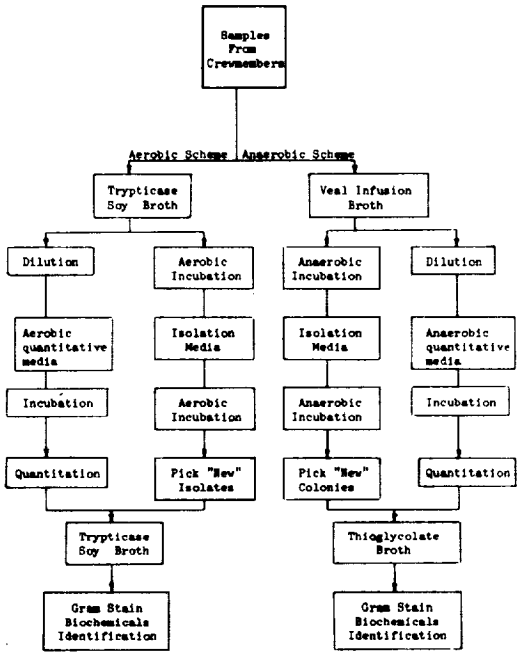
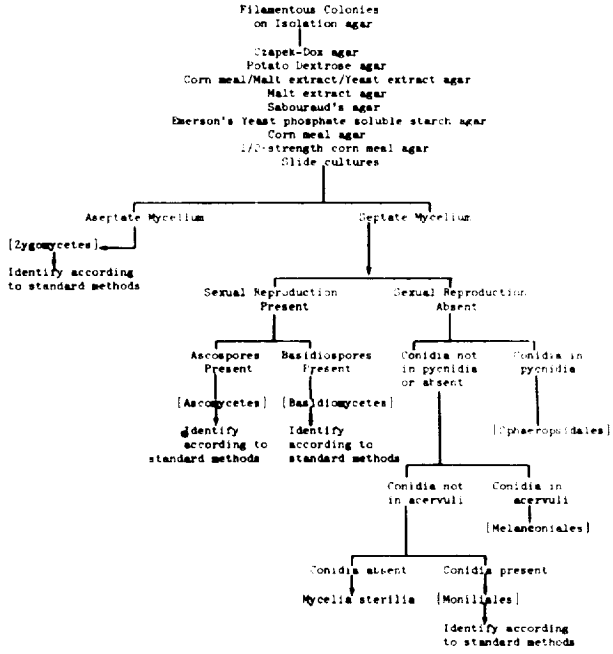
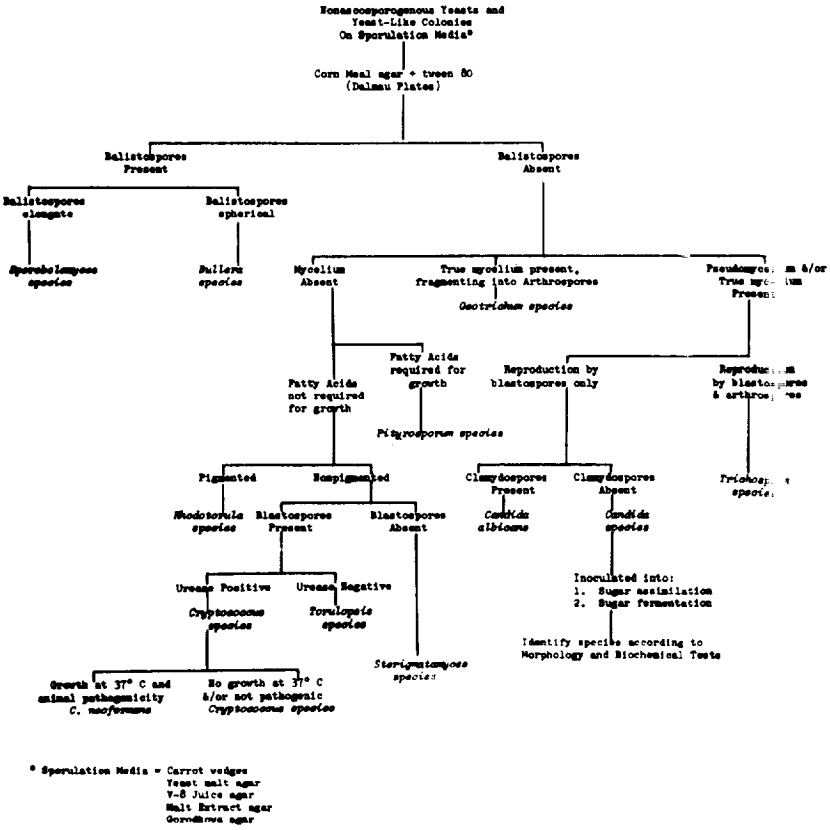


Figure A-1.- Outline of bacteriological analyses.

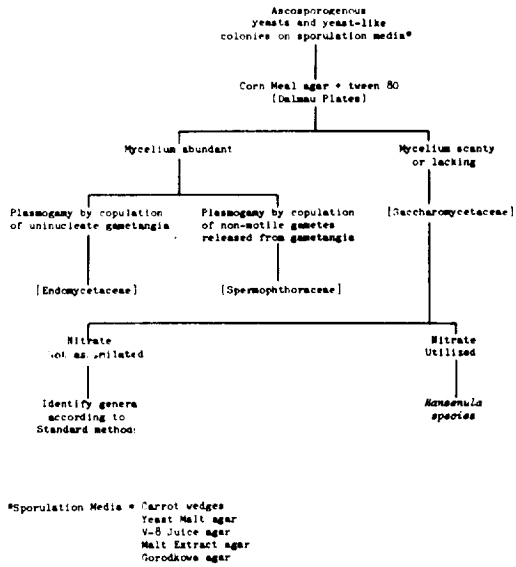


(a) Identification of filamentous fungi.

Figure A-2.- Identification schemes.



(b) Identification of nonascosporogenous yeasts and yeast-like fungi.



(c) Identification of ascosporogenous yeasts and yeast-like fungi.

Figure A-2.- Concluded.

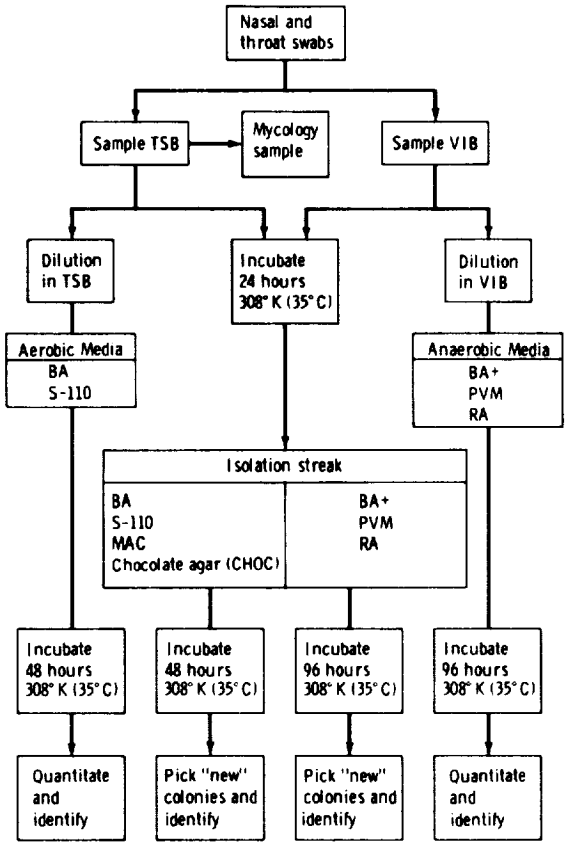


Figure A-3. - Outline of bacteriological analyses for nasal swabs and throat swabs.

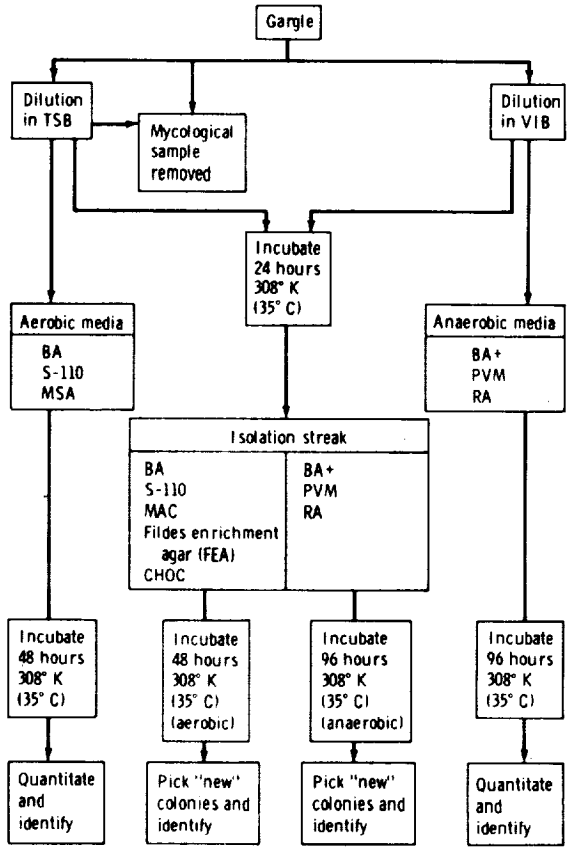


Figure A-4. - Outline of bacteriological analyses for gargle samples.

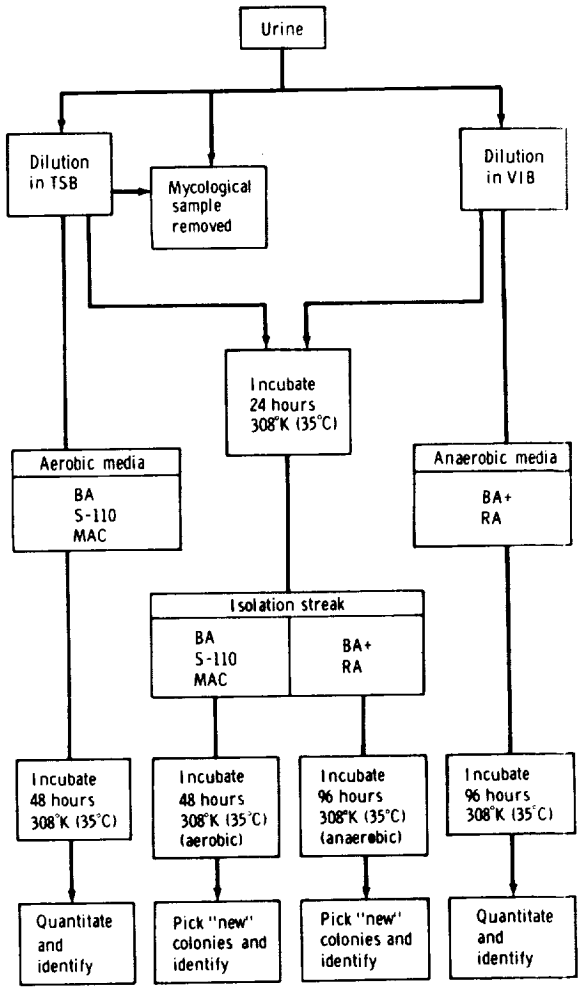


Figure A-5.- Outline of bacteriological analyses for urine sample.

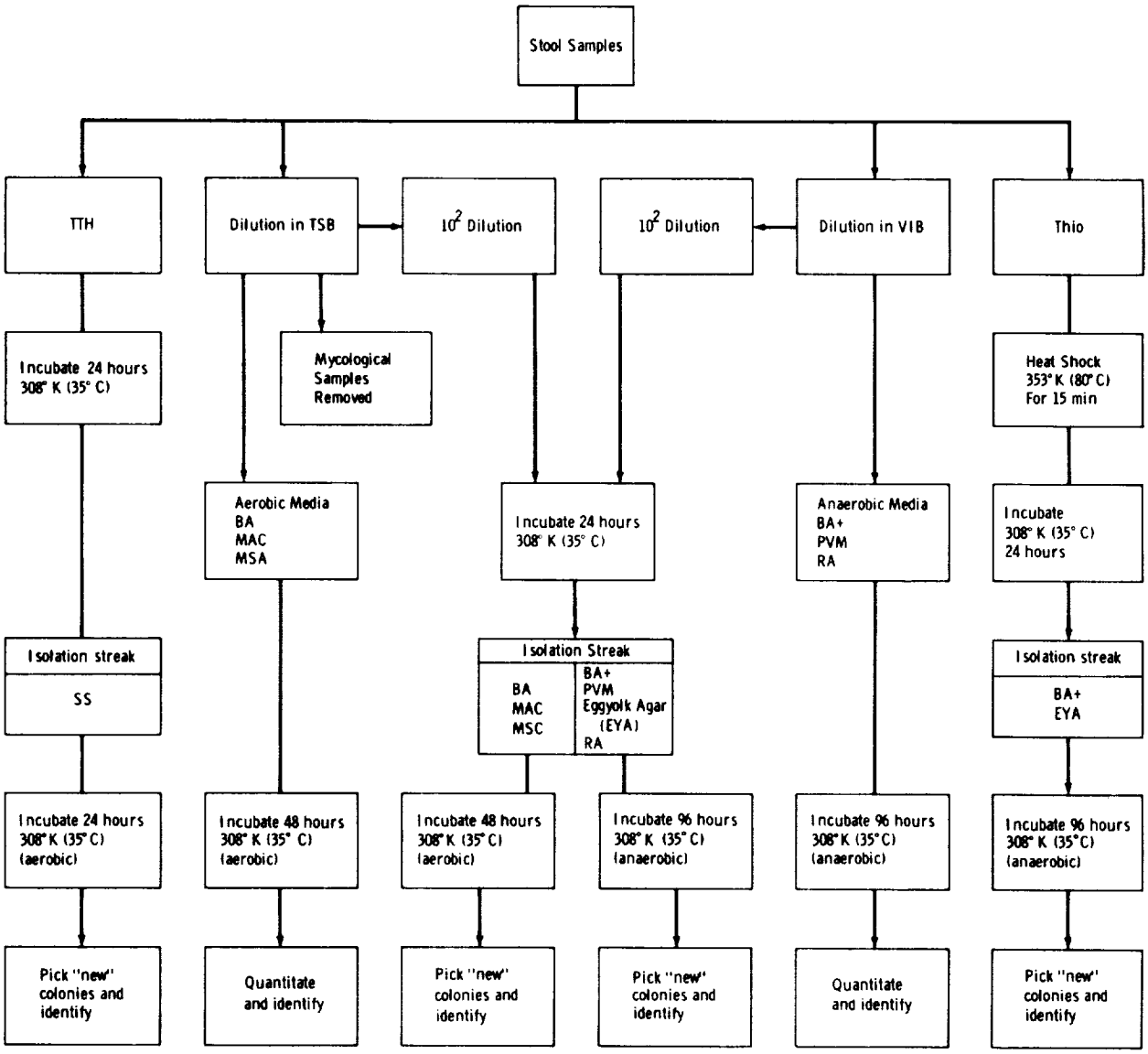


Figure A-6.- Outline of bacteriological analyses for stool samples.

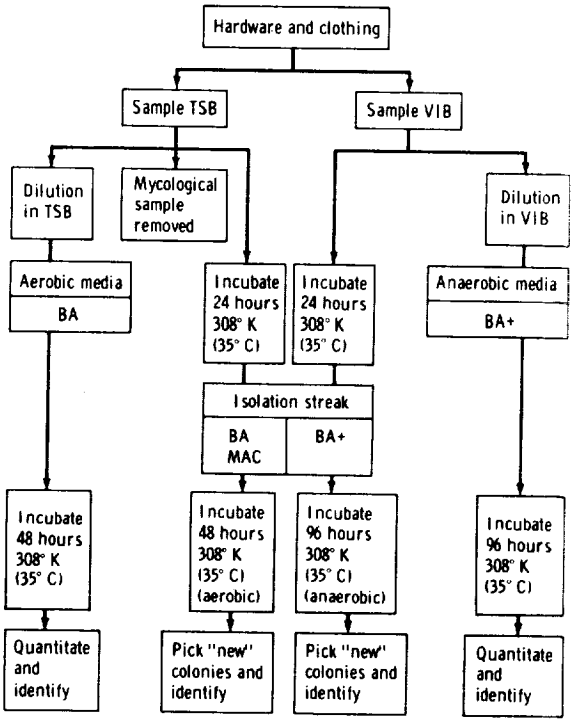


Figure A-7. - Outline of bacteriological analyses of spacecraft hardware and EVA clothing.

APPENDIX B

RATIONALE FOR DETERMINATION OF MEDICAL IMPORTANCE OF MICROORGANISMS

GENERAL

The samples obtained from astronauts for medical microbiological studies constitute four broad areas: the skin (scalp, ear, axilla, hands, navel, groin, toes), the upper respiratory tract (nares, throat swab, gargle), the urine, and the feces. Each of these areas will be analyzed independently in the following sections.

SKIN

Because of its close association with the environment, the skin may harbor a large variety of microorganisms as transients or residents. Many of the microorganisms are capable of mediating secondary infections following damage to the skin, as in the case of cuts, abrasions, burns, and so forth. Of this group, those microorganisms listed in table B-I represent the most common pathogens associated with infections of the skin.

UPPER RESPIRATORY TRACT

The nostrils and oral cavity, although interconnected, offer quite different environments. Staphylococci do well in the nose and are generally the predominating microorganism (especially S. epidermidis). The predominating microorganism in the oral cavity is more likely to be α-hemolytic streptococci (especially S. epidemicus). Diphtheroid bacilli often are found in both locations.

The list of microorganisms generally considered "normal flora" in the oral cavity include Neisseria sp., lactobacilli, fusiform bacilli, spirochetes, Veillonella sp., Peptococcus sp., Peptostreptococcus sp., Leptotrichia sp., Vibrio sp., and Actinomyces sp. All of these except the Neisseria are anaerobic bacteria and, therefore, generally are not found in the nostrils, although they may be present in the nasopharyngeal area.

A list of the microorganisms considered to be of medical importance when isolated from the upper respiratory tract is presented in table B-II. These microorganisms are also reported when isolated from other areas so that their presence in the subject population can be monitored.

URINE

Any microorganism, given the opportunity, is considered capable of causing urinary tract infections. For this reason, quantitation of microorganisms present in the urine is the most widely accepted method of differentiating between actual infection and contaminating strains. A concentration of 100 000 viable cells per cubic centimeter of urine usually is considered indicative of infection, whereas counts of less than 1000 viable cells per cubic centimeter of urine are considered contaminants. As with other "rules," this one must be liberally tempered with discretion. Studies of urinary tract infections and of urine from noninfected subjects permits one to list the most commonly found contaminants and the most prominent causes of urinary tract infections. Such a tabulation is presented in table B-III.

FECES

A large variety of microorganisms are commonly found in asymptomatic feces, either as residents or transients. The few pathogens most often recovered from subjects residing in the United States are listed in table B-IV.

TABLE B-I. - COMMON PATHOGENS ASSOCIATED

WITH SKIN INFECTIONS

Microorganisms	Associated diseases
Staphylococcus aureus	Boils, abscesses, wound infections
Streptococcus sp. (β-hemolytic, group A)	Wound infections
Candida albicans	Dermatomycosis and onychomycosis
Pseudomonas aeruginosa	Exterior auditory canal infections, wound infections
Enterobacteriaceae	Wound infections
Nonenteric gram negative rods	Wound infections
Corynebacterium minutissimum[a]	Erythrasma[a]
Aspergillus sp.	External otitis, chronic sinusitis, and bronchiectasis
Dermatophytes[b]	Dermatomycosis

[a]Not culturable; found by microscopic examination of skin scales.

[b]Cultures of questionable value unless clinical lesions are present and unless skin scrapings can be obtained for culture.

TABLE B-II. - COMMON MICROORGANISMS OF MEDICAL IMPORTANCE IN THE UPPER RESPIRATORY TRACT

Microorganisms	Associated Diseases
Streptococcus pyogenes	Pharyngitis, tonsillitis, scarlet fever
Diplococcus pneumoniae	Pneumonia
Staphylococcus aureus	Abscess of larynx, pneumonia
Proteus species, Pseudomonas species, Klebsiella species and other coliforms	Nonspecific membranous laryngitis chronic sinusitis, pneumonia, abscess of larynx
Haemophilus species	Meningitis, sinusitis, bronchitis, bronchopneumonia
Neisseria meningitidis	Meningitis
Corynebacterium diphtheria*	Diphtheria
Bordetella pertussis*	Pertussis
Candida albicans	Thrush, bronchitis, pneumonitis

*Rarely found in immunized adults

TABLE B-III. - COMMON MICROORGANISMS IN THE URINARY TRACT

Common contaminants	Common pathogens
Staphylococci	Coliform bacilli (including intermediate forms):
Corynebacterium sp.	Escherichia sp.
Coliforms	Klebsiella sp.
Enterococci	Enterobacter sp.
Proteus sp.	Serratia sp.
Streptococcus sp., α- and β-hemolytic	Hafnia sp.
Saprophytic yeasts	Proteus sp.
Bacillus sp.	Pseudomonas aeruginosa and other Pseudomonas sp.
	Enterococci
	Staphylococci
	Alcaligenes sp.
	Herellea sp.
	Haemophilus (especially H. vaginalis)
	Candida albicans
	Streptococcus sp., β-hemolytic (usually groups B and D)
	Neisseria gonorrhoeae
	Salmonella sp.
	Shigella sp.

TABLE B-IV. - COMMON MICROORGANISMS OF MEDICAL IMPORTANCE IN THE FECES

Microorganisms	Associated diseases
Salmonella sp.	Enteritis, septicemia, acute gastroenteritis, typhoid fever, salmonellosis
Shigella sp.	Dysentery, acute gastroenteritis, shigellosis
Arizona group	Suspect human enteric infections; known pathogens in other animals
Mima vaginicola	Diarrhea
Citrobacter group	Suspect human enteric infections
Alkalescens-dispar group	Mild dysentery, pyelitis, bacteremia
Proteus sp.	Suspect in various enteric infections, food poisoning