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THE INFLUENCE OF DIET ON THE NORMAL FECAL FLORA OF THE CHIMPANZEE

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FOREWORD

This is a final report of a study conducted both at the Wisconsin Alumni Research Foundation laboratories in Madison, Wisconsin and the Paul Moore Research and Development Center of Republic Aviation Corporation at Farmingdale, L.I., New York under Air Force contract AF 29(600)-4555. The research was conducted from February 1964 to February 1965. Dr. Robert Levenson of the 6571st Aeromedical Research Laboratory at Holloman Air Force Base, New Mexico was project monitor.

The study was under the direction of Dr. Lorraine S. Gall, Chief, Microbiology, Life Sciences and Space Environment Laboratory, Paul Moore Research and Development Center, Republic Aviation Corporation, with the able assistance of Mr. Charles N. Huhtanen, Mrs. Fay Ames, Mrs. Shirley Dunwoody, Mrs. Jacquelyn Miller and Miss Patricia Sterry. The assistance of Dr. Rebecca C. Lancefield, the renowned expert on streptococci, working at the Rockefeller Institute in New York, is gratefully acknowledged for her help in identifying a predominant streptococcus strain found during this study.

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This technical report has been reviewed and is approved.

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ABSTRACT

The effect of various diets on the normal fecal bacterial flora of chimpanzees in captivity is little understood. Since such information is of value in formulating programs for the care and feeding of chimpanzees in vivaria and since diet is known to change the intestinal flora of other animals, a study was undertaken to determine the effect of diet on the aerobic and anaerobic fecal flora of twelve chimpanzees separated from the chimpanzee colony in the vivarium at the 6571st Aeromedical Research Laboratory at Holloman Air Force Base, New Mexico and used as subjects on a nutrition study at Wisconsin Alumni Research Foundation, Madison, Wisconsin. The animals were transferred from Holloman to Wisconsin three to four months before the first sampling period and approximately 3-1/2 months time elapsed between the first sampling period and the second. The Holloman diet consisted of an apple, an orange and a banana in the early morning, a vitamin "cocktail" in the afternoon and Purina primate pellets in the late afternoon. The Purina, Rockland and Ciba diet consisted of the primate pellets marketed by those firms and the Wisconsin WARF pelleted diet #1 was a diet compounded by the personnel at the Wisconsin Alumni Research Foundation. The cultures were isolated from rectal swabs and studied by methods comparable to those used in the baseline study at Holloman. After the primary cultures were isolated in the laboratories at the Wisconsin Alumni Research Foundation they were prepared for shipping and were refrigerated during transportation to the Republic laboratories where the identification of the cultures was carried out. The data obtained from the aerobic bacterial studies were summarized in tables grouping the occurrence of the Enterobacteriaceae, streptococci and miscellaneous aerobes so that comparisons can be made by sampling period, diet and for each animal. The data of the occurrence of the anaerobic bacterial cultures were summarized in tables as obligate anaerobes or facultative anaerobes, using the designation derived from the anaerobic "key" so that the same comparisons can be made as for the aerobic cultures. The aerobic bacteria isolated were more markedly influenced by the individual animal than by diet. This was particularly true of certain of the gram negative rods, such as proteus, pseudomonas, untypable cultures, and possibly klebsiella and certain typable beta hemolytic streptococci. Two types of bacteria, salmonella and peculiar beta-hemolytic gram positive bacillus, were diet-oriented and may have been carried in on or were favored by the diets. An overall simplification of the aerobic flora similar to that seen in the basic Holloman study occurred after the twelve chimpanzees had been isolated from other chimpanzees for a prolonged period of time. The distribution of anaerobic bacteria in the feces both strict and facultative anaerobes was influenced markedly by the diet fed and to a lesser extent by the individual animal. The predominance of anaerobes over aerobes and the proportion of strict vs facultative anaerobes were influenced by the composition of the diet fed, and to a lesser extent the proportion of strict vs facultative anaerobes was influenced by the individual animal. The length of time which the diet was fed also played an important role in the proportion of strict vs facultative anaerobes. An overall simplification of the diversity of types of anaerobic bacteria occurred as the test progressed and the time of isolation from new chimpanzees became longer.

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INTRODUCTION

The effect of various diets on the normal fecal bacterial flora of chimpanzees in captivity is little understood. Since such information is of value in formulating programs for the care and feeding of chimpanzees in vivaria and since diet is known to change the intestinal flora of other animals, a study was undertaken to determine the effect of diet on the aerobic and anaerobic fecal flora of 12 chimpanzees separated from the chimpanzee colony in the vivarium at the 6571st Aeromedical Research Laboratory, Holloman AFB, New Mexico and used as subjects on a nutrition study at Wisconsin Alumni Research Foundation, Madison, Wisconsin.

Baseline studies on the normal fecal flora of the chimpanzee in the colony at the 6571st Aeromedical Research Laboratory had been studied for a year's period and the results of this program are contained in RAC 1094-5FT,*"Study of Bacterial Flora of the Alimentary Tract of Chimpanzees." These data were used as a comparison for this study on the effect of four different diets on the fecal flora of these twelve animals.

Fifteen field trips were made to Wisconsin as outlined in Table I to study the fecal flora after the chimpanzees had been fed the various diets for periods of four and six weeks. The Holloman diet was used as a transition diet between the test diets.

The animals were transferred from Holloman to Wisconsin three to four months before the first sampling period and approximately 3-1/2 months time elapsed between the first sampling period and the second. The Holloman diet consisted of an apple and a banana in the early morning, a vitamin "cocktail" in the afternoon and Purina primate pellets in the late afternoon. The Purina, Rockland and Ciba diet consisted of the primate pellets marketed by those firms and the Wisconsin WARF pelleted diet #1 was a diet compounded by the personnel at the Wisconsin Alumni Research Foundation.

The animals were maintained indoors in air conditioned rooms at all times. The animals showed no overt signs of illness at any of the sampling periods with the exception of the eighth and ninth periods when they were on the Ciba diet, at which time loose stools were noted on most of the animals. For this reason the ninth sampling period was moved ahead one week. One animal, Doug, #175, was removed from the experiment after the tenth sampling period for reasons not related to the experiment.

The cultures were isolated from rectal swabs and studied by methods comparable to those used in the baseline study at Holloman. [1] After the primary cultures were isolated in the laboratories at the Wisconsin Alumni Research Foundation they were prepared for shipping and were refrigerated during transportation to the Republic laboratories where the identification of the cultures was carried out. The technical effort extended from February 1964 to February 1965.

Results of the aerobic and anaerobic culturing are discussed in separate sections in this report.

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* ARL-TDR-64-19, DDC Document Number AD-455017

SECTION II

METHODS

The methods for collecting and culturing the fecal samples from the chimpanzees by both aerobic and anaerobic techniques are described briefly in this Section while details of the bacteriological techniques and media are contained in Appendices I, II, and III.

1. Collection of Samples

Two samples were collected from the rectum of each chimpanzee tested by swabbing the rectum with dry "swubes" (swabs with a protective plastic sheath), which were placed immediately into broth. One swab was placed into 0.5 ml of Gall's broth and was used for the aerobic culturing, while the other swab was placed into 1.0 ml of Gall's broth to which had been added enough cysteine to reduce the potential of the medium to approximately -200 mv. (The composition of Gall's broth and the cysteine solution are described in Appendix I.) The rectal samples were designated as CW followed by the sample number, ranging from 1 through 174, (CW-1, CW-2, CW-3, etc.).

2. Bacterial Culturing Techniques

Both the aerobic and anaerobic primary culturing of the samples was done immediately in the field laboratory at Wisconsin Alumni Research Foundation by inoculating the specified media and incubating at 37°C. All cultures showing growth were transported to the Republic Aviation Corporation Laboratory for further study. All broth cultures were transferred to solid media prior to transport.

The aerobic culturing of the rectal samples was carried out on various differential media designed to selectively culture certain types of bacteria. MacConkey's, Bismuth sulfite (BS), Salmonella-Shigella (SS), and Tetrathionate broth were used to isolate Enterobacteriaceae from the feces. Mitis-Salivarius (MS) was used for streptococci and staphylococci, while Rogosa's agar as a pour plate was employed for lactobacilli. Blood agar plates were used to culture fastidious bacteria not encouraged by the other media. An aerobic counting plate was also made from each sample. The plates were read after the appropriate incubation period, sealed with plastic rings, refrigerated and returned to the central laboratory at Republic for further processing, where selected colonies from each plate were picked into nutrient broth, Gram stained and separated into the proper category for identification as indicated for each type of culture in Appendix I. Tetrathionate broth showing growth was immediately inoculated on BS, SS, MacConkey's and Brilliant Green agar which were incubated, and returned to Republic for study and identification as above.

The anaerobic culturing of the rectal samples was performed immediately by the serial dilution of the sample in Gall's broth made anaerobic by the addition of cysteine, as shown in Figure 1 and incubated anaerobically. When growth was observed, agar shakes of the cultures were made to allow transport of the cultures to the Republic laboratory. In addition, two anaerobic pour plates were made from appropriate dilutions of fecal samples and a blood plate was made from all samples and incubated anaerobically. The details of these primary isolation procedures are contained in Appendix I.

The agar shake cultures, the cultures on anaerobic Petri plates and blood agar plates were sealed and refrigerated until returned to the Republic laboratory for further study. The anaerobic cultures from the agar shakes representing the top three dilutions of the fecal material and the colonies from the anaerobic Petri dishes were purified when necessary and were studied by means of screen tests to allow their comparison with a "key" setup in the Republic laboratories with the anaerobes isolated from human feces. Further study is being made under another contract (NASw -738, Study of the Normal Fecal Bacterial Flora of Man) (2) of the cultures in this "key" which will lead to the characterization or identification of these cultures. The colonies on the blood plates were picked into nutrient broth, Gram stained and separated into the proper category for further study leading to their identification. Details of the procedures used to screen test the anaerobes and identify the cultures from the blood plates are contained in Appendix I.

A Gram stain was made from the original aerobic swab samples, and was observed for the morphological types of bacteria present.

The data obtained from the aerobic bacterial studies were summarized in tables grouping the occurrence of the Enterobacteriaceae, streptococci and miscellaneous aerobes so that comparisons can be made by sampling period and also for each animal. The data of the occurrence of the anaerobic bacterial cultures were summarized in tables as obligate anaerobes or facultative anaerobes, using the designation derived from the anaerobic "key" so that the same comparisons can be made as for the aerobic cultures.

SECTION III

AEROBIC STUDIES

During the year June 1963 - July 1964, a thorough baseline study was done on the types of organisms present in the feces of the chimpanzees in the chimpanzee colony at the 6571st Aeromedical Research Laboratory at Holloman Air Force Base in New Mexico, and the results are contained in report RAC 1094-5FR,* "Study of Bacterial Flora of the Alimentary Tract of Chimpanzees." The twelve animals used in the nutrition study at Wisconsin Alumni Research Foundation were taken directly from this colony and certain of the twelve animals on the nutrition study had been previously sampled during the Holloman study. The samples were taken by the same technique and in general the same cultural procedures and personnel were used as during the Holloman study, so that these results were as nearly comparable as possible. The reporting procedure was also set up to correspond to that used in the Holloman reports and the data are summarized under the same three broad catagories: 1) gram negative bacilli, 2) streptococcus, and 3) miscellaneous aerobes. These data are summarized according to period and comparative results from all periods are summarized for each animal.

1. Gram Negative Rods

The gram negative rods found on each animal during each sampling period are summarized in Table II. The gram negative rods which occurred in the twelve chimpanzees on the nutrition study during the first sampling period were in general similar to those found on the Holloman study at the time that the animals left the Holloman colony. There was a rather wide variety of organisms found during the initial sampling period including the usual E. coli, aerobacter, and several species of proteus. In addition shigella was isolated from three different animals and four other types of gram negative bacilli were represented. A period of three and one-half months elapsed before the animals were tested again at which time the flora had simplified markedly and the shigella had disappeared entirely. A few typable coli began to appear. The simplification of the gram negative flora continued during the next two periods, while the chimpanzees were on the Purina diet, but when the animals were placed on the Rockland diet, salmonella occurred in three animals and continued during the next sampling period when the animals were still on the Rockland diet. A shigella was also isolated during this period and there was also a notable increase in the number of serotypes of E. coli. When the animals returned to the Holloman-Transition diet the enteropathogens disappeared.

However, during the eighth and ninth sampling periods when the animals were on the Ciba diet, the salmonella returned and persisted during the tenth period when the animals were on the Holloman-Transition diet. During this period the proteus disappeared but there was an increase in the serotypes of E. coli including five isolations of Arizona-Citrobacter. After the animals had been on the Holloman diet for a longer period the flora simplified and remained simple, with virtually no enteropathogens until the animals were placed on the WARF pelleted diet #1, at which time salmonella reoccurred and the serotypes of E. coli including two isolations of Bethesda-Ballerup were noted. The flora simplified markedly after the animals had been on the WARF pelleted diet for four weeks. During the last sampling period when the animals had been on the Holloman diet for one week, one salmonella culture was isolated and the same animal carried typable E. coli including Bethesda-Ballerup.

* ARL-TDR-64-19, DDC Document No. AD-455017

From these data it would appear that certain diets, especially Rockland and Ciba, either carried or favored the development of enteropathogens such as salmonella and the potentially pathogenic serotypes of E. coli. The period during which the Holloman-Transition diet was being fed often reflected the flora from the previous period, particularly during the tenth period when the salmonella persisted after having occurred on the Ciba diet. Otherwise, the diet did not appear to influence the occurrence of gram negative rods

The comparison of the gram negative bacilli recovered from the feces of each of the twelve animals during the fifteen test periods is summarized in Table III and offer some interesting data. For example, certain animals accounted for the majority of all isolations of certain bacteria. Two animals accounted for half of the 32 cultures of proteus isolated and four animals never showed proteus during any sampling period. Of a total of eleven pseudomonas cultures, seven isolations were from one animal and three from another. Unkeyed gram negative bacilli were encountered quite frequently, but certain animals carried them more frequently than others, as four animals carried sixteen of the 24 untypable cultures, whereas the other eight animals had one or no untypable cultures. Certain animals seemed more prone to carry klebsiella, since of the fourteen klebsiella isolated, four animals accounted for ten of the isolations. The distribution of aerobacter was more general, but some animals were particularly heavy carriers of this organism, as two animals accounted for fifteen of the 35 cultures isolated, while five animals showed one or less isolations. On the other hand the salmonella although isolated only eighteen times was found at some time in all but two animals.

Thus it would appear that the non-pathogenic Enterobacteriaceae were influenced more by the individual animal than by the diet fed, whereas the pathogenic species, particularly salmonella, may either be carried in or fostered by certain types of diet. Also the distribution of typable coli seemed somewhat more influenced by diet that by the individual animal.

The six most commonly occurring gram negative rods are listed in Table IIIa As would be expected, E. coli and its serotypes were the most numerous organisms isolated, followed by aerobacter, proteus, unkeyed gram negative rods and salmonella. This correlates well in general with the findings on the basic Holloman study. However, salmonella which was found only once on the basic Holloman study was found eighteen times on the nutrition study and as previously noted seemed to be diet related. Klebsiella was found somewhat less frequently in the nutrition study than in the Holloman experiments, but the decrease was not marked.

2. Streptococci

The occurrence of the streptococci in each animal in each sampling period is summarized in Table IV. The streptococci found in the feces of the twelve chimpanzees on the nutrition study reflect the types of organisms found in the Holloman colony in general. However, during the first sampling period a rather large number of typable streptococci, principally of the human type C and group G were isolated. It is interesting to note that directly after these samples were taken, the chimpanzees in Wisconsin came down with respiratory infections. The other streptococci present occurred according to the usual pattern and included Streptococcus salivarius, mitis, enterococci and non-typable strains particularly an untypable beta hemolytic streptococcus which occurred on the anaerobic blood plates.

At the time of the second sampling three months later, typable beta hemolytic organisms occurred sporadically and even the untypable beta hemolytic streptococcus had become less prevalent. During the third sampling period the streptococci were unremarkable except for the prevalence of mixed strains which could not be purified and this situation continued during the next sampling period. The mixed strain disappeared almost completely during the fifth sampling period and except for the reoccurrence of the non-typable beta hemolytic streptococcus and an occasional typable streptococcus, the pattern remained constant until the thirteenth sampling period when five typable streptococcus cultures, three type C and two type B were isolated. These disappeared during the fourteenth and fifteenth sampling periods when the usual pattern of streptococci prevailed with the untypable beta hemolytics being the only prevalent unusual organism. From these data there appeared to be no relationship between the occurrence of streptococci and the diet fed.

A comparison of the streptococci found on each animal during the fifteen sampling periods is summarized in Table V and shows that certain animals were more apt to carry typable streptococci than others. For example, of the 28 typable streptococci over half (15) were isolated from two animals and five animals had no typable streptococci at all. The non-typable beta hemolytic streptococcus occurred frequently on all animals and enterococci, Streptococcus salivarius and Streptococci mitis occurred regularly on all the animals, whereas Streptococcus bovis appeared sporadically on all the animals.

Except for the typable streptococci which appeared more frequently in certain animals there appeared to be few individual differences in the distribution of streptococci. The same five types of streptococci that occurred most frequently in the Holloman animals also occurred in these animals on the nutrition study, although the enterococci appeared to be slightly more numerous on the animals on the nutrition study than on the Holloman study. It is interesting to note that the non-typable beta hemolytic streptococcus was found so frequently in animals both at Holloman and on the nutrition study. This streptococcus is under special study and will be described more fully elsewhere in this report.

3. Miscellaneous Aerobes

The miscellaneous aerobic bacteria occurring in the twelve chimpanzees on the nutrition study during each sampling period are summarized in Table VI. During the first sampling period these organisms presented a rather diverse picture comparable to that seen in the animals in the Holloman colony at the time these animals were separated from the colony with nine different types of organisms being present in certain of the twelve animals. These bacteria included such potential pathogens as hemophilus, pneumococcus and neisseria. The occurrence of PPLO was reported during this period but the uncertainty of the testing procedure being used caused the results of the PPLO study to be dropped from the remainder of the report. During the second sampling period which took place about 3-1/2 months after the first sampling period the flora had simplified greatly and only staphylococci and lactobacilli appeared in significant numbers. This finding was substantiated by the third test which took place two weeks later. On both the second and third sampling periods coagulase-positive staphylococcus was isolated from one or two animals, but on the fourth sampling period one-third of the animals were carrying this staphylococcus. During the fifth sampling period the coagulase-positive staphylococcus had disappeared and a few corynebacteria appeared as well as lactobacillus, and this held true for the sixth sampling period with the exception that the corynebacteria had disappeared. During the subsequent sampling periods up to the thirteenth period there was a very simple bacterial flora composed mainly of lactobacillus and staphylococci with occasional corynebacteria. The main variation seemed to be in the frequency of occurrence of the coagulase-positive staphylococcus and to some extent in the total number of animals carrying any staphylococcus. In general the greater the incidence of coagulase-positive staphylococci, the larger the number of animals carrying any staphylococcus. During the thirteenth and continuing into the fourteenth period, almost every animal carried a beta hemolytic bacillus to the extent of one or two colonies on each aerobic blood plate. This bacillus had not been seen prior to the animals going on the WARF pelleted diet #1 and it disappeared completely in the fifteenth sampling period when the animals had been fed the Holloman diet for a period of only one week. It is interesting to speculate that perhaps this organism was actually carried on the undigested food of WARF pelleted #1 and did not transplant into the intestinal tract at all.

The comparison of the miscellaneous aerobes found in each individual animal during the various sampling periods is summarized in Table VII and is quite similar and unremarkable. Only two animals, Denise and Donald, never had a coagulase-positive staphylococcus. Certain animals tended at times to have more corynebacteria than others, including Mimi, Steve, and Elbys, although corynebacteria were found sporadically on some of the other animals. The most frequently occurring organisms grouped with the miscellaneous aerobes were the lactobacilli followed by the staphylococci, about 20% of which were coagulase-positive. The peculiar gram positive rod isolated exclusively from the WARF pelleted diet #1 was the next most frequently occurring miscellaneous aerobe, followed closely by corynebacteria. With the exception of the peculiar gram positive rod, which seemed to be diet-related, the frequency of occurrence of the miscellaneous aerobes is similar to that found in the chimpanzees in the Holloman colony.

4. Fungi

The fungi media often supported the growth of bacteria, but when a fungus was isolated attempts were made to identify it and the results are included in Table VIII Certain fungi appeared sporadically such as Candida tropicallis, Trichosporon sp., yeast, Geotrichum candidum. During certain periods Geotrichum candidum occurred on several of the animals. These periods were the second, third, and fourth periods after which it largely disappeared. Trichosporon sp. occurred sporadically until the seventh period when it occurred frequently and then continued its sporadic occurrences until the tenth and eleventh periods when it again occurred frequently. This fungus then skipped the twelfth period and occurred again four times in the thirteenth period. Candida tropicallis occurred sporadically until the sixth and seventh periods during which it was found four and three times respectively, after which it disappeared completely. Other than these instances the occurrences of fungi were not remarkable and did not seem to occur repeatedly in any one animal or during the feeding of any certain diet.

The total occurrences of the gram negative bacilli, streptococci and miscellaneous aerobes recovered from the feces is tabulated in Tables IX, X and XI. These tables serve to indicate the relative frequency of isolation of the various organisms in all animals in all periods.

5. Discussion of Aerobic Data

The occurrence of the aerobic bacteria with respect both to types and frequency in general compared favorably with the data from the basic Holloman study. (1) The first samples taken in Wisconsin had the most diverse flora, after which the number of different types of aerobic bacteria isolated dropped to a fairly stable level which was maintained during the remainder of the study. This finding confirms similar data obtained during the basic Holloman study, and in both instances the determining factor in the simplification seemed to be an isolation of at least six months from chimpanzees other than those in the colony. No effect of season on the fecal microflora was detected in the Wisconsin animals, as was found in the basic Holloman study, which probably is because the animals in Wisconsin were kept indoors in air conditioned rooms at all times.

The most marked differences in the aerobic fecal flora were shown in relation to the individual animal. Several bacteria, notably certain gram negative rods, occurred more frequently in certain individual animals than in others, and it was also interesting to note that certain chimpanzees tended to support a more varied gram negative flora than others. Several chimpanzees had a tendency to carry potentially pathogenic typable beta hemolytic streptococci, much as some humans may do. The one instance when these types of streptococci were widespread was followed by an outbreak of upper respiratory infections among the chimpanzees, which may indicate that the presence of these streptococci in the feces merely reflected presence of these types of streptococci in the upper respiratory system at that sampling period.

Two types of bacteria, salmonella and a beta-hemolytic gram positive bacillus, were diet-related. The salmonella had never been isolated in the twelve chimpanzees in Wisconsin prior to feeding the Rockland diet. During the feeding of this diet, salmonella was isolated 6 times after which it occurred sporadically during the remainder of the test, particularly when the chimpanzees were eating the Ciba and Holloman-Transition diet. The salmonella may have been ingested with the Rockland diet and have become established in the tract of the chimpanzees after which it occurred whenever the food eaten allowed it to occur, or it may merely have been favored by the various diets during which it occurred. The beta hemolytic bacillus, however, appears to be strictly related to WARF #1 pellets, and since only one or two colonies appeared per plate, it may never have become established in the gut but merely have been transported through the gut on particles of food carrying this bacterium.

The beta hemolytic streptococcus which has occurred so frequently on the "anaerobic" blood plates, growing under the mass has been referred to Dr. Rebecca Lancefield of the Rockfeller Institute in New York for identification. This bacterium may be described as a round coccus in short chains which is isolated and grown most easily under anaerobic conditions. This organism ferments inulin, lactose, sucrose and glucose definitely, and raffinose, glycerol, sorbitol and mannitol slightly, forms a soft acid curd in litmus milk with partial or no reduction, and produces a pH of 4.0 in 1% glucose broth in 24 hours. In agar shakes this streptococcus showed an anaerobic pattern of growth on initial isolation. Growth and hemolysis could be obtained on aerobic blood plates but the colonies were pinpoint and grew only in the primary streak of the inoculum. Incubation of blood agar plate subcultures under CO_2 resulted in larger colonies and zones of hemolysis and growth in subsequent streaks. Dr. Lancefield identified this organism as

Streptococcus Group F, no specific serotype. This streptococcus may be pathogenic under certain conditions and is found in human respiratory infections. It is difficult to grow and isolate.

In summary, the aerobic bacteria isolated were more markedly influenced by the individual animal than by diet. This was particularly true of certain of the gram negative rods, such as proteus, pseudomonas, untypable cultures, and possibly klebsiella and certain typable beta hemolytic streptococci. Two types of bacteria, salmonella and a peculiar beta-hemolytic gram positive bacillus, were diet-oriented and may have been carried in on, or were favored by, the diets. An overall simplification of the aerobic flora similar to that seen in the basic Holloman study occurred after the twelve chimpanzees had been isolated from other chimpanzees for a prolonged period of time.

SECTION IV

ANAEROBIC STUDIES

The study of the anaerobic fecal bacteria of the chimpanzees on the Wisconsin nutrition diets is of particular importance because of the demonstrated influence of diet upon the normal anaerobic fecal flora of man (Determination of Aerobic and Anaerobic Microflora of Human Feces, AF33 (615)-1748)(3) and the known influence of various feeding regimens on the intestinal flora of other animals. This study was conducted to determine whether diet also influences the fecal flora of chimpanzees. The data obtained during these anaerobic fecal studies have been considered from several aspects including: 1) the ratio of aerobes to anaerobes; 2) the occurrences of obligate anaerobes as compared to facultative anaerobes; and 3) the distribution of the various types of fecal anaerobes characterized according to the anaerobic key used during the baseline study (Study of Bacterial Flora of the Alimentary Tract of Chimpanzees, AF29(600)-4124). (1)

Comparisons of these data were made for the various sampling periods, the various diets and each individual animal. A comparison was also made with the results from the baseline study conducted using similar techniques on the Holloman chimpanzee colony under contract AF29(600)-4124.

1. Ratio of Aerobes to Anaerobes

The predominance of anaerobic bacteria over aerobic bacteria in the feces of chimpanzees and humans was demonstrated in work done under contract AF29(600)-4124,"Study of Bacterial Flora of the Alimentary Tract of Chimpanzees," and NASw-738, "Study of the Normal Fecal Bacterial Flora of Man," using techniques similar to those employed in this study. The comparative heighth of growth of the aerobic and anaerobic bacteria from the fecal samples taken from the chimpanzees on the Wisconsin nutrition study are included in Table XII . The figures under column "A" are taken from plate counts and calculations are made so that the figure represents the highest tube in the dilution series which would have shown aerobic growth. The figure under column "AN" represents the highest tube in the dilution series of anaerobic growth, while the figures under the third column express the number of 10-fold differences between the heighth of aerobic and anaerobic bacterial growth. The figure in the "difference" column expresses the preponderance of anaerobes over aerobes in each sample since the difference is always in the same direction. Table XIII shows that an overall average difference of all the sampling periods and of all the animals of 3.0, which represents 1000 times preponderance of anaerobes over aerobes, which compares well with the Holloman study average of 3.4. During certain periods the preponderance of anaerobic bacteria was higher than in others as shown by the average differences recorded in Table XII . This difference was particularly marked in periods eight and thirteen when the average difference showed a 10,000 times preponderance of anaerobes. Table XIV also summarizes the difference of anaerobes over aerobes according to diet, and both the Ciba and WARF pelleted #1 diets show greater than 1000 times excess of anaerobes over aerobes. As seen in Table XII only one animal, Steve, shows a much higher predominance of anaerobes than the average.

Thus it would appear from these data that the anaerobic bacteria are about 1000 times more numerous than the aerobic organisms in the feces of the chimpanzees, which substantiates the data from the basic Holloman contract. In addition the Ciba and WARF #1 diets appear to support a somewhat greater predominance of anaerobes over aerobes than the other diets and diet seems to have greater influence on the dominance of anaerobes than the individual animal since only one animal varied markedly from the average.

2. The Occurrence of Obligate and Facultative Anaerobes

Since the data in this study show that the anaerobes predominate over aerobes in the feces of the chimpanzee, it is important to know the degree of anaerobiosis of the cultures isolated. Accordingly, the occurrence of obligate vs facultative anaerobes in the top three dilutions of fecal material which show growth has been tabulated for each sampling period and each animal in Table XV and the percentage of strict anaerobes vs facultative anaerobes in the various sampling periods, and on the various diets is presented in Tables XVI and XVII. In Table XVI the percentage of strict anaerobes vs facultative anaerobes for each sampling period shows an extreme variation ranging from 11% strict anaerobes in the tenth sampling period to 70% in the thirteenth sampling period. That this difference is clearly related to diet is shown in Table XVII where the results are expressed as a function of the diet fed. For example, the highest percentage of obligate anaerobes occurred in the WARF pelleted diet #1 where 65% of the most predominant organisms isolated were obligate anaerobes. The Rockland diet showed the next highest percentage of obligate anaerobes followed by the Ciba and Purina Chow diet. The Holloman diet showed only 39% obligate anaerobes, compared with 47% found with the same diet on the animals in the Holloman basic study. This discrepancy is caused by the results of one sampling period only as in two out of the three sampling periods when the Holloman diet was fed 47% and 43% strict anaerobes appeared while for some unexplained reason the third time the Holloman diet was fed the figure had dropped markedly to 27%. Consistently low percentages of strict anaerobes were found on the Holloman-Transition diet (11%, 17%, 18% and 29%) which may be the result of the unsettled condition of the intestinal flora due to insufficient stabilization period on the diet. The Holloman-Transition diet was fed for only two weeks and it does not appear that this is long enough to allow a settled condition to develop in the intestinal flora.

The percentage of anaerobes vs facultative anaerobes found in each individual animal was totaled and the average percentage of strict anaerobes is presented in Table XV . Three of the animals, Mimi, Steve and possibly Red showed a considerably higher percentage of strict anaerobes than the average of all the animals, while Denise and Elbys showed a larger proportion of facultative anaerobes. These differences were not as great, however, as the variations brought about by diet, since the extreme range for individual animals was only between 24% and 49% compared to diet, where the extreme range was 19% to 65%. It would appear that the diet did influence the percentage of strict vs facultative anaerobes and that the dietary influence was greater than animal, although there were individual differences between animals.

3. Distribution of Various Types of Anaerobes

Many of the predominating anaerobes were screened according to a key used in the basic Holloman contract AF29(600)4124. A summary of the total numbers of anaerobes screened and the percentage of those screened which were able to be keyed is summarized by period in Table XVIII and by diet in Table XIX. The number of cultures screened was in excess of 1000, about one-third of which were obligate anaerobes. The overall percentage of those obligate anaerobes keyed was 77% and the facultative anaerobes keyed was 90% with an average of 85% of the total cultures screened which were keyable. This compares well with the figures on the basic study in which 81% of the obligates, 74% of the facultative anaerobes and 79% of the total were keyable, although many more facultative anaerobes were recognizable on the most recent study. In the present study the percentage of anaerobes keyed varied considerably from period to period and this appeared to be related to the diet. With respect to the obligate anaerobes the highest percentage of keyable organisms was found on the Rockland where 89% of the obligate organisms and 94% of the facultative bacteria were recognizable. The largest number of unkeyed strict anaerobes occurred on the Purina diet and by far the largest number of unkeyed facultative anaerobes occurred on the Wisconsin diet.

From these and other data it would appear that the organisms supported by the Rockland diet were the most nearly like the organisms found in the humans since the "key" is based largely on human isolations.

The distribution of these anaerobes in fecal samples is summarized for each animal for each period in Table XX, and the totals for each period are included in Table XXI. The distribution of anaerobes in the fecal samples by diet is summarized in Table XXII. The distribution of the various types of strict and facultative anaerobes varies with the sampling period and the facultative anaerobes screened are more numerous than the strict anaerobes in most periods, due to the preponderance of facultative anaerobes isolated in these periods. The variation in the types of strict anaerobes isolated seems to be diet-related in many instances. Taking into consideration that the figures listed under the Holloman diet represent three samplings, under the Holloman-Transition four samplings and for the remainder of the diets only two samplings it may be calculated that if the anaerobes were evenly distributed one would expect to find only about 15% of each of these organisms on the Purina, Rockland, Ciba and WARF #1 diets, 20% on the Holloman and 30% on the Holloman-Transition. It is interesting to note that on the Rockland diet FA-1, FA-2 and FA-3 occurred frequently, since one-third of all of the FA-1 group, 40% of the FA-2, and over 50% of the FA-3 organisms isolated on all diets were found on the Rockland diet. Well over one-half of the FA-8 isolations occurred on the Holloman diet, one-third of the FA-18, nearly one-third of the FA-5 group and over 40% of the CT-3 group were isolated while the animals were fed the Holloman diet. These percentages changed abruptly when the animals were fed the Holloman diet as a transition feed. Sixty percent of the FA-6 isolated and 40% of the CT-1 group were found on the Holloman-Transition diet. The Purina Chow diet supported 40% of CT-1 and over 40% of the FA-10 group of organisms. Over 60% of FA-4 and about one-third of the FA-17 group occurred during the period when the chimpanzees were eating the Ciba diet. The WARF pelleted #1 diet supported over one-half of the FA-14 and more than one-third of the FA-15 group, as well as almost one-half of the FA-18 group isolated. Thus there was considerable difference in the occurrences of the various types of strict anaerobes on the various diets.

Some of the facultative anaerobes also tended to be favored by certain diets. For example, almost two-thirds of the FN-1 group occurred on the Purina diet and three-fifths of FN-3 and FN-4 were found on the same diet. Quite dramatic was the frequency of occurrences of the enterococci on the Holloman diet, on which well over one-third of this commonly occurring organism was isolated. Two-thirds of the CN-1 isolated were also found while the animals were on the Holloman diet. On the Holloman-Transition diet there appeared to be a somewhat disproportionate number of lactobacilli as more than 25% of the lactobacillus occurred on this diet as well as more than one-half of the CN-2 and three-fourths of the FN-5 group. The lactobacilli also were found in large numbers on the Ciba diet. Most striking was the almost complete lack of enterococci on the WARF pelleted #1 diet where it occurred only five times.

From these data it can be seen that the diet fed influences the facultative anaerobes as well as the strict anaerobes. It also can be concluded that the length of time which a diet is fed influences the composition of the flora, since the organisms found when the Holloman diet was fed for prolonged periods differed from the organisms when the Holloman- Transition diet was fed for a period of only two weeks. This demonstrated that the distribution of fecal anaerobes is influenced by the length of feed of certain types as well as by the diet itself.

The distribution of the anaerobes in the fecal samples is summarized according to each individual animal in Table XXIII and the totals for each animal are presented in Table XIV. Only the presence of 25% or more of the total isolations of a certain organism will be considered to present a significant difference from the overall average picture. Using this as a criterion relatively few organisms appeared to be isolated more frequently in one animal than in the average. Steve showed 30% of the FA-3, 25% of all of the FA-4, FA-12 and FA-17 groups that were isolated, while Phil carried 30% of the FA-6 and 40% of the FA-10 isolated. Mimi had 50% of the FA-3, Red carried 25% of FA-1, Elbys 25% of FA-2, and Manuel had 40% of the CT-1 group. Since many of these percentages are based on rather small numbers of isolations, such as four or five occurrences, the percentages should not be considered as representing a marked incidence, with the possible exception of FA-3, since 80% of the seventeen isolations of FA-3 occurred in two animals. Steve was the one chimpanzee with more strict anaerobes than the average which probably explains why his name appears on the list so frequently. From these data it would appear that diet had more influence than the individual animal on the types of both strict and facultative anaerobes which were isolated and screened from these animals.

Comparing the distribution of the anaerobes in the fecal samples on the Holloman diet fed at Wisconsin with the baseline data obtained from the fecal samples of the chimpanzees at the Holloman colony it would appear that the main difference lay in the simpler flora found in the animals on the Wisconsin diet as the experiment progressed since of the nineteen types of obligate anaerobes considered on both studies, seventeen occurred during the basic experiment and only thirteen occurred during the Wisconsin trials. FA-3 was found only one-half as often in the Wisconsin trials as on the basic study, which is of interest since FA-3 was the only organism which seems strongly animal-oriented. Thus the chance choice of certain chimpanzees may have influenced the occurrence of this group of bacteria. FA-6 was not found on the Holloman diet when fed at Wisconsin but occurred fourteen times during the basic study and FA-11 and FA-12 were also not found on the Wisconsin study but were isolated nine and eight times respectively on the Holloman study. Among the facultative anaerobes the enterococci and lactobacilli occurred about twice as frequently during the Wisconsin study as during the basic Holloman trials. Thus it would appear that a simpler flora tending toward a greater frequency of occurrence of lactobacilli and enterococci was found on the animals at Wisconsin when fed the same diet as at Holloman.

Since it was noted that facultative anaerobes become more numerous when the diet is changed frequently, the increase in the facultative anaerobic lactobacilli and enterococci on the nutrition study may be due to the frequency of changing diets.

4. Discussion of Anaerobic Data

The findings from the human fecal flora studies done under contract AF33(615) 1748, "Determination of Aerobic and Anaerobic Microflora of Human Feces," and AF33(615)1814, "Biomedical Criteria for Personal Hygiene," using procedures similar to those employed in this study show that diet influences the anaerobic fecal flora of the human. Also, numerous animal studies with subjects other than primates have shown that diet plays an important part in determining the composition of the anaerobic intestinal flora. For this reason emphasis was placed on the influence of the diets fed in the Wisconsin study upon the anaerobic fecal flora of the chimpanzees. The factors considered were the relative proportion of aerobes to anaerobes, the ratio of facultative to strict anaerobes and distribution of the individual types of anaerobes and facultative anaerobes isolated from chimpanzees on each diet. The influence of the sampling period, the diet and the individual animal was considered for all three factors.

The predominance of anaerobes over aerobes in the feces has been established both in the basic Holloman study and in the human trials conducted using similar techniques and the data from the animals on the Wisconsin nutrition experiment again confirmed this finding. The influence of diet on the proportion of anaerobes to aerobes was seen in this study and was somewhat more marked on certain diets such as Ciba and WARF #1 than on others. The individual animal seemed to exert little or no influence on the predominance of anaerobes over aerobes since only one animal, Steve, deviated significantly from the average.

The occurrence of obligate vs facultative anaerobes showed striking differences in animals fed various diets and was particularly marked with respect to the Holloman-Transition diet, the Purina and Ciba diets vs the WARF pelleted #1 diet. This difference probably involves the composition of the diets, since the percentage of strict anaerobes was 65% for the WARF pelleted diet compared to 19% for the transition and 33% and 35% for the Purina and Ciba diets respectively which represents a two-fold difference. However, composition alone does not seem to be the answer since the Holloman and Holloman-Transition diet had the same composition, but showed vastly different percentages of strict anaerobes, the values being 19% for the Transition diet compared to 39% for the Holloman, again representing a two-fold difference. This can be explained on the basis of the length of time during which the diet was fed, since the Holloman-Transition diet was fed for only two weeks whereas the Holloman diet was fed for a period of several weeks to several months. The carry-over in flora from other diets onto the Holloman-Transition diet was evident in several instances and the unsettled condition of the flora with a tendency toward an increase in the facultative anaerobes during this unsettled period was quite clear. From these data it can be concluded that both the composition of diet and the length of time that the diet was fed played a role in the predominance of the facultative anaerobes over strict anaerobes.

The individual animal showed less marked fluctuations in the proportion of strict vs obligate anaerobes from the average than was found between various diets. It is interesting to note that Steve, the animal which showed the greatest predominance of anaerobes over aerobes, also showed the greatest predominance of strict anaerobes over facultative anaerobes. On the other hand Mimi, who showed as great a difference with respect to strict vs facultative anaerobes as Steve, conformed exactly to the average on the predominance of anaerobes over aerobes. Both Denise and Elbys, who showed a below average figure with respect to the ratio of strict vs facultative anaerobes, were near the overall average with respect to the predominance of anaerobes over aerobes. Thus only Steve seems to be a really "anaerobic" chimpanzee and it would seem that diet played a greater part than the individual animal in the occurrence of strict anaerobes.

The distribution of the various types of anaerobes presents a very interesting picture. Both the strict anaerobes and the facultative anaerobes isolated and screened from the Wisconsin study appeared to change with an alteration in diet. Fourteen of the nineteen groups of strict anaerobic type-cultures appeared to be at least somewhat diet-related. Taking into consideration the number of samplings carried out while the animals were eating each of the different diets, the number of isolations of fourteen out of twenty-one "type" cultures were found oftener than would be expected on certain diets. This was also true of seven of the nine of facultative anaerobic type cultures. This tendency for certain organisms to occur more frequently on certain diets demonstrated the influence of diet upon the fecal anaerobes. In contrast the animals did not seem to have a peculiar or individual anaerobic flora. Only one type culture, FA-3, seemed to be strongly animal-oriented as 80% of the fourteen isolations of FA-3 occurred on two animals. Whereas nine of the "type" cultures appeared more frequently on one animal than on others, the percentage was usually only 25% of the cultures isolated and the overall occurrence of these type cultures was infrequent, so that the finding probably does not represent as marked an incidence as was seen with the diet. Thus the distribution of the various types seemed to be influenced more by diet than by the individual animal

A phenomon was observed on the basic Holloman diet which appeared even more strongly during the Wisconsin study, which was the influence of isolation from other chimpanzees outside of the colony on the diversity of anaerobic flora found in the feces of the chimpanzees. On the basic Holloman study no new chimpanzees were added to the colony following the third field trip, and the data showed that both the diversity of aerobes, and to a lesser extent the anaerobes of these animals became simpler following this isolation from new chimpanzees. This appeared more dramatically in the Wisconsin chimpanzees since only thirteen types of anaerobes out of a possible nineteen types occurred in the Wisconsin chimpanzees as compared to seventeen on the basic study. For example, FA-6, FA-11 and FA-12 were found fairly frequently in animals eating the Holloman diet on the basic Holloman study, but did not occur at all when the same diet was fed at Wisconsin.

The "type cultures" of anaerobic bacteria are being characterized physiologically and certain cultures seem more oriented toward protein degradation while others seem to depend more on carbohydrate utilization in their metabolism. When these physiological studies are completed and the composition of the diets are more fully known, conclusions may be drawn as to the relationship between composition of diet and the intestinal bacteria associated with the various dietary components.

5. Summary of Anaerobic Data

In summary, the distribution of anaerobic bacteria in the feces (both strict and facultative anaerobes) was influenced markedly by the diet fed and to a lesser extent by the individual animal. The predominance of anaerobes over aerobes and the proportion of strict vs facultative anaerobes were influenced by the composition of the diet fed, and to a lesser extent the proportion of strict vs facultative anaerobes was influenced by the individual animal. The length of time which the diet was fed also played an important role in the proportion of strict vs facultative anaerobes. An overall simplification of the diversity of types of anaerobic bacteria occurred as the test progressed and the time of isolation from new chimpanzees became longer.

SECTION V

CONCLUSIONS

The data obtained from the aerobic and anaerobic culturing of the rectal contents of chimpanzees fed various diets at Wisconsin Alumni Research Foundation under contract AF29(600)4555 show several definite results.

1. The aerobic bacteria isolated were more markedly influenced by the individual animal than by diet. This was particularly true of certain of the gram negative rods, such as proteus, pseudomonas, untypable cultures, and possibly klebsiella and certain typable beta hemolytic streptococci. Two types of bacteria, salmonella and a peculiar beta-hemolytic gram positive bacillus, were diet-oriented and may have been carried in on,or were favored by the diets. An overall simplification of the aerobic flora similar to that seen in the basic Holloman study occurred after the twelve chimpanzees had been isolated from other chimpanzees for a prolonged period of time.

2. The distribution of anaerobic bacteria in the feces(both strict and facultative anaerobes) were influenced markedly by the diet fed and to a lesser extent by the individual animal. The predominance of anaerobes over aerobes and the proportion of strict vs facultative anaerobes were influenced by the composition of the diet fed, and to a lesser extent the proportion of strict vs facultative anaerobes was influenced by the individual animal. The length of time which the diet was fed also played an important role in the proportion of strict vs facultative anaerobes. An overall simplification of the diversity of types of anaerobic bacteria occurred as the test progressed and the time of isolation from new chimpanzees became longer.

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SECTION VI

RECOMMENDATIONS

The data from work carried out under this contract point up several possible areas for future work.

1. More studies on fecal bacteria of chimpanzees needed on animals fed carefully defined diets, to determine the influence of each major nutrient, i. e., protein, animal and vegetable; carbohydrate, simple and complex; and fat, on the intestinal flora.

2. Determine the relationship of diet to the intestinal flora by careful physiological characterization of each anaerobic "type" culture to determine the role, if any, of these bacteria in the digestion of the diet and the nutrition of the host animal eating this diet.

3. Study of the fecal flora in chimpanzees fed the same two markedly different diets alternated at various time intervals to determine the minimum length of time necessary to feed a diet before the intestinal flora stabilizes.

SECTION VII

TABLES

TABLE I

Animals Sampled During Each Test Period

Period	Diet	Animal Name	Holloman Designation	RAC Designation
1	Holloman	Randy	170	CW-1
		Marc	172	CW-2
	(Regular diet)	Mimi	126	CW-3
		Sonia	122	CW-4
		Denise	145	CW-5
		Red	158	CW-6
		Steve	173	CW-7
		Phil	174	CW-8
		Elbys	117	CW-9
		Doug	175	CW-10
		Donald	198	CW-11
		Manuel	139	CW-12
2	Purina	Randy	170	CW-13
		Marc	172	CW-14
	(approx. 4 weeks)*	Mimi	126	CW-15
		Sonia	122	CW-16
		Denise	145	CW-17
		Doug	175	CW-18
		Red	158	CW-19
		Steve	173	CW-20
		Donald	198	CW-21
		Phil	174	CW-22
		Manuel	139	CW-23
		Elbys	117	CW-24
3	Purina	Randy	170	CW-25
		Marc	172	CW-26
	(approx. 6 weeks)	Red	158	CW-27
		Denise	145	CW-28
		Mimi	126	CW-29
		Sonia	122	CW-30
		Doug	175	CW-31
		Donald	198	CW-32
		Steve	173	CW-33
		Manuel	139	CW-34
		Phil	174	CW-35
		Elbys	117	CW-36

* Length of time on diet before sampling

TABLE I (Cont'd)

Animals Sampled During Each Test Period

Period	Diet	Animal Name	Holloman Designation	RAC Designation
4	Holloman-Transition (approx. 2 weeks)	Marc Randy Mimi Sonia Doug Donald Manuel Elbys Steve Phil Red Denise	172 170 126 122 175 198 139 117 173 174 158 145	CW-37 CW-38 CW-39 CW-40 CW-41 CW-42 CW-43 CW-44 CW-45 CW-46 CW-47 CW-48
5	Rockland (approx. 4 weeks)	Denise Red Phil Steve Doug Donald Randy Marc Sonia Manuel Elbys Mimi	145 158 174 173 175 198 170 172 122 139 117 126	CW-49 CW-50 CW-51 CW-52 CW-53 CW-54 CW-55 CW-56 CW-57 CW-58 CW-59 CW-60
6	Rockland (approx. 2 weeks)	Marc Randy Denise Red Manuel Doug Donald Steve Phil Sonia Mimi Elbys	172 170 145 158 139 175 198 173 174 122 126 117	CW-61 CW-62 CW-63 CW-64 CW-65 CW-66 CW-67 CW-68 CW-69 CW-70 CW-71 CW-72

TABLE I (Cont'd)

Animals Sampled During Each Test Period

Period	Diet	Animal Name	Holloman Designation	RAC Designation
7	Holloman-Transition	Marc	172	CW-73
		Randy	170	CW-74
	(approx. 10 days)	Red	158	CW-75
		Denise	145	CW-76
		Donald	198	CW-77
		Doug	175	CW-78
		Steve	173	CW-79
		Phil	174	CW-80
		Mimi	126	CW-81
		Sonia	122	CW-82
		Elbys	117	CW-83
		Manuel	139	CW-84
8	Ciba	Mimi	126	CW-85
		Sonia	122	CW-86
	(approx. 4 weeks)	Randy	170	CW-87
		Marc	172	CW-88
		Red	158	CW-89
		Denise	145	CW-90
		Phil	174	CW-91
		Steve	173	CW-92
		Doug	175	CW-93
		Donald	198	CW-94
		Elbys	117	CW-95
		Manuel	139	CW-96
9	Ciba	Randy	170	CW-97
		Marc	172	CW-98
	(approx. 5 weeks)	Doug	175	CW-99
		Donald	198	CW-100
		Red	158	CW-101
		Denise	145	CW-102
		Steve	173	CW-103
		Phil	174	CW-104
		Mimi	126	CW-105
		Sonia	122	CW-106
		Elbys	117	CW-107
		Manual	139	CW-108

TABLE I (Cont'd)

Animals Sampled During Each Test Period

Period	Diet	Animal Name	Holloman Designation	RAC Designation
10	Holloman-Transition (approx. 2 weeks)	Mimi	126	CW-109
		Sonia	122	CW-110
		Marc	172	CW-111
		Randy	170	CW-112
		Doug	175	CW-113
		Donald	198	CW-114
		Elbys	117	CW-115
		Steve	173	CW-116
		Phil	174	CW-117
		Manuel	139	CW-118
		Red	158	CW-119
		Denise	145	CW-120
11	Holloman (approx. 4 weeks)	Randy	170	CW-120A
		Marc	172	CW-121
		Denise	145	CW-122
		Red	158	CW-123
		Steve	173	CW-124
		Phil	174	CW-125
		Sonia	122	CW-126
		Mimi	126	CW-127
		Manuel	136	CW-128
		Elbys	117	CW-129
		Donald	198	CW-130
12	Holloman (approx. 6 weeks)	Randy	170	CW-131
		Marc	172	CW-132
		Red	158	CW-133
		Denise	145	CW-134
		Mimi	126	CW-135
		Sonia	122	CW-136
		Phil	174	CW-137
		Steve	173	CW-138
		Elbys	117	CW-139
		Manuel	136	CW-140
		Donald	198	CW-141

TABLE I (Concluded)

Animals Sampled During Each Test Period

Period	Diet	Animal Name	Holloman Designation	RAC Designation
13	WARF Pelleted #1	Randy	170	CW-142
	(approx. 16 days)	Marc	172	CW-143
		Sonia	122	CW-144
		Mimi	126	CW-145
		Denise	145	CW-146
		Red	158	CW-147
		Steve	173	CW-148
		Phil	174	CW-149
		Donald	198	CW-150
		Elbys	117	CW-151
		Manuel	139	CW-152
14	WARF Pelleted #1	Marc	172	CW-153
	(approx. 4 weeks)	Randy	170	CW-154
		Phil	174	CW-155
		Steve	173	CW-156
		Sonia	122	CW-157
		Mimi	126	CW-158
		Donald	198	CW-159
		Elbys	117	CW-160
		Denise	145	CW-161
		Red	158	CW-162
		Manuel	139	CW-163
15	Holloman-Transition	Marc	172	CW-164
	(approx. 1 week)	Randy	170	CW-165
		Sonia	122	CW-166
		Mimi	126	CW-167
		Red	158	CW-168
		Denise	145	CW-169
		Donald	198	CW-170
		Elbys	117	CW-171
		Steve	173	CW-172
		Manuel	139	CW-173
		Phil	174	CW-174

TABLE II

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Randy	170	1		X			X								X	X			Poly B; no type
Marc	172	2																	E. coli; no type
Mimi	126	3									X				X		X		E. coli B
Sonia	122	4													X				
Denise	145	5																	E. coli B
Red	158	6													X				
Steve	173	7																	E. coli; no type
Phil	174	8																	
Elbys	117	9			X										X		X		Poly B; no type
Doug	175	10																	E. coli; no type
Donald	198	11		X	X														E. coli; no type
Manuel	139	12			X	X				X							X		E. coli; Poly B; no type

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Randy	170	13													X				E. coli - no type E. coli Poly B - no further type
Marc	172	14																	E. coli Poly B 0128:B12 E. coli Poly B 086:B7
Mimi	126	15			X														E. coli - no type
Sonia	122	16		X						X									E. coli - no type
Denise	145	17		X															E. coli - no type
Doug	175	18																	
Red	158	19		X															E. coli Poly B 128:B12
Steve	173	20																	E. coli - no type
Donald	198	21											X		X				
Phil	174	22								X									
Manuel	139	23			X	X													E. coli - no type
Elbys	117	24																	E. coli - no type

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Anitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Randy	170	25																	E. coli
Marc	172	26																	E. coli
Red	158	27																	
Denise	145	28		X															E. coli
Mimi	126	29	X			X													E. coli
Sonia	122	30					X												E. coli
Doug	175	31																	E. coli
Donald	198	32	X																
Steve	173	33																	E. coli
Manuel	139	34				X	X												
Phil	174	35																	E. coli
Elbys	117	36																	E. coli; Poly A

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus				Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
					morganii	vulgaris	mirabilis	rettgeri											
Marc	172	37																	E. coli
Randy	170	38		X											X				E. coli
Mimi	126	39													X				E. coli; Poly B E. coli; Poly B 0124:B17
Sonia	122	40		X											X				E. coli
Doug	175	41																	E. coli; Poly B0128:B12 E. coli
Donald	198	42													X				
Manuel	139	43																	E. coli
Elbys	117	44																	E. coli
Steve	173	45																	E. coli
Phil	174	46	X																E. coli
Red	158	47													X				
Denise	145	48																	E. coli

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
DENISE	145	49																X	E. coli-086:b7, 011:B4, 0124:B17, 0127:B8 E. coli poly A & B
RED	158	50	X																E. coli
PHIL	174	51																	E. coli - poly B, 086:B7
STEVE	173	52																	E. coli, poly B, no serotype
DOUG	175	53																	E. coli - poly B, 086:B7
DONALD	198	54																	E. coli - poly A & B, 0127:B8 E. coli - poly B, 086:B7
RANDY	170	55	X																E. coli - no type
MARC	172	56																X	E. coli
SONIA	122	57					X												E. coli - no type
MANUEL	139	58	X	X		X												X	
ELBYS	117	59																	E. coli poly B, 086:B7
MIMI	126	60																	E. coli - no type

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
MARC	172	61																	
RANDY	170	62	X												X				E. coli - no type
DENISE	145	63																	E. coli poly B 086:B7, E. coli - no type
RED	158	64	X												X		X		
MANUEL	139	65																	
DOUG	175	66	X															X	E. coli - no type
DONALD	198	67																	Coli - poly B - no serotype E. coli poly B 086:B7
STEVE	173	68		X		X													E. coli - no type
PHIL	174	69								X									
SONIA	122	70	X												X				
MIMI	126	71	X												X			X	E. coli poly B 086:B7
ELBYS	117	72				X												X	E. coli - no type E. coli poly B 086:B7

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Anitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
MARC	172	73													X				E. coli - no type
RANDY	170	74	X	X											X				E. coli - no type
RED	158	75																	E. coli - no type
DENISE	145	76				X								X					E. coli - no type
DONALD	198	77													X				
DOUG	175	78		X															E. coli - no type
STEVE	173	79													X				E. coli - no type
PHIL	174	80								X									E. coli 086:B7, coli - no type
MIMI	126	81				X													E. coli - no type
SONIA	122	82					X												E. coli
ELBYS	117	83																	E. coli
MANUEL	139	84																	E. coli

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Anitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
MIMI	126	85		X		X	X											X	E. coli
SONIA	122	86		X											X				E. coli
RANDY	170	87		X											X			X	E. coli
MARC	172	88																	E. coli
RED	158	89																	E. coli poly A-B, 111:B4, 0126B16
DENISE	145	90				X									X				E. coli
PHIL	174	91													X				E. coli
STEVE	173	92			X										X				
DOUG	175	93																	E. coli
DONALD	198	94																X	
ELBYS	117	95		X															E. coli
MANUEL	139	96		X		X												X	E. coli

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Anitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
RANDY	170	97																	E. coli - no type
MARC	172	98																	E. coli poly A&B 0126:B16, 111:B4 E. coli
DOUG	175	99																	E. coli - no type
DONALD	198	100																	
RED	158	101																	E. coli - no type
DENISE	145	102				X													E. coli - no type
STEVE	173	103			X														
PHIL	174	104		X															
MIMI	126	105				X													
SONIA	122	106		X											X			X	E. coli - no type
ELBYS	117	107																	E. coli - no type
MANUEL	139	108		X															E. coli 0127:B8 - 0124:B17

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Mimi	126	109													X			Poly O	Coli; Arizona-Citrobacter
Sonia	122	110													X			X	Coli; Poly A; Arizona-Citrobacter
Marc	172	111													X				Coli; Poly A & B
Randy	170	112													X				Coli
Doug	175	113													X				Coli
Donald	198	114																	Coli; Arizona-Citrobacter
Elbys	117	115																	Coli; Poly B 0119:B14
Steve	173	116																X	Coli; Poly B 0125:B15; Arizona-Citrobacter
Phil	174	117																	Coli
Manuel	139	118																X	Coli; Arizona-Citrobacter
Red	158	119																	
Denise	145	120																	Coli

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Randy	170	120a																	Coli
Marc	172	121																	Coli
Denise	145	122																	Coli
Red	158	123																	Coli
Steve	173	124																	Coli
Phil	174	125								X									Coli
Sonia	122	126			X														Coli
Mimi	126	127											X						Coli; Poly A 0126:B16; Poly B 0111: B4
Manuel	139	128																	Coli
Elbys	117	129																	Coli
Donald	198	130																	

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Randy	170	131		X															Coli
Marc	172	132													X				Coli
Red	158	133	X												X				Coli
Denise	145	134																	Coli
Mimi	126	135																	Coli
Sonia	122	136																	Coli
Phil	174	137																	Coli
Steve	173	138																	Coli
Elbys	117	139																	Coli
Manuel	139	140																	Coli; Poly A 0127:B8; Poly A 011:B4; Poly B 0126:B16
Donald	198	141																	

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Anitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Randy	170	142																	Coli Poly A 011:B4
Marc	172	143																X	
Sonia	122	144													X			X	
Mimi	126	145				X													Coli
Denise	145	146																	Coli; Bethesda Ballerup
Red	158	147																	Coli; Bethesda Ballerup
Steve	173	148																	Coli
Phil	174	149								X									
Donald	198	150																	
Elbys	117	151				X													Coli
Manuel	139	152				X				X									Coli Poly B 086:B7

TABLE II (Cont'd)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Marc	172	153																	Coli
Randy	170	154																	
Phil	174	155								X									
Steve	173	156																	Coli
Sonia	122	157																	Coli
Mimi	126	158																	Coli
Donald	198	159																	
Elbys	117	160																	Coli
Denise	145	161																	Coli
Red	158	162																	Coli
Manuel	139	163																	

TABLE II (Concluded)

GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Marc	172	164																	Coli
Randy	170	165				X													Coli
Sonia	122	166	X	X											X			X	Coli; type A&B, Bethesda-Ballerup
Mimi	126	167																	Coli
Red	158	168																	Coli
Denise	145	169		X															Coli
Donald	198	170																	Coli
Elbys	117	171																	Coli
Steve	173	172																	Coli
Manuel	139	173								X									Coli
Phil	174	174								X									Coli

TABLE III

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Randy	170	1		X			X								X	X			Poly B - no type
Randy	170	13													X				E. coli - no type E. coli, Poly B-no further type
Randy	170	25																	E. coli
Randy	170	38		X											X				E. coli
Randy	170	55	X																E. coli - no type
Randy	170	62	X												X				E. coli - no type
Randy	170	74	X	X											X				E. coli - no type
Randy	170	87		X											X			X	E. coli
Randy	170	97																	E. coli - no type
Randy	170	112													X				E. coli
Randy	170	120a																	E. coli
Randy	170	131		X															E. coli
Randy	170	142																	E. coli; Poly A 011:B4
Randy	170	154																	
Randy	170	165				X													E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus				Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
					morganii	vulgaris	mirabilis	rettgeri											
Marc	172	2																	E. coli - no type
Marc	172	14																	E. coli, Poly B0128:B12 E. coli, Poly B086:B7
Marc	172	26																	E. coli
Marc	172	37																	E. coli
Marc	172	56																X	E. coli
Marc	172	61																	
Marc	172	73														X				E. coli - no type
Marc	172	88																	E. coli
Marc	172	98																	E. coli, Poly A&B 0126:B16, 111:B4 E. coli
Marc	172	111														X				E. coli; Poly A & B
Marc	172	121																	E. coli
Marc	172	132														X				E. coli
Marc	172	143																X	
Marc	172	153																	E. coli
Marc	172	164																	E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Mimi	126	3									X				X		X		E. coli B
Mimi	126	15			X														E. coli - no type
Mimi	126	29	X			X													E. coli
Mimi	126	39													X				E. coli - Poly B E. coli - Poly B 0124:B17
Mimi	126	60																	E. coli - no type
Mimi	126	71	X												X			X	E. coli Poly B 086:B7
Mimi	126	81				X													E. coli - no type
Mimi	126	85		X		X	X											X	E. coli
Mimi	126	105				X													
Mimi	126	109													X			Poly O	E. coli; Arizona-Citrobacter
Mimi	126	127											X						E. coli ; Poly A0126:B16; Poly B 011:B4
Mimi	126	135																	E. coli
Mimi	126	145				X													E. coli
Mimi	126	158																	E. coli
Mimi	126	167																	E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Sonia	122	4													X				
Sonia	122	16		X						X									E. coli - no type
Sonia	122	30					X												E. coli
Sonia	122	40		X											X				E. coli
Sonia	122	57					X												E. coli - no type
Sonia	122	70	X												X				
Sonia	122	82					X												E. coli
Sonia	122	86		X											X				E. coli
Sonia	122	106		X											X			X	E. coli - no type
Sonia	122	110													X			X	E. coli; Poly A; Arizona-Citrobacter
Sonia	122	126			X														E. coli
Sonia	122	136																	E. coli
Sonia	122	144													X			X	
Sonia	122	157																	E. coli
Sonia	122	166	X	X											X			X	E. coli; Type A&B; Bethesda-Ballerup

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Denise	145	5																	E. coli - B
Denise	145	17		X															E. coli - no type
Denise	145	28		X															E. coli
Denise	145	48																	E. coli
Denise	145	49																X	E. coli; 086:B7, 011:B4, 0124:B17, 0127:B8 E. coli Poly A&B
Denise	145	63																	E. coli Poly B 086:B7 E. coli - no type
Denise	145	76				X								X					E. coli - no type
Denise	145	90				X									X				E. coli
Denise	145	102				X													E. coli - no type
Denise	145	120																	E. coli
Denise	145	122																	E. coli
Denise	145	134																	E. coli
Denise	145	146																	E. coli; Bethesda-Ballerup
Denise	145	161																	E. coli
Denise	145	169		X															E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Red	158	6													X				
Red	158	19		X															E. coli; Poly B 0128:B12
Red	158	27																	
Red	158	47													X				
Red	158	50	X																E. coli
Red	158	64	X												X		X		
Red	158	75																	E. coli - no type
Red	158	89																	E. coli Poly A&B 111:B4; 0126:B16
Red	158	101																	E. coli - no type
Red	158	119																	
Red	158	123																	E. coli
Red	158	133	X												X				E. coli
Red	158	147																	E. coli; Bethesda-Ballerup
Red	158	162																	E. coli
Red	158	168																	E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus				Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
					morganii	vulgaris	mirabilis	rettgeri											
Steve	173	7																	E. coli - no type
Steve	173	20																	E. coli - no type
Steve	173	33																	E. coli
Steve	173	45																	E. coli
Steve	173	52																	E. coli; Poly B - no serotype
Steve	173	68		X		X													E. coli - no type
Steve	173	79													X				E. coli - no type
Steve	173	92			X										X				
Steve	173	103			X														
Steve	173	116																X	Coli; Poly B 0125:B15; Arizona-Citrobacter
Steve	173	124																	E. coli
Steve	173	138																	E. coli
Steve	173	148																	E. coli
Steve	173	156																	E. coli
Steve	173	172																	E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Phil	174	8																	
Phil	174	22								X									
Phil	174	35																	E. coli
Phil	174	46	X																E. coli
Phil	174	51																	E. coli; Poly B 086:B7
Phil	174	69								X									
Phil	174	80								X									E. coli 086:B7, E. coli - no type
Phil	174	91													X				E. coli
Phil	174	104		X															
Phil	174	117																	E. coli
Phil	174	125								X									E. coli
Phil	174	137																	E. coli
Phil	174	149								X									
Phil	174	155								X									
Phil	174	174								X									E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Elbys	117	9			X										X		X		Poly B - no type
Elbys	117	24																	E. coli - no type
Elbys	117	36																	E. coli - Poly A
Elbys	117	44																	E. coli
Elbys	117	59																	E. coli, Poly B 086:B7
Elbys	117	72				X												X	E. coli - no type E. coli, Poly B 086:B7
Elbys	117	83																	E. coli
Elbys	117	95		X															E. coli
Elbys	117	107																	E. coli - no type
Elbys	117	115																	E. coli; Poly B 0119:B14
Elbys	117	129																	E. coli
Elbys	117	139																	E. coli
Elbys	117	151				X													E. coli
Elbys	117	160																	E. coli
Elbys	117	171																	E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Donald	198	11		X	X														E. coli - no type
Donald	198	21											X		X				
Donald	198	32	X																
Donald	198	42													X				
Donald	198	54																	E. coli, Poly A&B 0127:B8 E. coli, Poly B 086:B7
Donald	198	67																	E. coli; Poly B -- no serotype E. coli Poly B, 086:B7
Donald	198	77													X				
Donald	198	94																X	
Donald	198	100																	
Donald	198	114																	E. coli; Arizona-Citrobacter
Donald	198	130																	
Donald	198	141																	
Donald	198	150																	
Donald	198	159																	
Donald	198	170																	E. coli

TABLE III (Cont'd)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Manuel	139	12			X	X				X							X		E. coli, Poly B - no type
Manuel	139	23			X	X													E. coli - no type
Manuel	139	34				X	X												
Manuel	139	43																	E. coli
Manuel	139	58	X	X		X												X	
Manuel	139	65																	
Manuel	139	84																	E. coli
Manuel	139	96		X		X												X	E. coli
Manuel	139	108		X															E. coli; 0127:B8 - 0124:B17
Manuel	139	118																X	E. coli; Arizona-Citrobacter
Manuel	139	128																	E. coli
Manuel	139	140																	E. coli; Poly A 011:B4; 0127:B8; Poly B 0126:B16
Manuel	139	152				X				X									E. coli; Poly B 086:B7
Manuel	139	163																	
Manuel	139	173								X									E. coli

TABLE III (Concluded)

COMPARISON OF GRAM NEGATIVE BACILLI RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
Doug	175	10																	E. coli - no type
Doug	175	18																	
Doug	175	31																	E. coli
Doug	175	41																	E. coli Poly B 0128:B12 E. coli
Doug	175	53																	E. coli, Poly B 086:B7
Doug	175	66	X															X	E. coli - no type
Doug	175	78		X															E. coli - no type
Doug	175	93																	E. coli
Doug	175	99																	E. coli - no type
Doug	175	113													X				E. coli

TABLE IIIa

Most Commonly Occurring Aerobic Fecal Bacteria in Chimpanzee Colony by Sampling Period

Bacteria	Holloman	Purina	Purina	Holloman-Transition	Rockland	Rockland	Holloman-Transition	Ciba	Ciba	Holloman-Transition	Holloman	Holloman	WARF Pelleted #1	WARF Pelleted #1	Holloman-Transition	Total
Gram Neg. Bacilli																
Escherichia coli	7	7	9	10	10	5	10	9	7	11	10	10	7	7	11	130
E. coli type	5	4	1	3	8	4	1	1	2	7	1	3	4		2	46
Aerobacter	5	2		5		4	4	5	1	5		2	1		1	35
Proteus	5	3	4		2	2	3	5	3		1		3		1	32
Unkeyed	2	3	1	2	1	1	2	5	3			1			2	23
Salmonella					3	3		4	1	4			2		1	18
Streptococcus																
Mitis	10	8	12	11	3	6	11	11	12	7	8	10	10	8	11	138
Enterococci	4	10	9	4	8	12	12	12	9	11	10	11	8	9	4	133
Beta Hemolytic Strep	17	6		6	4	10	6	8	6	9	11	7	8	6	10	114
Salivarius	11	10	10	9	2	5	8	6	7	11	8	6	6	6	7	112
Non-type	7	12		7	6	8	5	6	6	6	11	7	6	6	9	102
Misc. Aerobes																
Lactobacillus	2	12	3	7	11	12	12	12	11	12	10	10	11	11	11	147
Staphylococci	7	5	3	9	9	7	7	9	10	7	3	3	7	10	8	104
Coag. Pos. Staph		1	2	4			2	3	3	2			1	2	2	22
Gram Pos. Rod*													8	11		19
Corynebacter	1				3			2		1	2	2	2		5	18

*Beta hemolytic rod

TABLE IIIa (cont'd)

Most Commonly Occurring Aerobic Fecal Bacteria in Chimpanzee Colony by Diet

Bacteria	Holloman	Purina	Holloman Transition	Rockland	Ciba	WARF #1	RAC 1094 -5FR	Total
Gram Negative Bacilli								
Escherichia coli	27	16	42	15	16	14	67	130
E. coli type	9	5	13	12	3	4	37	45
Aerobacter	7	2	15	4	6	1	19	35
Proteus	6	7	4	4	8	3	26	32
Unkeyed	3	4	6	2	8	-	13	23
Salmonella	-	-	5	6	5	2	1	18
Streptococcus								
Mitis	28	20	40	9	23	18	46	138
Enterococci	25	19	31	20	21	17	29	133
Beta Hemolytic Strep	35	6	31	14	14	14	63	114
Salivarius	25	20	35	7	13	12	52	112
Non-type	25	12	27	14	12	12	51	102
Misc. Aerobes								
Lactobacillus	22	15	42	23	23	22	56	147
Staphylococci	13	8	31	16	19	17	57	104
Coag. Pos. Staph	0	3	10	0	6	3	12	22
Gram Pos. Rod*	0	0	0	0	0	19	0	19
Corynebacter	5	0	6	3	2	2	16	18

* Beta hemolytic rod

TABLE IV

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Randy	170	1			X		X	X							X	
Marc	172	2			X		X	X							X	
Mimi	126	3	X	X*	X			X								
Sonia	122	4		X*	X		X									
Denise	145	5			X	X	X							X		
Red	158	6	X	X*	X		X	X								
Steve	173	7	X	X*	X		X									
Phil	174	8		X*			X									
Elbys	117	9		X*	X		X	X								
Doug	175	10			X		X	X						X		
Donald	198	11			X		X									
Manuel	139	12	X	X*	X											

* Potentially Pathogenic

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman Number	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G
RANDY	170	13	X	X	X	X	X			X					
MARC	172	14	X	X	X	X	X				X				
MIMI	126	15		X*	X	X	X								
SONIA	122	16	X	X*	X										
DENISE	145	17	X	X*		X	X								
DOUG	175	18	X	X*	X										
RED	158	19	X	X	X										
STEVE	173	20	X	X	X		X								
DONALD	198	21	X	X	X		X								
PHIL	174	22	X	X	X		X							X	
MANUEL	139	23	X	X		X									
ELBYS	117	24		X	X		X								

* Potentially Pathogenic

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
RANDY	170	25	X		X		X									X
MARC	172	26			X		X									
RED	158	27	X		X		X									X
DENISE	145	28	X		X		X									
MIMI	126	29	X		X		X									X
SONIA	122	30	X		X		X									X
DOUG	175	31	X				X									
DONALD	198	32	X		X	X	X									X
STEVE	173	33	X		X		X									X
MANUEL	139	34			X		X									
PHIL	174	35	X		X		X									
ELBYS	117	36					X									

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
MARC	172	37		X*	X	X	X									
RANDY	170	38			X		X									
MIMI	126	39		X*			X									
SONIA	122	40			X		X									
DOUG	175	41		X	X		X									
DONALD	198	42			X		X									X
MANUEL	139	43		X*	X		X									
ELBYS	117	44	X	X*	X											
STEVE	173	45		X*			X									
PHIL	174	46	X	X*			X									
RED	158	47	X		X	X	X									X
DENISE	145	48	X		X		X									X

* Potentially Pathogenic

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
DENISE	145	49	X	X*			X									
RED	158	50	X													
PHIL	174	51	X	X*	X											
STEVE	173	52		X*												
DOUG	175	53														
DONALD	198	54		X												
RANDY	170	55	X		X	X	X									
MARC	172	56	X													X
SONIA	122	57	X													
MANUEL**	139	58		X												
ELBYS	117	59	X	X			X									
MIMI	126	60	X													

* Indicates possible pathogenicity
** Strep – Group B

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
MARC**	172	61	X				X		X							
RANDY	170	62	X											X		
DENISE	145	63	X	X	X		X			X						
RED	158	64	X		X	X	X									
MANUEL	139	65	X			X										
DOUG	175	66	X			X										
DONALD	198	67	X	X*		X										
STEVE	173	68	X	X*	X		X									
PHIL	174	69	X	X*												
SONIA	122	70	X	X*												
MIMI	126	71	X	X*	X		X									
ELBYS	117	72	X	X*	X		X									

* Indicates possible pathogenicity
** Group B Streptococcus

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
MARC	172	73	X	X*	X		X									
RANDY	170	74	X	X*	X		X									
RED	158	75	X				X									
DENISE**	145	76	X				X							X		
DONALD	198	77	X		X		X									
DOUG	175	78	X	X*	X											
STEVE	173	79	X		X	X	X									
PHIL	174	80	X		X		X									
MIMI	126	81	X	X*	X	X	X									
SONIA	122	82	X	X*			X									
ELBYS	117	83	X		X		X									
MANUEL	139	84	X				X									

* Indicates possible pathogenicity
** Group B Streptococcus

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
MIMI	126	85	X	X*			X									
SONIA	122	86	X	X*	X		X									
RANDY	170	87	X		X		X									
MARC	172	88	X	X*			X			X						
RED	158	89	X		X											
DENISE	145	90	X	X*	X	X	X									
PHIL	174	91	X				X									
STEVE	173	92	X		X		X									
DOUG	175	93	X	X*		X	X									
DONALD	198	94	X	X*			X									
ELBYS	117	95	X				X			X						
MANUEL	139	96	X		X		X									

* Indicates possible pathogenicity

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
RANDY	170	97	X	X*	X		X									
MARC	172	98	X	X*	X		X									
DOUG	175	99	X			X	X									
DONALD	198	100	X	X*			X									
RED	158	101	X	X*	X		X									
DENISE	145	102	X	X*	X		X									
STEVE	173	103					X									
PHIL	174	104		X*	X		X									
MIMI	126	105	X			X	X									
SONIA	122	106	X		X		X									
ELBYS	117	107			X		X									
MANUEL	139	108	X			X	X									

* Indicates possible pathogenicity

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Mimi	126	109	X	X*	X		X									
Sonia	122	110	X	X*			X									
Marc	172	111	X	X*	X											
Randy	170	112	X		X					X						Type B
Doug	175	113	X		X		X									
Donald	198	114	X		X		X									
Elbys	117	115	X	X*	X											
Steve	173	116	X		X											
Phil	174	117	X		X		X									
Manuel	139	118	X	X*	X											
Red	158	119	X		X		X									Type B
Denise	145	120		X*	X		X									

*Potentially pathogenic

TABLE IV (cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Randy	170	120a	X	X*	X											
Marc	172	121	X	X*	X											
Denise	145	122	X	X*			X									
Red	158	123	X	X*	X		X									
Steve	173	124	X	X*	X		X									
Phil	174	125	X	X*	X											
Sonia	122	126	X	X*	X		X									
Mimi	126	127	X	X*			X									
Manuel	139	128	X	X*			X									
Elbys	117	129		X*	X		X									
Donald	198	130	X	X*	X		X									

*Potentially Pathogenic

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Randy	170	131	X		X											
Marc	172	132	X	X*	X		X									
Red	158	133	X	X*	X		X									
Denise	145	134	X	X*	X		X									
Mimi	126	135	X	X*	X		X									
Sonia	122	136	X				X									
Phil	174	137	X	X*	X		X									
Steve	173	138	X	X*			X									
Elbys	117	139	X	X*			X									
Manuel	139	140	X				X									
Donald	198	141	X				X									

*Potentially Pathogenic

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Randy	170	142			X		X			X						Type B
Marc	172	143					X			X						Type B
Sonia	122	144	X		X		X									
Mimi	126	145	X							X						
Denise	145	146	X	X*			X									
Red	158	147		X*	X		X									
Steve	173	148	X	X*	X		X									
Phil	174	149	X	X*	X		X									
Donald	198	150	X	X*	X		X									
Elbys	117	151	X	X*			X									
Manuel	139	152	X				X									

*Potentially Pathogenic

TABLE IV (Cont'd)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Marc	172	153			X											
Randy	170	154	X	X*	X											
Phil	174	155	X		X											
Steve	173	156		X*			X									
Sonia	122	157	X		X		X									
Mimi	126	158	X	X*	X		X									
Donald	198	159	X				X									
Elbys	117	160	X	X*			X									
Denise	145	161	X	X*			X									
Red	158	162	X	X*	X		X									
Manuel	139	163	X				X									

*Potentially Pathogenic

TABLE IV (Concluded)

STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Marc	172	164	X	X*			X									
Randy	170	165	X	X*	X		X									
Sonia	122	166	X				X									
Mimi	126	167		X*			X		X							
Red	158	168	X	X*	X		X									
Denise	145	169		X*	X		X									
Donald	198	170					X									
Elbys	117	171		X*	X		X									
Steve	173	172		X*	X		X									
Manuel	139	173		X*	X		X									
Phil	174	174		X*	X		X									

TABLE V

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Randy	170	1			X		X	X							X	
Randy	170	13	X	X	X	X	X			X						
Randy	170	25	X		X		X									X
Randy	170	38			X		X									
Randy	170	55	X		X	X	X									
Randy	170	62	X											X		
Randy	170	74	X	X*	X		X									
Randy	170	87	X		X		X									
Randy	170	97	X	X*	X		X									
Randy	170	112	X		X					X						Type B
Randy	170	120a	X	X*	X											
Randy	170	131	X		X											
Randy	170	142			X		X			X						Type B
Randy	170	154	X	X*	X											
Randy	170	165	X	X*	X		X									

* Potentially Pathogenic

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Marc	172	2			X		X	X							X	
Marc	172	14	X	X	X	X	X			X						
Marc	172	26			X		X									
Marc	172	37		X*	X	X	X									
Marc	172	56	X													X
Marc***	172	61	X				X		X							
Marc	172	73	X	X*	X		X									
Marc	172	88	X	X*			X			X						
Marc	172	98	X	X*	X		X									
Marc	172	111	X	X*	X											
Marc	172	121	X	X*	X											
Marc	172	132	X	X*	X		X									
Marc	172	143					X			X						Type B
Marc	172	153			X											
Marc	172	164	X	X*			X									

* Potentially Pathogenic
*** Group B streptococcus

TABLE V (Cont'd)
COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Mimi	126	3	X	X*	X			X								
Mimi	126	15		X*	X	X	X									
Mimi	126	29	X		X		X									X
Mimi	126	39		X*			X									
Mimi	126	60	X													
Mimi	126	71	X	X*	X		X									
Mimi	126	81	X	X*	X	X	X									
Mimi	126	85	X	X*			X									
Mimi	126	105	X			X	X									
Mimi	126	109	X	X*	X		X									
Mimi	126	127	X	X*			X									
Mimi	126	135	X	X*	X		X									
Mimi	126	145	X							X						
Mimi	126	158	X	X*	X		X									
Mimi	126	167		X*			X		X							

* Potentially Pathogenic

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Sonia	122	4		X*	X		X									
Sonia	122	16	X	X*	X											
Sonia	122	30	X		X		X									X
Sonia	122	40			X		X									
Sonia	122	57	X													
Sonia	122	70	X	X*												
Sonia	122	82	X	X*			X									
Sonia	122	86	X	X*	X		X									
Sonia	122	106	X		X		X									
Sonia	122	110	X	X*			X									
Sonia	122	126	X	X*	X		X									
Sonia	122	136	X				X									
Sonia	122	144	X		X		X									
Sonia	122	157	X		X		X									
Sonia	122	166	X				X									

* Potentially Pathogenic

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Denise	145	5			X	X	X							X		
Denise	145	17	X	X*		X	X									
Denise	145	28	X		X		X									
Denise	145	48	X		X		X									X
Denise	145	49	X	X*			X									
Denise	145	63	X	X	X		X			X						
Denise***	145	76	X				X							X		
Denise	145	90	X	X*	X	X	X									
Denise	145	102	X	X*	X		X									
Denise	145	120		X*	X		X									
Denise	145	122	X	X*			X									
Denise	145	134	X	X*	X		X									
Denise	145	146	X	X*			X									
Denise	145	161	X	X*			X									
Denise	145	169		X*	X		X									

* Potentially Pathogenic
*** Group B streptococcus

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Red	158	6	X	X*	X		X	X								
Red	158	19	X	X	X											
Red	158	27	X		X		X									X
Red	158	47	X		X	X	X									X
Red	158	50	X													
Red	158	64	X		X	X	X									
Red	158	75	X				X									
Red	158	89	X		X											
Red	158	101	X	X*	X		X									Type B
Red	158	119	X		X		X									
Red	158	123	X	X*	X		X									
Red	158	133	X	X*	X		X									
Red	158	147		X*	X		X									
Red	158	162	X	X*	X		X									
Red	158	168	X	X*	X		X									

* Potentially Pathogenic

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Steve	173	7	X	X*	X		X									
Steve	173	20	X	X	X		X									
Steve	173	33	X		X		X									X
Steve	173	45		X*			X									
Steve	173	52		X*												
Steve	173	68	X	X*	X		X									
Steve	173	79	X		X	X	X									
Steve	173	92	X		X		X									
Steve	173	103					X									
Steve	173	116	X		X											
Steve	173	124	X	X*	X		X									
Steve	173	138	X	X*			X									
Steve	173	148	X	X*	X		X									
Steve	173	156		X*			X									
Steve	173	172		X*	X		X									

* Potentially Pathogenic

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Phil	174	8		X*			X									
Phil	174	22	X	X	X		X									
Phil	174	35	X		X		X									X
Phil	174	46	X	X*			X									
Phil	174	51	X	X*	X											
Phil	174	69	X	X*												
Phil	174	80	X		X		X									
Phil	174	91	X				X									
Phil	174	104		X*	X		X									
Phil	174	117	X		X		X									
Phil	174	125	X	X*	X											
Phil	174	137	X	X*	X		X									
Phil	174	149	X	X*	X		X									
Phil	174	155	X		X											
Phil	174	174		X*	X		X									

* Potentially Pathogenic

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Elbys	117	9		X*	X		X	X						X		
Elbys	117	24		X	X		X									
Elbys	117	36					X									
Elbys	117	44	X	X*	X											
Elbys	117	59	X	X			X									
Elbys	117	72	X	X*	X		X									
Elbys	117	83	X		X		X									
Elbys	117	95	X				X			X						
Elbys	117	107			X		X									
Elbys	117	115	X	X*	X											
Elbys	117	129		X*	X		X									
Elbys	117	139	X	X*			X									
Elbys	117	151	X	X*			X									
Elbys	117	160	X	X*			X									
Elbys	117	171		X*	X		X									

* Potentially Pathogenic

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Donald	198	11			X		X									
Donald	198	21	X	X	X		X									
Donald	198	32	X		X	X	X									X
Donald	198	42			X		X									X
Donald	198	54		X												
Donald	198	67	X	X*		X										
Donald	198	77	X		X		X									
Donald	198	94	X	X*			X									
Donald	198	100	X	X*			X									
Donald	198	114	X		X		X									
Donald	198	130	X	X*	X		X									
Donald	198	141	X				X									
Donald	198	150	X	X*	X		X									
Donald	198	159	X				X									
Donald	198	170					X									

* Potentially Pathogenic

TABLE V (Cont'd)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Manuel	139	12	X	X*	X											
Manuel	139	23	X	X		X										
Manuel	139	34			X		X									
Manuel	139	43		X*	X		X									
Manuel**	139	58		X												
Manuel	139	65	X			X										
Manuel	139	84	X				X									
Manuel	139	96	X		X		X									
Manuel	139	108	X			X	X									
Manuel	139	118	X	X*	X											
Manuel	139	128	X	X*			X									
Manuel	139	140	X				X									
Manuel	139	152	X				X									
Manuel	139	163	X				X									
Manuel	139	173		X*	X		X									

* Potentially Pathogenic
** Strep - Group B

TABLE V (Concluded)

COMPARISON OF STREPTOCOCCUS FROM FECES

Animal	Holloman No.	RAC Number CW	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
Doug	175	10		X*	X		X	X						X		
Doug	175	18	X	X*	X											
Doug	175	31	X				X									
Doug	175	41		X	X		X									
Doug	175	53														
Doug	175	66	X			X										
Doug	175	78	X	X*	X											
Doug	175	93	X	X*		X	X									
Doug	175	99	X			X	X									
Doug	175	113	X		X		X									

* Potentially Pathogenic

TABLE VI

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO**	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media***	Lactobacillus	Sarcina	Gaffkya	Neisseria
Randy	170	1					X				X				
Marc	172	2	X				X				X				
Mimi	126	3	X		X		X		X		X				
Sonia	122	4						X	X		X				
Denise	145	5	X						X						
Red	158	6	X		X		X		X						X
Steve	173	7	X				X								
Phil	174	8	X				X		X		X	X			
Elbys	117	9	X				X		X		X	X			
Doug	175	10							X		X				X
Donald	198	11		X											X
Manuel	139	12							X						X

* Possible Pathogen
** See Page 7
*** See separate tables

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman Number	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO **	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media ***	Lactobacillus	Sarcina	Gaffkya	Neisseria
RANDY	170	13										X			
MARC	172	14	X								X	X			
MIMI	126	15	X								X	X			
SONIA	122	16									X	X			
DENISE	145	17										X			
DOUG	175	18	X*								X	X			
RED	158	19									X	X			
STEVE	173	20	X								X	X			
DONALD	198	21									X	X			
PHIL	174	22	X									X			
MANUEL	139	23										X			
ELBYS	117	24									X	X			

* Possible pathogen
** See Page 7
*** See separate tables

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman Number	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO **	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media ***	Lactobacillus	Sarcina	Gaffkya	Neisseria
RANDY	170	25									X				
MARC	172	26										X			
RED	158	27									X				
DENISE	145	28										X			
MIMI	126	29	X								X				
SONIA	122	30									X				
DOUG	175	31										X			
DONALD	198	32									X				
STEVE	173	33	*X												
MANUEL	139	34	*X								X				
PHIL	174	35									X				
ELBYS	117	36													

* Possible pathogen
** See Page 7
*** See separate tables

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman Number	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO **	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media ***	Lactobacillus	Sarcina	Gaffkya	Neisseria
MARC	172	37	X								X	X			
RANDY	170	38									X	X			
MIMI	126	39	X								X	X			
SONIA	122	40	*X								X	X			
DOUG	175	41	X								X	X			
DONALD	198	42									X				
MANUEL	139	43	*X								X				
ELBYS	117	44	*X			X									
STEVE	173	45	X								X	X			
PHIL	174	46	X								X	X			
RED	158	47	*X								X				
DENISE	145	48									X				

* Possible pathogen
** See Page 7
*** See separate tables

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO * *	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
DENISE	145	49						X			X	X			
RED	158	50	X								X	X			
PHIL	174	51	X								X	X			
STEVE	173	52	X									X			
DOUG	175	53	X					X			X	X			
DONALD	198	54						X				X			
RANDY	170	55	X								X	X			
MARC	172	56	X								X				
SONIA	122	57									X	X			
MANUEL	139	58	X								X	X			
ELBYS	117	59	X								X	X			
MIMI	126	60	X								X	X			

** See Page 7

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO **	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
MARC	172	61									X	X			
RANDY	170	62									X	X			
DENISE	145	63									X	X			
RED	158	64	X								X	X			
MANUEL	139	64	X								X	X			
DOUG	175	66	X								X	X			
DONALD	198	67									X	X			
STEVE	173	68	X									X			
PHIL	174	69	X								X	X			
SONIA	122	70									X	X			
MIMI	126	71	X								X	X			
ELBYS	117	72	X								X	X			

** See Page 7

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO * *	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacilius	Sarcina	Gaffkya	Neisseria
MARC	172	73	X								X	X			
RANDY	170	74	X								X	X			
RED	158	75										X			
DENISE	145	76	X								X	X			
DONALD	198	77	X								X	X			
DOUG	175	78									X	X			
STEVE	173	79									X	X			
PHIL	174	80									X	X			
MIMI	126	81	X*								X	X			
SONIA	122	82									X	X			
ELBYS	117	83	X*								X	X			
MANUEL	139	84	X								X	X			

* Indicates possible pathogenicity
** See Page 7

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO **	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
MIMI	126	85	X*								X	X			
SONIA	122	86										X			
RANDY	170	87	X								X	X			
MARC	172	88	X									X			
RED	158	89	X*									X			
DENISE	145	90	X								X	X			
PHIL	174	91	X								X	X			
STEVE	173	92						X				X			
DOUG	175	93	X*								X	X			
DONALD	198	94									X	X			
ELBYS	117	95	X					X				X			
MANUEL	139	96	X								X	X			

* Indicates possible pathogenicity

** See Page 7

TABLE VI (cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO **	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
RANDY	170	97									X	X			
MARC	172	98	X*								X	X			
DOUG	175	99	X*								X	X			
DONALD	198	100	X								X	X			
RED	158	101	X									X			
DENISE	145	102	X									X			
STEVE	173	103	X*					X				X			
PHIL	174	104	X								X	X			
MIMI	126	105	X					X			X				
SONIA	122	106	X									X			
ELBYS	117	107										X			
MANUEL	139	108	X									X			

* Indicates possible pathogenicity

** See Page 7

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Mimi	126	109	X								X	X			
Sonia	122	110									X	X			
Marc	172	111	X								X	X			
Randy	170	112									X	X			
Doug	175	113	X*								X	X			
Donald	198	114									X	X			
Elbys	117	115	X								X	X			
Steve	173	116	X								X	X			
Phil	174	117									X	X			
Manuel	139	118	X*					X			X	X			
Red	158	119	X									X			
Denise	145	120									X	X			

*Potentially pathogenic

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Randy	170	120a									X	X			
Marc	172	121									X	X			
Denise	145	122									X	X			
Red	158	123										X			
Steve	173	124	X								X	X			
Phil	174	125	X								X	X			
Sonia	122	126	X								X	X			
Mimi	126	127						X			X	X			
Manuel	139	128									X				
Elbys	117	129						X			X	X			
Donald	198	130									X	X			

TABLE VI (cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Randy	170	131									X	X			
Marc	172	132	X								X	X			
Red	158	133										X			
Denise	145	134									X	X			
Mimi	126	135	X					X			X	X			
Sonia	122	136										X			
Phil	174	137									X	X			
Steve	173	138													
Elbys	117	139	X					X			X	X			
Manuel	139	140									X	X			
Donald	198	141										X			

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Randy	170	142									X	X			
Marc	172	143							X**		X	X			
Sonia	122	144	X						X**			X			
Mimi	126	145	X*						X**			X			
Denise	145	146							X**		X	X			
Red	158	147	X					X	X**		X	X			
Steve	173	148	X					X	X**		X	X			
Phil	174	149									X	X			
Donald	198	150	X						X**		X	X			
Elbys	117	151	X								X	X			
Manuel	139	152	X						X**		X	X			

* Potentially pathogenic
** Beta hemolytic bacillus

TABLE VI (Cont'd)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Marc	172	153	X						X**		X	X		X	
Randy	170	154	X*						X**		X	X	X		
Phil	174	155	X						X**		X	X			
Steve	173	156	X*						X**			X			
Sonia	122	157	X						X**		X	X		X	
Mimi	126	158	X						X**		X	X			
Donald	198	159	X						X**			X			
Elbys	117	160	X						X**		X	X			
Denise	145	161							X**		X	X			
Red	158	162	X						X**			X			
Manuel	139	163	X						X**			X			

* Potentially pathogenic
** Beta hemolytic bacillus

TABLE VI (Concluded)

MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Marc	172	164	X					X			X	X			
Randy	170	165						X			X	X			
Sonia	122	166	X					X			X	X			
Mimi	126	167	X					X			X	X			
Red	158	168										X			
Denise	145	169									X	X			
Donald	198	170	X									X			
Elbys	117	171	X*					X			X	X			
Steve	173	172	X								X	X			
Manuel	139	173	X									X			
Phil	174	174	X*								X	X			

*Potentially pathogenic

TABLE VII

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Randy	170	1					X				X				
Randy	170	13										X			
Randy	170	25									X				
Randy	170	38									X	X			
Randy	170	55	X								X	X			
Randy	170	62									X	X			
Randy	170	74	X								X	X			
Randy	170	87	X								X	X			
Randy	170	97									X	X			
Randy	170	112									X	X			
Randy	170	120a									X	X			
Randy	170	131									X	X			
Randy	170	142									X	X			
Randy	170	154	X*						X**		X	X	X		
Randy	170	165						X			X	X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Marc	172	2	X				X				X				
Marc	172	14	X								X	X			
Marc	172	26										X			
Marc	172	37	X								X	X			
Marc	172	56	X								X				
Marc	172	61									X	X			
Marc	172	73	X								X	X			
Marc	172	88	X									X			
Marc	172	98	X*								X	X			
Marc	172	111	X								X	X			
Marc	172	121									X	X			
Marc	172	132	X								X	X			
Marc	172	143							X**		X	X			
Marc	172	153	X						X**		X	X		X	
Marc	172	164	X					X			X	X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO **	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media***	Lactobacillus	Sarcina	Gaffkya	Neisseria
Mimi	126	3	X		X		X		X		X				
Mimi	126	15	X								X	X			
Mimi	126	29	X								X				
Mimi	126	39	X								X	X			
Mimi	126	60	X								X	X			
Mimi	126	71	X								X	X			
Mimi	126	81	X*								X	X			
Mimi	126	85	X*								X	X			
Mimi	126	105	X					X			X				
Mimi	126	109	X								X	X			
Mimi	126	127						X			X	X			
Mimi	126	135	X					X			X	X			
Mimi	126	145	X*						X****			X			
Mimi	126	158	X						X****		X	X			
Mimi	126	167	X					X			X	X			

* Potentially Pathogenic
** See Page
*** See Separate Page

**** = Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Sonia	122	4						X	X		X				
Sonia	122	16									X	X			
Sonia	122	30									X				
Sonia	122	40	X*								X	X			
Sonia	122	57									X	X			
Sonia	122	70									X	X			
Sonia	122	82									X	X			
Sonia	122	86										X			
Sonia	122	106	X									X			
Sonia	122	110									X	X			
Sonia	122	126	X								X	X			
Sonia	122	136										X			
Sonia	122	144	X						X**			X			
Sonia	122	157	X						X**		X	X		X	
Sonia	122	166	X					X			X	X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Denise	145	5	X						X						
Denise	145	17										X			
Denise	145	28										X			
Denise	145	48									X				
Denise	145	49						X			X	X			
Denise	145	63									X	X			
Denise	145	76	X								X	X			
Denise	145	90	X								X	X			
Denise	145	102	X									X			
Denise	145	120									X	X			
Denise	145	122									X	X			
Denise	145	134									X	X			
Denise	145	146							X**		X	X			
Denise	145	161							X**		X	X			
Denise	145	169									X	X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Red	158	6	X		X		X		X						X
Red	158	19									X	X			
Red	158	27									X				
Red	158	47	X*								X				
Red	158	50	X								X	X			
Red	158	64	X								X	X			
Red	158	75										X			
Red	158	89	X*									X			
Red	158	101	X									X			
Red	158	119	X									X			
Red	158	123										X			
Red	158	133										X			
Red	158	147	X					X	X**		X	X			
Red	158	162	X						X**			X			
Red	158	168										X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Steve	173	7	X				X								
Steve	173	20	X								X	X			
Steve	173	33	X*												
Steve	173	45	X*								X	X			
Steve	173	52	X									X			
Steve	173	68	X									X			
Steve	173	79									X	X			
Steve	173	92						X				X			
Steve	173	103	X*					X				X			
Steve	173	116	X								X	X			
Steve	173	124	X								X	X			
Steve	173	138													
Steve	173	148	X					X	X**		X	X			
Steve	173	156	X*						X**			X			
Steve	173	172	X								X	X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Phil	174	8	X				X		X		X	X			
Phil	174	22	X									X			
Phil	174	35									X				
Phil	174	46	X								X	X			
Phil	174	51	X								X	X			
Phil	174	69	X								X	X			
Phil	174	80									X	X			
Phil	174	91	X								X	X			
Phil	174	104	X								X	X			
Phil	174	117									X	X			
Phil	174	125	X								X	X			
Phil	174	137									X	X			
Phil	174	149									X	X			
Phil	174	155	X						X**		X	X			
Phil	174	174	X*								X	X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Elbys	117	9	X				X		X		X	X			
Elbys	117	24									X	X			
Elbys	117	36													
Elbys	117	44	X*			X									
Elbys	117	59	X								X	X			
Elbys	117	72	X								X	X			
Elbys	117	83	X*								X	X			
Elbys	117	95	X					X				X			
Elbys	117	107										X			
Elbys	117	115	X								X	X			
Elbys	117	129						X			X	X			
Elbys	117	139	X					X			X	X			
Elbys	117	151	X								X	X			
Elbys	117	160	X						X**		X	X			
Elbys	117	171	X*					X			X	X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Donald	198	11		X											X
Donald	198	21									X	X			
Donald	198	32									X				
Donald	198	42									X				
Donald	198	54						X				X			
Donald	198	67									X	X			
Donald	198	77	X								X	X			
Donald	198	94									X	X			
Donald	198	100	X								X	X			
Donald	198	114									X	X			
Donald	198	130									X	X			
Donald	198	141										X			
Donald	198	150	X						X**		X	X			
Donald	198	159	X						X**			X			
Donald	198	170	X									X			

* Potentially Pathogenic

** Beta Hemolytic Bacillus

TABLE VII (Cont'd)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Manuel	139	12							X						X
Manuel	139	23										X			
Manuel	139	34	X*								X				
Manuel	139	43	X*								X				
Manuel	139	58	X								X	X			
Manuel	139	65	X								X	X			
Manuel	139	84	X								X	X			
Manuel	139	96	X								X	X			
Manuel	139	108	X									X			
Manuel	139	118	X*					X			X	X			
Manuel	139	128									X				
Manuel	139	140									X	X			
Manuel	139	152	X						X**		X	X			
Manuel	139	163	X						X**			X			
Manuel	139	173	X									X			

* Potentially Pathogenic
** Beta Hemolytic Bacillus

TABLE VII (Concluded)

COMPARISON OF MISCELLANEOUS AEROBES RECOVERED FROM FECES

Animal	Holloman No.	RAC Number CW	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
Doug	175	10							X		X				X
Doug	175	18	X*								X	X			
Doug	175	31										X			
Doug	175	41	X								X	X			
Doug	175	53	X					X			X	X			
Doug	175	66	X								X	X			
Doug	175	78									X	X			
Doug	175	93	X*								X	X			
Doug	175	99	X*								X	X			
Doug	175	113	X*								X	X			

* Potentially Pathogenic

TABLE VIII

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast*	Geotrichum Candidum	Unidentified
Randy	170	1		X	X		
Marc	172	2	X				
Mimi	126	3				X	
Sonia	122	4	X				
Denise	145	5					
Red	158	6					
Steve	173	7					
Phil	174	8		X	X		
Elbys	117	9					
Doug	175	10					
Donald	198	11		X			
Manuel	139	12					

* Black Mucoid

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
Randy	170	13					
Marc	172	14					
Mimi	126	15	X			X	
Sonia	122	16				X	
Denise	145	17					
Doug	175	18				X	
Red	158	19				X	
Steve	173	20				X	
Donald	198	21				X	
Phil	174	22				X	
Manuel	139	23					
Elbys	117	24				X	

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
Randy	170	25					
Marc	172	26					
Red	158	27				X	
Denise	145	28					
Mimi	126	29		X			
Sonia	122	30				X	
Doug	175	31				X	
Donald	198	32				X	
Steve	173	33					
Manuel	139	34		X			
Phil	174	35					
Elbys	117	36					

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
Marc	172	37				X	
Randy	170	38				X	
Mimi	126	39	X				
Sonia	122	40	X				
Doug	175	41				X	
Donald	198	42		X			
Manuel	139	43				X	
Elbys	117	44					
Steve	173	45					
Phil	174	46				X	
Red	158	47				X	
Denise	145	48			X		

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
DENISE	145	49					
RED	158	50		X			
PHIL	174	51	X				
STEVE	173	52					
DOUG	175	53				X	
DONALD	198	54					
RANDY	170	55	X				
MARC	172	56		X			
SONIA	122	57			X		
MANUEL	139	58			X		
ELBYS	117	59		X			
MIMI	126	60		X			

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
MARC	172	61		X			
RANDY	170	62			X		
DENISE	145	63			X		
RED	158	64		X			
MANUEL	139	65	X				
DOUG	175	66	X				
DONALD	198	67	X				
STEVE	173	68					
PHIL	174	69	X				
SONIA	122	70			X		
MIMI	126	71				X	
ELBYS	117	72			X		

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
MARC	172	73	X				
RANDY	170	74	X	X			
RED	158	75					
DENISE	145	76	X				
DONALD	198	77		X			
STEVE	173	79		X			
PHIL	174	80			X		
MIMI	126	81		X			
SONIA	122	82				X	
ELBYS	117	83		X			
MANUEL	139	84			X		

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
MIMI	126	85					
SONIA	122	86					
RANDY	170	87			X		
MARC	172	88					
RED	158	89					
DENISE	145	90			X		
PHIL	174	91			X		
STEVE	173	92					
DOUG	175	93				X	
DONALD	198	94		X			
ELBYS	117	95					
MANUEL	139	96				X	

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
RANDY	170	97		X			
MARC	172	98		X			
DOUG	175	99		X			
DONALD	198	100			X		
RED	158	101					
DENISE	145	102					
STEVE	173	103					
PHIL	174	104			X		
MIMI	126	105				X	
SONIA	122	106					
ELBYS	117	107					
MANUEL	139	108					

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
Mimi	126	109		X			
Sonia	122	110		X	X		
Marc	172	111		X			
Randy	170	112	C. albicans				
Doug	175	113		X			
Donald	198	114	C. albicans				
Elbys	117	115					
Steve	173	116		X			
Phil	174	117		X			
Manuel	139	118		X			
Red	158	119					
Denise	145	120		X			

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
Randy	170	120a					
Marc	172	121		X			
Denise	145	122		X			
Red	158	123					
Steve	173	124		X			
Phil	174	125					
Sonia	122	126					
Mimi	126	127					
Manuel	139	128					
Elbys	117	129		X			
Donald	198	130		X			

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Other
Randy	170	131			C. Pseudo-tropicalis		
Marc	172	132			C. Pseudo-tropicalis		
Red	158	133			Candida sp.		
Denise	145	134					
Mimi	126	135					
Sonia	122	136					
Phil	174	137					
Steve	173	138					
Elbys	117	139					Penicillium sp.
Manuel	139	140					Sporotrichum sp.
Donald	198	141					Graphium sp.

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
Randy	170	142			X		
Marc	172	143					
Sonia	122	144		X			
Mimi	126	145					
Denise	145	146		X			
Red	158	147			X		
Steve	173	148					
Phil	174	149					
Donald	198	150		X			
Elbys	117	151		X			
Manuel	139	152			X		

TABLE VIII (cont'd)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Other
Marc	172	153			C. Krusei		
Randy	170	154					Penicillium sp.
Phil	174	155			Candida sp.		
Steve	173	156					Cryptococcus (Saprophytic) sp.
Sonia	122	157			C. Pseudo-tropicalis		Alternaria sp.
Mimi	126	158					
Donald	198	159					
Elbys	117	160					Mold sp. Chromogenic (yellow)
Denise	145	161			Candida sp.		
Red	158	162					
Manuel	139	163					

TABLE VIII (Concluded)

Types of Fungi Isolated

Animal	Holloman Number	RAC Number CW	Candida Tropicallis	Trichosporom sp.	Yeast	Geotrichum Candidum	Unidentified
Marc	172	164					
Randy	170	165					
Sonia	122	166					
Mimi	126	167			Candida sp.		
Red	158	168					
Denise	145	169					
Donald	198	170					
Elbys	117	171			Candida sp.		
Steve	173	172					
Manuel	139	173					
Phil	174	174					

TABLE IX

Total Occurrence of Gram Negative Bacilli Recovered from Feces

Test Period	Total No. of Animals	Typable E. coli	Klebsiella	Unkeyed	Proteus morganii	Proteus vulgaris	Proteus mirabilis	Proteus rettgeri	Bacterium Antitratum	Pseudomonas	Alcaligenes	Moraxella-mima	Hafnia	Providence	Aerobacter	Serratia	Shigella	Salmonella	Escherichia
1	12	5		2	3	1	1			1	1				5	1	3		7
2	12	4		3	2	1				2			1		2				7
3	12	1	2	1		2	2												9
4	12	3	1	2											5				10
5	12	8	3	1		1	1											3	10
6	12	4	5	1		2				1					4		1	3	5
7	12	1	1	2		2	1			1				1	4				10
8	12	1		5	1	3	1								5			4	9
9	12	2		3	1	2									1			1	7
10	12	7													5			4	11
11	11	1			1					1			1						10
12	11	3	1	1											2				10
13	11	4				3				2					1			2	7
14	11									1									7
15	11	2	1	2		1				2					1			1	11
Total	175	46	14	23	8	18	6			11	1		2		35	1	4	18	130

TABLE X

Total Occurrence of Streptococcus from Feces

Test Period	Total No. of Animals	Beta Hemolytic Streptococci	Enterococci	Non-Types	Salivarius	Bovis	Mitis	Human C	Type A	Type C	Equinus	Type F	Type D	Type G	Group G	Mixed Strain
1	12	17	4	7	11	1	10	6						2	2	
2	12	6	10	12	10	5	8			1	1				1	
3	12		9		10	1	12									6
4	12	6	4	7	9	2	11									3
5	12	4	8	6	2	1	3									1
6	12	10	12	8	5	4	6		1	1				1		
7	12	6	12	5	8	2	11							1		
8	12	8	12	6	6	2	11			2						
9	12	6	9	6	7	3	12									
10	12	9	11	6	11		7			1						
11	11	11	10	11	8		8									
12	11	7	11	7	6		10									
13	11	8	8	6	6		10			3						
14	11	6	9	6	6		8									
15	11	10	4	9	7		11		1							
Total	175	114	133	102	112	21	138	6	2	8	1			4	3	10

TABLE XI

Total Occurrence of Miscellaneous Aerobes Recovered from Feces

Test Period	Total No. of Animals	Coagulase Positive Staphylococci	Staphylococcus	Haemophilus	Pneumococcus	Leptotrichia	PPLO	Corynebacteria	Gram Positive Rod	Vibrio	Fungi Media	Lactobacillus	Sarcina	Gaffkya	Neisseria
1	12		7	1	2		7	1	8		7	2			4
2	12	1	5								8	12			
3	12	2	3								7	3			
4	12	4	9			1					11	7			
5	12		9					3			10	11			
6	12		7								11	12			
7	12	2	7								11	12			
8	12	3	9					2			7	12			
9	12	3	10								6	11			
10	12	2	7					1			11	12			
11	11		3					2			10	10			
12	11		3					2			7	10			
13	11	1	7					2	8*		9	11			
14	11	2	10						11*		7	11	2	1	
15	11	2	8					5			8	11			
Total	175	22	104	1	2	1	7	18	27		130	147	2	1	4

* Beta Hemolytic Bacillus

TABLE XII

Comparative Height of Growth of Aerobic and Anaerobic Bacteria from Fecal Samples

		Sampling Period											
		I			II			III			IV		
Holloman Number	Chimpanzee	A(1)	AN(2)	Diff.(3)	A	AN	Diff.	A	AN	Diff.	A	AN	Diff.
170	Randy	5	7	2	6	9	3	6	9	3	6	8	2
172	Marc	>4	9	5	6	9	3	6	9	3	6	9	3
126	Mimi	>4	8	4	6	9	3	5	7	2	6	9	3
122	Sonia	>4	8	4	6	8	2	6	8	2	6	8	2
145	Denise	5	7	2	5	7	2	6	9	3	6	8	2
158	Red	5	8	3	6	8	2	6	9	3	6	8	2
173	Steve	5	8	3	6	8	2	5	7	2	5	8	3
174	Phil	5	8	3	5	8	3	6	8	2	6	8	2
117	Elbys	5	8	3	6	9	3	6	9	3	4	9	5
175	Doug	5	8	3	5	6	1	>4	7	3	6	9	3
198	Donald	5	8	3	6	9	3	5	9	4	6	8	2
139	Manuel	5	9	4	6	8	2	5	8	3	5	8	3
		V			VI			VII			VIII		
170	Randy	6	9	3	6	9	3	5	8	3	6	9	3
172	Marc	6	8	2	6	9	3	5	8	3	4	9	5
126	Mimi	6	8	2	6	10	4	6	9	3	>4	8	4
122	Sonia	6	8	2	6	8	2	5	9	4	4	8	4
145	Denise	6	9	3	5	8	3	5	9	4	6	9	3
158	Red	6	8	2	5	8	3	6	8	2	6	9	3
173	Steve	5	8	3	4	8	4	6	10	4	>4	10	6
174	Phil	6	8	2	6	8	2	5	8	3	4	8	4
117	Elbys	6	9	3	5	7	2	6	7	1	4	8	4
175	Doug	5	8	3	6	9	3	6	9	3	5	8	3
198	Donald	6	10	4	5	9	4	5	9	4	4	9	5
139	Manuel	6	8	2	5	8	3	6	9	3	4	7	3

TABLE XII (Concluded)

Holloman Number	Chimpanzee	IX A(1)	IX AN(2)	IX Diff.(3)	X A	X AN	X Diff.	XI A	XI AN	XI Diff.	XII A	XII AN	XII Diff.
170	Randy	6	10	4	5	8	3	6	8	2	6	10	4
172	Marc	5	8	3	5	7	2	6	9	3	6	8	2
126	Mimi	4	8	4	5	6	1	5	8	3	6	8	2
122	Sonia	>4	8	4	5	7	2	5	8	3	6	7	1
145	Denise	6	9	3	5	6	1	6	8	2	5	8	3
158	Red	5	7	2	5	8	3	6	8	2	6	8	2
173	Steve	>4	10	6	5	8	3	5	9	4	>4	7	3
174	Phil	4	9	5	5	6	1	5	9	4	<6	9	3
117	Elbys	5	10	5	5	7	2	6	8	2	6	8	2
175	Doug	6	7	1	5	8	3						
198	Donald	5	9	4	5	7	2	5	7	2	5	7	2
139	Manuel	5	8	3	5	8	3	5	7	2	<6	8	2

Holloman Number	Chimpanzee	XIII A	XIII AN	XIII Diff.	XIV A	XIV AN	XIV Diff.	XV A	XV AN	XV Diff.	Overall Average
170	Randy	5	9	4	6	10	4	5	9	4	3.1
172	Marc	4	7	3	6	9	3	5	8	3	3.0
126	Mimi	>4	8	4	6	9	3	6	10	4	3.0
122	Sonia	4	9	5	6	8	2	6	9	3	2.8
145	Denise	4	10	6	6	7	1	6	10	4	2.8
158	Red	5	8	3	6	10	4	6	10	4	2.7
173	Steve	6	10	4	6	9	3	6	10	4	3.6
174	Phil	5	10	5	6	9	3	6	9	3	3.0
117	Elbys	4	9	5	6	8	2	6	10	4	3.1
175	Doug										2.6
198	Donald	4	7	3	6	8	2	6	9	3	3.1
139	Manuel	5	8	3	6	9	3	6	8	2	2.7
											3.0

(1) Calculated highest tube in dilution series with aerobic bacteria
(2) Highest tube in dilution series showing anaerobic growth
(3) Number of 10-fold differences between aerobic and anaerobic bacterial growth

TABLE XIII

Average Difference in Comparative Heighth of Aerobic and Anaerobic Bacterial Growth for Each Sampling Period

I - 3.5	IX - 3.7
II - 2.4	X - 2.2
III - 2.7	XI - 2.6
IV - 2.7	XII - 2.3
V - 2.5	XIII - 4.1
VI - 3.0	XIV - 2.7
VII - 3.0	XV - 3.5
VIII - 4.0	Overall - 3.0

TABLE XIV

Average Difference in Comparative Heighth of Aerobic and Anaerobic Bacterial Growth for Each Diet

Holloman	Holloman-Transition	Purina	Rockland	Ciba	WARF #1
2.8	2.8	2.55	2.75	3.85	3.2

TABLE XV

Occurrence of Obligate and Facultative Anaerobic Bacterial Cultures in the Top Three Dilutions of Fecal Samples Showing Growth

		Sampling Period															
		I		II		III		IV		V		VI		VII		VIII	
Holloman Number	Animal	A	F	A	F	A	F	A	F	A	F	A	F	A	F	A	F
170	Randy	1	2	1	2	0	3	0	3	2	1	1	2	0	3	2	1
172	Marc	3	0	2	1	1	2	1	2	1	2	2	1	1	2	2	1
126	Mimi	2	1	1	2	0	3	2	1	1	2	3	0	0	3	1	2
122	Sonia	1	2	1	2	0	3	1	2	1	2	1	2	0	3	2	1
145	Denise	1	2	0	3	1	2	0	3	1	2	1	2	1	2	1	2
158	Red	2	1	1	2	2	1	1	2	1	2	2	1	1	2	1	2
173	Steve	1	2	0	3	1	2	1	2	1	2	1	2	1	2	1	2
174	Phil	1	2	1	2	2	1	1	2	1	2	0	3	1	2	2	1
117	Elbys	1	2	0	3	1	2	1	2	1	2	1	2	0	3	0	3
198	Donald	1	2	1	2	2	1	0	3	2	1	1	2	1	2	0	3
139	Manuel	2	1	1	2	3	0	2	1	1	2	2	1	0	3	1	2
175	Doug	1	2	0	3	1	2	0	3	1	2	1	2	0	3	0	3
Total		17	19	9	27	14	22	10	26	14	22	16	20	6	30	13	23

A - Obligate Anaerobes

F - Facultative Anaerobes

TABLE XV (Concluded)

		Sampling Period																
		IX		X		XI		XII		XIII		XIV		XV		Total		
Holloman Number	Animal	A	F	A	F	A	F	A	F	A	F	A	F	A	F	A	F	% A
170	Randy	1	2	1	2	0	3	2	1	3	0	0	3	0	3	14	31	31
172	Marc	1	2	0	3	1	2	1	2	2	1	0	3	0	3	18	27	40
126	Mimi	2	1	1	2	2	1	0	3	3	0	3	0	1	2	22	23	49
122	Sonia	1	2	0	3	2	1	0	3	3	0	3	0	0	3	16	29	36
145	Denise	0	3	0	3	2	1	1	2	0	3	2	1	0	3	11	34	24
158	Red	0	3	0	3	1	2	2	1	1	2	3	0	1	2	19	26	42
173	Steve	3	0	1	2	3	0	0	3	2	1	3	0	3	0	22	23	49
174	Phil	1	2	0	3	2	1	1	2	3	0	2	1	0	3	18	27	40
117	Elbys	0	3	0	3	1	2	1	2	3	0	1	2	1	2	12	33	27
198	Donald	1	2	1	2	0	3	1	2	3	0	2	1	0	3	16	29	36
139	Manuel	2	1	0	3	0	3	0	3	0	3	1	2	0	3	15	30	33
175	Doug	0	3	0	3											4	26	13*
Total		12	24	4	32	14	19	9	24	23	10	20	13	6	27	187	338	36.5

A - Obligate Anaerobes
F - Facultative Anaerobes
* Not included in average

TABLE XVI

Percentage of Strict Anaerobic and Facultative Anaerobic Cultures Isolated from Top Dilutions of Fecal Samples and Screened

Experiment Number	Diet Designation	Strict Anaerobes	Facultative Anaerobes
1	Holloman	47	53
2	Purina	25	75
3	Purina	40	60
4	Holloman-Transition	29	71
5	Rockland	40	60
6	Rockland	45	55
7	Holloman-Transition	17	83
8	Ciba	36	64
9	Ciba	33	67
10	Holloman-Transition	11	89
11	Holloman	43	57
12	Holloman	27	73
13*	WARF Pelleted #1	70	30
14	WARF Pelleted #1	60	40
15	Holloman-Transition	18	82

* One animal excluded because of contamination

TABLE XVII

Percentage of Obligate and Facultative Anaerobes from Top Dilutions of Fecal Samples by Diet

Diet	% Obligate Anaerobes	% Facultative Anaerobes
Holloman	39	61
Holloman-Transition	19	81
Purina	33	67
Rockland	43	57
Ciba	35	65
WARF Pelleted #1	65	35

TABLE XVIII

Number of Anaerobes Isolated from Fecal Samples Screened
With Percentage of Each Type of Anaerobes Keyed
by Sampling Period

	Total	Sampling Period														
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
Total Screened	1083	95	84	45	56	63	88	77	69	67	45	97	95	70	61	71
Total Obligate Anaerobes	394	45	24	18	16	28	35	14	24	21	10	37	16	43	43	20
Total Facultative Anaerobes	689	50	60	27	40	35	53	63	45	46	35	60	79	27	18	51
Percent Obligate Keyed	77	80	55	72	94	93	84	64	77	71	70	78	69	91	58	90
Percent Obligate Unkeyed	23	20	45	28	6	7	16	36	33	29	30	22	31	9	42	10
Percent Facultative Keyed	90	90	88	89	85	97	82	79	91	83	94	100	99	82	39	96
Percent Facultative Unkeyed	10	10	12	11	15	3	8	21	9	17	6	0	1	18	61	4
Percent Total Keyed	85	85	79	82	88	95	90	77	83	79	89	91	94	87	53	94
Percent Total Unkeyed	15	15	21	18	12	5	10	23	17	21	11	8	6	13	47	6

TABLE XIX

Number of Anaerobes Isolated from Fecal Samples Screened With Percentage of Each Type of Anaerobes Keyed by Diet

	Holloman	Holloman-Transition	Purina	Rockland	Ciba	WARF #1
Total Screened	287	249	129	151	136	131
Total Obligate Anaerobes	98	60	42	63	45	86
Total Facultative Anaerobes	189	189	87	88	91	45
Percent Obligate Keyed	78	72	62	89	69	75
Percent Obligate Unkeyed	22	18	38	11	31	25
Percent Facultative Keyed	97	88	88	94	87	60
Percent Facultative Unkeyed	3	12	12	6	13	40
Percent Total Keyed	91	86	80	92	81	71
Percent Total Unkeyed	9	14	20	8	19	29

TABLE XX

Distribution of Anaerobes in Fecal Samples
(First Test)

Anaerobes	Chimpanzee Number CW												
	1	2	3	4	5	6	7*	8	9	10	11	12	Total
FA-1							1						1
FA-2			2	1	1								4
FA-3													
FA-4							1						1
FA-5			1						1				2
FA-6													
FA-7													
FA-8	1	3	3	5	2	4	1	1	1	2	2	1	26
FA-9													
FA-10													
FA-11													
FA-12													
FA-13													
FA-14													
FA-15													
FA-16													
FA-17													
FA-18													
CT-1				1							1		2
CT-2													
CT-3													
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed	1	2	1		1	2					1	1	9
TOTAL	2	5	7	7	4	6	3	1	2	2	4	2	45
FN-1													
FN-2		1			1	1			1			1	5
FN-3													
FN-4								2		1		1	4
Unkeyed	1										3	1	5
Lactobacillus	1			3	1		1	2	4	4	1	1	18
Enterococci	2				1	2			5	3	1	4	18
CN-1													
CN-2													
Miscellaneous													
TOTAL	4	1	0	3	3	3	1	4	10	8	5	8	50

* Plates - aerobic spreader

TABLE XX (Cond't)

Distribution of Anaerobes in Fecal Samples

(Second Test)

Anaerobes	Chimpanzee Number CW												
	13	14	15	16	17	18*	19	20	21	22	23	24	Total
FA-1													
FA-2													
FA-3													
FA-4													
FA-5													
FA-6					1								1
FA-7													
FA-8	1	2											3
FA-9					1								1
FA-10									1	1			2
FA-11													
FA-12													
FA-13													
FA-14			1										1
FA-15								1					1
FA-16													
FA-17		2											2
FA-18													
CT-1													
CT-2			1								1		2
CT-3													
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed	1		4		2			1		3			11
TOTAL	2	4	6	0	4	0	0	2	1	4	1	0	24
FN-1	1		4	2	3		4	2	1			1	18
FN-2				2			3				1	1	7
FN-3	3												3
FN-4		1						3	3	1	1		9
Unkeyed			1					2		4			7
Lactobacillus	1				1	2						2	6
Enterococci	1	1	1	3	1						2		9
CN-1													
CN-2											1		1
Miscellaneous													
TOTAL	6	2	6	7	5	2	7	7	4	5	5	4	60

* Failure of growth on anaerobic plates

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Third Test)

Anaerobes	Chimpanzee Number CW												
	25	26	27	28	29	30	31	32	33	34	35	36	Total
FA-1			3				1						4
FA-2													
FA-3													
FA-4													
FA-5			1										1
FA-6			1										1
FA-7													
FA-8												1	1
FA-9													
FA-10		1											1
FA-11													
FA-12													
FA-13													
FA-14											1		1
FA-15													
FA-16													
FA-17													
FA-18													
CT-1									1	3			4
CT-2													
CT-3													
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed		2		1			1				1		5
TOTAL	0	3	5	1	0	0	2	0	1	3	2	1	18
FN-1				1				1					2
FN-2	2	1									1		4
FN-3					3	3							6
FN-4													
Unkeyed	1			1				1					3
Lactobacillus		1							1		3	2	7
Enterococci		2	1	2									5
CN-1													
CN-2													
Miscellaneous													
TOTAL	3	4	1	4	3	3	0	2	1	0	4	2	27

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Fourth Test)

Anaerobes	Chimpanzee Number CW												
	37	38	39	40	41	42	43	44	45	46	47	48	Total
FA-1									1				1
FA-2										1			1
FA-3													
FA-4													
FA-5													
FA-6				1	1		1		1	2			6
FA-7													
FA-8											1		1
FA-9													
FA-10													
FA-11													
FA-12									1				1
FA-13					1								1
FA-14													
FA-15													
FA-16													
FA-17													
FA-18													
CT-1							1		1	1			3
CT-2													
CT-3										1			1
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed				1									1
TOTAL	0	0	0	2	2	0	2	0	4	5	1	0	16
FN-1		1											1
FN-2		1	1								1		3
FN-3													
FN-4													
Unkeyed			1		1	1		1			2		6
Lactobacillus		1		3	1	3	1	3	1				13
Enterococci	5	4	1				2	1			1	3	17
CN-1													
CN-2													
Miscellaneous													
TOTAL	5	7	3	3	2	4	3	5	1	0	4	3	40

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Fifth Test)

Anaerobes	Chimpanzee Number CW												
	49	50	51	52	53	54	55	56	57	58	59	60	Total
FA-1		1	1	3	1			1			1		8
FA-2				1		1							2
FA-3				2		1						2	5
FA-4													
FA-5													
FA-6		1											1
FA-7													
FA-8			1				2						3
FA-9						1							1
FA-10													
FA-11													
FA-12	1												1
FA-13													
FA-14													
FA-15	2	1	1										4
FA-16													
FA-17													
FA-18													
CT-1													
CT-2												1	1
CT-3													
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed	1			1									2
TOTAL	4	3	3	7	1	3	2	1	0	0	1	3	28
FN-1													
FN-2		2			2								4
FN-3					1								1
FN-4													
Unkeyed						1							1
Lactobacillus				1	1				1		1	2	6
Enterococci	2	1	1			1	2	3	2	2	6	3	23
CN-1													
CN-2													
Miscellaneous													
TOTAL	2	3	1	1	4	2	2	3	3	2	7	5	35

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples (Sixth Test)

Anaerobes	Chimpanzee Number CW 61	62	63	64	65	66	67	68	69	70	71	72	Total
FA-1			2	1									3
FA-2							3	1				4	8
FA-3			1					1			2		4
FA-4													
FA-5	1	1											2
FA-6								2					2
FA-7					1						1		2
FA-8						1	1				1		2
FA-9				1									1
FA-10													
FA-11													
FA-12			1				1				1		3
FA-13													
FA-14													
FA-15									1				1
FA-16													
FA-17					1					1			2
FA-18													
CT-1													
CT-2													
CT-3													
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed		1						1	1	1		1	5
TOTAL	1	2	4	2	2	1	4	5	2	2	5	5	35
FN-1													
FN-2	2	1	1		2	3				1			10
FN-3													
FN-4													
Unkeyed		1						1		1		1	4
Lactobacillus		1						1	3		2		7
Enterococci	3	3	3	3	2	1	7		1	3	3	1	30
CN-1													
CN-2		1						1					2
Miscellaneous													
TOTAL	5	7	4	3	4	4	7	3	4	5	5	2	53

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples
(Seventh Test)

Anaerobes	Chimpanzee Number CW												
	73	74	75	76	77	78	79	80	81	82	83	84	Total
FA-1													
FA-2			1		1								2
FA-3								1					1
FA-4													
FA-5							1						1
FA-6													
FA-7													
FA-8	1				1								2
FA-9													
FA-10													
FA-11													
FA-12													
FA-13													
FA-14	1												1
FA-15													
FA-16													
FA-17							1						1
FA-18													
CT-1										1			1
CT-2													
CT-3													
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed	2			1			1			1			5
TOTAL	4	0	1	1	2	0	3	1	0	2	0	0	14
FN-1				1		1	2						4
FN-2			1	2	1	1				2	1	1	9
FN-3													
FN-4													
Unkeyed	3				2			1	4	1		2	13
Lactobacillus		1								1			2
Enterococci	2	6	8	4	1	6					3	4	34
CN-1													
CN-2							1						1
Miscellaneous													
TOTAL	5	7	9	7	4	8	3	1	4	4	4	7	63

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Eighth Test)

Anaerobes	Chimpanzee Number CW 85	86	87	88	89	90	91	92	93	94	95	96	Total
FA-1										1			1
FA-2				2									2
FA-3													
FA-4													
FA-5													
FA-6							1						1
FA-7													
FA-8	1	1						1			1		4
FA-9													
FA-10													
FA-11			1										1
FA-12													
FA-13													
FA-14													
FA-15							1					1	2
FA-16													
FA-17								2			1		3
FA-18													
CT-1													
CT-2						1							1
CT-3											1		1
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed		1		2	1		2		1		1		8
TOTAL	1	2	1	4	1	1	4	3	1	1	4	1	24
FN-1										1			1
FN-2					2			1				1	4
FN-3												3	3
FN-4													
Unkeyed				1			2	1					4
Lactobacillus	5	1		1		1	2			2	2	2	16
Enterococci			2	1	5	2			3	2	1		16
CN-1													
CN-2								1					1
Miscellaneous													
TOTAL	5	1	2	3	7	3	4	3	3	5	3	6	45

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Ninth Test)

Anaerobes	Chimpanzee Number CW												Total
	97	98	99	100	101	102	103	104	105	106	107	108	
FA-1													
FA-2							1	1					2
FA-3													
FA-4		3		2									5
FA-5							1						1
FA-6													
FA-7													
FA-8													
FA-9													
FA-10							1			1			2
FA-11													
FA-12													
FA-13													
FA-14													
FA-15												1	1
FA-16													
FA-17		2		1			1						4
FA-18													
CT-1													
CT-2													
CT-3													
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed	1	1		1			1		1	1			6
TOTAL	1	6	0	4	0	0	5	1	1	2	0	1	21
FN-1													
FN-2						1					2		3
FN-3													
FN-4											1		1
Unkeyed	3					2	1				2		8
Lactobacillus	1		5	1	2		2	4	3	3	2	2	25
Enterococci	3				3	2							8
CN-1									1				1
CN-2													
Miscellaneous													
TOTAL	7	0	5	1	5	5	3	4	4	3	7	2	46

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Tenth Test)

Anaerobes	Chimpanzee Number CW												
	109	110	111	112	113	114	115	116	117	118	119	120	Total
FA-1													
FA-2													
FA-3													
FA-4													
FA-5	2				1								3
FA-6		2	1					1					4
FA-7													
FA-8													
FA-9													
FA-10													
FA-11													
FA-12													
FA-13													
FA-14													
FA-15													
FA-16													
FA-17													
FA-18													
CT-1													
CT-2													
CT-3													
GD-1													
GD-2													
GD-3													
GD-4													
GD-5													
GD-6													
GD-7													
Unkeyed		1				1				1			3
TOTAL	2	3	1	0	1	1	0	1	0	1	0	0	10
FN-1				1	1								2
FN-2													
FN-3									1				1
FN-4													
Unkeyed						1			1				2
Lactobacillus			1	1	3	4	4	5					18
Enterococci							2	1		4	4		11
CN-1										1			1
CN-2													
Miscellaneous													
TOTAL	0	0	1	2	4	5	6	6	2	5	4	0	35

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Eleventh Test)

Anaerobes	Chimpanzee Number CW											
	120a	121	122	123	124	125	126	127	128	129	130	Total
FA-1	1											1
FA-2			1									1
FA-3				1	3							4
FA-4					1							1
FA-5						1	1			1		3
FA-6												
FA-7											2	2
FA-8			1			1					1	3
FA-9												
FA-10												
FA-11												
FA-12												
FA-13												
FA-14						1	2					3
FA-15		1		1			1					3
FA-16								1				1
FA-17				2								2
FA-18							2				1	3
CT-1												
CT-2						1						1
CT-3											1	1
GD-1												
GD-2												
GD-3												
GD-4												
GD-5												
GD-6												
GD-7												
Unkeyed			1			1	4	2				8
TOTAL	1	1	3	4	4	5	10	3	0	1	5	37
FN-1				1					1			2
FN-2									2			2
FN-3												
FN-4												
Unkeyed												
Lactobacillus						1	1	2		5	1	10
Enterococci	6	11	6	5	5				3		5	41
CN-1							1	3				4
CN-2								1				1
Miscellaneous												
TOTAL	6	11	6	6	5	1	2	6	6	5	6	60

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Twelfth Test)

Anaerobes	Chimpanzee Number CW											
	131	132	133	134	135	136	137	138	139	140	141	Total
FA-1			2									2
FA-2												
FA-3												
FA-4												
FA-5					1							1
FA-6												
FA-7												
FA-8												
FA-9												
FA-10												
FA-11												
FA-12												
FA-13												
FA-14												
FA-15												
FA-16												
FA-17			2	1								3
FA-18			1				1					2
CT-1												
CT-2				1								1
CT-3							1				1	2
GD-1												
GD-2												
GD-3												
GD-4												
GD-5												
GD-6												
GD-7												
Unkeyed	3				1			1				5
TOTAL	3	0	5	2	2	0	2	1	0	0	1	16
FN-1												
FN-2												
FN-3												
FN-4												
Unkeyed									1			1
Lactobacillus	2	1		1	1				1		2	8
Enterococci	5	10	7	5	3	7	7	5	8	9	1	67
CN-1	1	1			1							3
CN-2												
Miscellaneous												
TOTAL	8	12	7	6	5	7	7	5	10	9	3	79

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Thirteenth Test)

Anaerobes	Chimpanzee Number CW											Total
	142	143	144	145	146	147	148	149	150	151	152	
FA-1		2					1	2				5
FA-2										2		2
FA-3												
FA-4			1									1
FA-5	2		1					1		1	1	6
FA-6	1				1							2
FA-7				1								1
FA-8												
FA-9												
FA-10								1				1
FA-11						1						1
FA-12				1								1
FA-13												
FA-14	2				2							4
FA-15	1		1				1	1	1			5
FA-16							1					1
FA-17				2			2					4
FA-18										3		3
CT-1												
CT-2												
CT-3												
GD-1			1									1
GD-2												
GD-3												
GD-4												
GD-5									1			1
GD-6												
GD-7												
Unkeyed	1							1		1	1	4
TOTAL	7	2	4	4	3	1	5	6	2	7	2	43
FN-1												
FN-2					1							1
FN-3												
FN-4						1						1
Unkeyed		1		2				1		1		5
Lactobacillus	1		2	1	1		2	1	1	2	3	14
Enterococci			1		3							4
CN-1												
CN-2												
Miscellaneous		1*						1*				2*
TOTAL	1	2	3	3	5	1	2	3	1	3	3	27

*FN-5

TABLE XX (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Fourteenth Test)

Anaerobes	Chimpanzee Number CW											
	153	154	155	156	157	158	159	160	161	162	163	Total
FA-1			1		1						1	3
FA-2												
FA-3		1			1		1					3
FA-4												
FA-5												
FA-6												
FA-7												
FA-8												
FA-9			1									1
FA-10												
FA-11			1									1
FA-12												
FA-13												
FA-14					1			1	1	1		4
FA-15			1	2								3
FA-16												
FA-17						1						1
FA-18		1					1		1	1		4
CT-1												
CT-2												
CT-3									1		1	2
GD-1												
GD-2												
GD-3												
GD-4								1				1
GD-5												
GD-6												
GD-7			1					1				2
Unkeyed	1	3		2	1	1	4	2	1	2	1	18
TOTAL	1	5	5	4	4	2	6	5	4	4	3	43
FN-1												
FN-2				1								1
FN-3												
FN-4												
Unkeyed				2	1	1	2	1	1	2	1	11
Lactobacillus									1	4		5
Enterococci					1							1
CN-1												
CN-2												
Miscellaneous												
TOTAL	0	0	0	3	2	1	2	1	2	6	1	18

TABLE XX (Concluded)

Distribution of Anaerobes in Fecal Samples
(Fifteenth Test)

Anaerobes	Chimpanzee Number CW											
	164	165	166	167	168	169	170	171	172	173	174	Total
FA-1	2				1			1				4
FA-2												
FA-3												
FA-4												
FA-5												
FA-6			1								1	2
FA-7												
FA-8			2	1			1					4
FA-9												
FA-10											1	1
FA-11												
FA-12									1			1
FA-13												
FA-14								1				1
FA-15												
FA-16												
FA-17												
FA-18			1	1							1	3
CT-1												
CT-2												
CT-3												
GD-1												
GD-2			1		1							2
GD-3												
GD-4												
GD-5												
GD-6												
GD-7												
Unkeyed				1				1				2
TOTAL	2	0	5	3	2	0	1	3	1	0	3	20
FN-1					1							1
FN-2											2	2
FN-3							1					1
FN-4												
Unkeyed									1		1	2
Lactobacillus		4	1	3	1	1	4	2		1		17
Enterococci		1		1				4	5	5	3	19
CN-1						1						1
CN-2	1		3			1						5
Miscellaneous				1*	2*							3
TOTAL	1	5	4	5	4	3	5	6	6	6	6	51

*FN-5

TABLE XXI

Distribution of Anaerobes in Fecal Samples by Period

Anaerobes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
FA-1	1		4	1	8	3		1			1	2	5	3	4	33
FA-2	4			1	2	8	2	2	2		1		2			24
FA-3					5	4	1				4			3		17
FA-4	1								5		1		1			8
FA-5	2		1			2	1		1	3	3	1	6			20
FA-6		1	1	6	1	2		1		4			2		2	20
FA-7						2					2		1			5
FA-8	26	3	1	1	3	2	2	4			3				4	49
FA-9		1			1	1								1		4
FA-10		2	1						2				1		1	7
FA-11								1					1	1		3
FA-12				1	1	3							1		1	7
FA-13				1												1
FA-14		1	1				1				3		4	4	1	15
FA-15		1			4	1		2	1		3		5	3		20
FA-16											1		1			2
FA-17		2				2	1	3	4		2	3	4	1		22
FA-18											3	2	3	4	3	15
CT-1	2		4	3			1									10
CT-2		2			1			1			1	1				6
CT-3				1				1			1	2		2		7
GD-1													1			1
GD-2															2	2
GD-3																
GD-4														1		1
GD-5													1			1
GD-6																
GD-7														2		2
Unkeyed	9	11	5	1	2	5	5	8	6	3	8	5	4	18	2	92
TOTAL	45	24	18	16	28	35	14	24	21	10	37	16	43	43	20	394
FN-1		18	2	1			4	1		2	2				1	31
FN-2	5	7	4	3	4	10	9	4	3		2		1	1	2	55
FN-3		3	6		1			3		1					1	15
FN-4	4	9							1				1			15
Unkeyed	5	7	3	6	1	4	13	4	8	2		1	5	11	2	72
Lactobacillus	18	6	7	13	6	7	2	16	25	18	10	8	14	5	17	172
Enterococci	18	9	5	17	23	30	34	16	8	11	41	67	4	1	19	303
CN-1									1	1	4	3			1	10
CN-2		1				2	1	1			1				5	11
Miscellaneous													2*		3*	5*
TOTAL	50	60	27	40	35	53	63	45	46	35	60	79	27	18	51	689

*FN-5

TABLE XXII

Distribution of Anaerobes in Fecal Samples by Diet

Anaerobes	Diets					
	Hol.	Hol.-Tran.	Purina	Rockland	Ciba	WARF #1
FA-1	4	5	4	11	1	6
FA-2	5	3		10	4	2
FA-3	4	1		9		3
FA-4	2				5	1
FA-5	6	4	1	2	1	6
FA-6		12	2	3	1	1
FA-7	2			2		1
FA-8	29	7	4	5	4	
FA-9			1	2		1
FA-10		1	3		2	1
FA-11					1	2
FA-12		2		4		1
FA-13		1				
FA-14	3	2	2			8
FA-15	3		1	5	3	7
FA-16	1					1
FA-17	5	1	2	2	7	5
FA-18	5	3				7
CT-1	2	4	4			
CT-2	2		2	1	1	
CT-3	3	1			1	2
GD-1						1
GD-2		2				
GD-3						
GD-4						1
GD-5						1
GD-6						
GD-7						2
Unkeyed	22	11	16	7	14	22
TOTAL	98	60	42	63	45	82
FN-1	2	8	20		1	
FN-2	7	14	11	14	7	2
FN-3		2	9	1	3	
FN-4	4		9		1	1
Unkeyed	6	23	10	5	12	15
Lactobacillus	36	50	13	13	41	18
Enterococci	127	81	14	53	24	5
CN-1	6	2			1	
CN-2	1	6	1	2	1	
Miscellaneous		3*				1*
TOTAL	189	189	87	88	91	42

*. FN-5

TABLE XXIII

Distribution of Anaerobes in Fecal Samples
(Randy)

Anaerobes	Sampling Period															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
FA-1											1					1
FA-2																
FA-3														1		1
FA-4																
FA-5						1							2			3
FA-6													1			1
FA-7																
FA-8	1	1			2											4
FA-9																
FA-10																
FA-11								1								1
FA-12																
FA-13																
FA-14													2			2
FA-15													1			1
FA-16																
FA-17																
FA-18														1		1
CT-1																
CT-2																
CT-3																
GD-1																
GD-2																
GD-3																
GD-4																
GD-5																
GD-6																
GD-7																
Unkeyed	1	1				1			1			3	1	3		11
TOTAL	2	2	0	0	2	2	0	1	1	0	1	3	7	5	0	26
FN-1		1		1						1						3
FN-2			2	1		1										4
FN-3		3														3
FN-4																
Unkeyed	1	1				1			3							6
Lactobacillus	1	1		1		1	1		1	1		2	1		4	14
Enterococci	2	1		4	2	3	6	2	3		6	5			1	35
CN-1												1				1
CN-2						1										1
Miscellaneous																
TOTAL	4	6	3	7	2	7	7	2	7	2	6	8	1	0	5	67

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Marc)

Anaerobes	Sampling Period															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FA-1					1								2		2	5
FA-2								2								2
FA-3																
FA-4									3							3
FA-5						1										1
FA-6										1						1
FA-7																
FA-8	3	2					1									6
FA-9																
FA-10			1													1
FA-11																
FA-12																
FA-13																
FA-14							1									1
FA-15											1					1
FA-16																
FA-17		2							2							4
FA-18																
CT-1																
CT-2																
CT-3																
GD-1																
GD-2																
GD-3																
GD-4																
GD-5																
GD-6																
GD-7																
Unkeyed	2		2				2	2	1					1		10
TOTAL	5	4	3	0	1	1	4	4	6	1	1	0	2	1	2	35
FN-1																
FN-2	1		1			2										4
FN-3																
FN-4		1														1
Unkeyed							3	1					1			5
Lactobacillus			1					1		1		1				4
Enterococci		1	2	5	3	3	2	1			11	10				38
CN-1												1				1
CN-2															1	1
Miscellaneous													1*			1*
TOTAL	1	2	4	5	3	5	5	3	0	1	11	12	2	0	1	55

*FN-5

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Mimi)

Anaerobes	Sampling Period															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FA-1																
FA-2	2															2
FA-3					2	2										4
FA-4																
FA-5	1									2		1				4
FA-6																
FA-7						1							1			2
FA-8	3					1		1							1	6
FA-9																
FA-10																
FA-11																
FA-12						1							1			2
FA-13																
FA-14		1														1
FA-15																
FA-16											1					1
FA-17													2	1		3
FA-18															1	1
CT-1																
CT-2		1			1											2
CT-3																
GD-1																
GD-2																
GD-3																
GD-4																
GD-5																
GD-6																
GD-7																
Unkeyed	1	4							1		2	1		1	1	11
TOTAL	7	6	0	0	3	5	0	1	1	2	3	2	4	2	3	39
FN-1		4														4
FN-2				1												1
FN-3			3													3
FN-4																
Unkeyed		1		1			4						2	1		9
Lactobacillus					2	2		5	3		2	1	1		3	19
Enterococci		1		1	3	3						3			1	12
CN-1									1		3	1				5
CN-2											1					1
Miscellaneous															1*	1*
TOTAL	0	6	3	3	5	5	4	5	4	0	6	5	3	1	5	55

*FN-5

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples
(Sonia)

Anaerobes	Sampling Period															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FA-1														1		1
FA-2	1															1
FA-3														1		1
FA-4													1			1
FA-5											1		1			2
FA-6				1						2					1	4
FA-7																
FA-8	5							1							2	8
FA-9																
FA-10									1							1
FA-11																
FA-12																
FA-13																
FA-14											2			1		3
FA-15											1		1			2
FA-16																
FA-17						1										1
FA-18											2				1	3
CT-1	1						1									2
CT-2																
CT-3																
GD-1													1			1
GD-2															1	1
GD-3																
GD-4																
GD-5																
GD-6																
GD-7																
Unkeyed				1		1	1	1	1	1	4			1		11
TOTAL	7	0	0	2	0	2	2	2	2	3	10	0	4	4	5	43
FN-1		2														2
FN-2		2				1	2									5
FN-3			3													3
FN-4																
Unkeyed						1	1							1		3
Lactobacillus	3			3	1		1	1	3		1		2		1	16
Enterococci		3			2	3						7	1	1		17
CN-1											1					1
CN-2															3	3
Miscellaneous																
TOTAL	3	7	3	3	3	5	4	1	3	0	2	7	3	2	4	50

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Denise)

Anaerobes	Sampling Period															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
FA-1						2										2
FA-2	1										1					2
FA-3						1										1
FA-4																
FA-5																
FA-6		1											1			2
FA-7																
FA-8	2										1					3
FA-9		1														1
FA-10																
FA-11																
FA-12					1	1										2
FA-13																
FA-14													2	1		3
FA-15					2											2
FA-16																
FA-17												1				1
FA-18														1		1
CT-1																
CT-2								1				1				2
CT-3														1		1
GD-1																
GD-2																
GD-3																
GD-4																
GD-5																
GD-6																
GD-7																
Unkeyed	1	2	1		1		1				1			1		8
TOTAL	4	4	1	0	4	4	1	1	0	0	3	2	3	4	0	31
FN-1		3	1				1									5
FN-2	1					1	2		1				1			6
FN-3																
FN-4																
Unkeyed			1						2					1		4
Lactobacillus	1	1						1				1	1	1	1	7
Enterococci	1	1	2	3	2	3	4	2	2		6	5	3			34
CN-1															1	1
CN-2															1	1
Miscellaneous																
TOTAL	3	5	4	3	2	4	7	3	5	0	6	6	5	2	3	58

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Red)

Anaerobes	Sampling Period 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
FA-1			3		1	1						2			1	8
FA-2							1									1
FA-3											1					1
FA-4																
FA-5			1													1
FA-6			1		1											2
FA-7																
FA-8	4			1												5
FA-9						1										1
FA-10																
FA-11													1			1
FA-12																
FA-13																
FA-14														1		1
FA-15					1						1					2
FA-16																
FA-17											2	2				4
FA-18												1		1		2
CT-1																
CT-2																
CT-3																
GD-1																
GD-2															1	1
GD-3																
GD-4																
GD-5																
GD-6																
GD-7																
Unkeyed	2							1						2		5
TOTAL	6	0	5	1	3	2	1	1	0	0	4	5	1	4	2	35
FN-1		4									1				1	6
FN-2	1	3		1	2		1	2								10
FN-3																
FN-4													1			1
Unkeyed				2										2		4
Lactobacillus									2					4	1	7
Enterococci	2		1	1	1	3	8	5	3	4	5	7				40
CN-1																
CN-2																
Miscellaneous															2*	2*
TOTAL	3	7	1	4	3	3	9	7	5	4	6	7	1	6	4	70

*FN-5

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Steve)

Anaerobes	Sampling Period															Total
	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FA-1	1			1	3								1			6
FA-2					1	1			1							3
FA-3					2	1					3					6
FA-4	1										1					2
FA-5							1		1							2
FA-6				1		2				1						4
FA-7																
FA-8	1							1								2
FA-9																
FA-10									1							1
FA-11																
FA-12				1											1	2
FA-13																
FA-14																
FA-15		1											1	2		4
FA-16													1			1
FA-17							1	2	1				2			6
FA-18																
CT-1			1	1												2
CT-2																
CT-3																
GD-1																
GD-2																
GD-3																
GD-4																
GD-5																
GD-6																
GD-7																
Unkeyed		1			1	1	1		1			1		2		8
TOTAL	3	2	1	4	7	5	3	3	5	1	4	1	5	4	1	49
FN-1		2					2									4
FN-2								1						1		2
FN-3																
FN-4		3														3
Unkeyed		2				1		1	1					2	1	8
Lactobacillus	1		1	1	1	1			2	5			2			14
Enterococci										1	5	5			5	16
CN-1																
CN-2						1	1	1								3
Miscellaneous																
TOTAL	1	7	1	1	1	3	3	3	3	6	5	5	2	3	6	50

* Plates - aerobic spreader

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Phil)

Anaerobes	Sampling Period															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
FA-1					1								2	1		4
FA-2				1		1			1							3
FA-3						1	1									2
FA-4																
FA-5											1		1			2
FA-6				2		2		1							1	6
FA-7																
FA-8	1				1						1					3
FA-9														1		1
FA-10		1											1		1	3
FA-11														1		1
FA-12																
FA-13																
FA-14			1								1					2
FA-15					1			1					1	1		4
FA-16																
FA-17																
FA-18												1			1	2
CT-1				1												1
CT-2											1					1
CT-3				1								1				2
GD-1																
GD-2																
GD-3																
GD-4																
GD-5																
GD-6																
GD-7														1		1
Unkeyed		3	1			1		2			1		1			9
TOTAL	1	4	2	5	3	5	1	4	1	0	5	2	6	5	3	47
FN-1																
FN-2			1												2	3
FN-3										1						1
FN-4	2	1														3
Unkeyed		4				1	1	2		1			1		1	11
Lactobacillus	2		3			1		2	4		1		1			14
Enterococci					1							7			3	11
CN-1																
CN-2						1										1
Miscellaneous													1*			1*
TOTAL	4	5	4	0	1	3	1	4	4	2	1	7	3	0	6	45

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Elbys)

Anaerobes	Sampling Period															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
FA-1					1										1	2
FA-2						4							2			6
FA-3																
FA-4																
FA-5	1										1		1			3
FA-6																
FA-7																
FA-8	1		1					1								3
FA-9																
FA-10																
FA-11																
FA-12																
FA-13																
FA-14														1	1	2
FA-15																
FA-16																
FA-17								1								1
FA-18													3			3
CT-1																
CT-2																
CT-3								1								1
GD-1																
GD-2																
GD-3																
GD-4															1	1
GD-5																
GD-6																
GD-7															1	1
Unkeyed						1		1					1	2	1	6
TOTAL	2	0	1	0	1	5	0	4	0	0	1	0	7	5	3	29
FN-1		1														1
FN-2	1	1					1		2							5
FN-3																
FN-4									1							1
Unkeyed				1		1			2			1	1	1		7
Lactobacillus	4	2	2	3	1			2	2	4	5	1	2	1	2	31
Enterococci	5			1	6	1	3	1		2		8			4	31
CN-1																
CN-2																
Miscellaneous																
TOTAL	10	4	2	5	7	2	4	3	7	6	5	10	3	2	6	76

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Doug)

Anaerobes	Sampling Period										
	1	2*	3	4	5	6	7	8	9	10	Total
FA-1			1		1						2
FA-2											
FA-3											
FA-4											
FA-5										1	1
FA-6											
FA-7											
FA-8	2					1					3
FA-9											
FA-10											
FA-11											
FA-12											
FA-13				1							1
FA-14											
FA-15											
FA-16											
FA-17											
FA-18											
CT-1											
CT-2											
CT-3											
GD-1											
GD-2											
GD-3											
GD-4											
GD-5											
GD-6											
GD-7											
Unkeyed			1					1			2
TOTAL	2	0	2	2	1	1	0	1	0	1	10
FN-1							1			1	2
FN-2					2	3	1				6
FN-3					1						1
FN-4	1										1
Unkeyed				1							1
Lactobacillus	4	2		1	1				5	3	16
Enterococci	3					1	6	3			13
CN-1											
CN-2											
Miscellaneous											
TOTAL	8	2	0	2	4	4	8	3	5	4	40

* Failure of growth on anaerobic plates

TABLE XXIII (Cont'd)

Distribution of Anaerobes in Fecal Samples

(Donald)

Anaerobes	Sampling Period															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FA-1								1								1
FA-2					1	3	1									5
FA-3					1									1		2
FA-4									2							2
FA-5																
FA-6																
FA-7											2					2
FA-8	2					1	1				1				1	6
FA-9					1											1
FA-10		1														1
FA-11																
FA-12																
FA-13																
FA-14																
FA-15													1			1
FA-16																
FA-17									1							1
FA-18											1			1		2
CT-1	1															1
CT-2																
CT-3											1	1				2
GD-1																
GD-2																
GD-3																
GD-4																
GD-5													1			1
GD-6																
GD-7																
Unkeyed	1								1	1				4		7
TOTAL	4	1	0	0	3	4	2	1	4	1	5	1	2	6	1	35
FN-1		1	1					1								3
FN-2							1									1
FN-3															1	1
FN-4		3														3
Unkeyed	3		1	1	1		2			1				2		11
Lactobacillus	1			3				2	1		1	2	1		4	15
Enterococci	1				1	7	1	2		4	5	1				22
CN-1																
CN-2																
Miscellaneous																
TOTAL	5	4	2	4	2	7	4	5	1	5	6	3	1	2	5	56

TABLE XXIII (Concluded)

Distribution of Anaerobes in Fecal Samples

(Manuel)

Anaerobes	Sampling Period															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
FA-1														1		1
FA-2																
FA-3																
FA-4																
FA-5													1			1
FA-6				1												1
FA-7						1										1
FA-8	1															1
FA-9																
FA-10																
FA-11																
FA-12																
FA-13																
FA-14																
FA-15								1	1							2
FA-16																
FA-17						1										1
FA-18																
CT-1			3	1												4
CT-2		1														1
CT-3														1		1
GD-1																
GD-2																
GD-3																
GD-4																
GD-5																
GD-6																
GD-7																
Unkeyed	1									1			1	1		4
TOTAL	2	1	3	2	0	2	0	1	1	1	0	0	2	3	0	18
FN-1											1					1
FN-2	1	1				2	1	1			2					8
FN-3								3								3
FN-4	1	1														2
Unkeyed	1						2							1		4
Lactobacillus	1			1				2	2				3		1	10
Enterococci	4	2		2	2	2	4			4	3	9			5	37
CN-1										1						1
CN-2		1														1
Miscellaneous																
TOTAL	8	5	0	3	2	4	7	6	2	5	6	9	3	1	6	67

TABLE XXIV

Distribution of Anaerobes in Fecal Samples
(Totals for All Animals)

Anaerobes	Holloman Chimpanzee Number												
	170	172	126	122	145	158	173	174	117	175**	198	139	Total
FA-1	1	5		1	2	8	6	4	2	2	1	1	33
FA-2		2	2	1	2	1	3	3	6		5		25
FA-3	1		4	1	1	1	6	2			2		18
FA-4		3		1			2				2		8
FA-5	3	1	4	2		1	2	2	3	1		1	20
FA-6	1	1		4	2	2	4	6		1		1	22
FA-7			2								2	1	5
FA-8	4	6	6	8	3	5	2	3	3	3	6	1	50
FA-9					1	1		1			1		4
FA-10		1		1			1	3			1		7
FA-11	1					1		1					3
FA-12			2		2		2						6
FA-13										1			1
FA-14	2	1	1	3	3	1		2	2				15
FA-15	1	1		2	2	2	4	4			1	2	19
FA-16			1				1						2
FA-17		4	3	1	1	4	6		1		1	1	22
FA-18	1		1	3	1	2		2	3		2	1	15
CT-1				2			2	1			1	4	10
CT-2			2		2			1					6
CT-3					1			2	1		2	1	7
GD-1				1									1
GD-2				1		1							2
GD-3													
GD-4									1				1
GD-5											1		1
GD-6													
GD-7								1	1				2
Unkeyed	11	10	11	11	8	5	8	9	6	2	7	4	92
TOTAL	26	35	39	43	31	35	49	47	29	10	35	18	397
FN-1	3		4	2	5	6	4		1	2	3	1	31
FN-2	4	4	1	5	6	10	2	3	5	6	1	8	55
FN-3	3		3	3				1		1	1	3	15
FN-4		1				1	3	3	1	1	3	2	15
Unkeyed	6	5	9	3	4	4	8	11	7	1	11	4	73
Lactobacillus	14	4	19	16	7	7	14	14	31	16	15	10	167
Enterococci	35	38	12	17	34	40	16	11	31	13	22	37	306
CN-1	1	1	5	1	1							1	10
CN-2	1	1	1	3	1		3	1				1	12
Miscellaneous		1*	1*			2*		1*					5*
TOTAL	67	55	55	50	58	70	50	45	76	40	56	67	689

* FN-5

** Doug - only 10 sampling periods

TABLE XXV*

Screen Tests for Predominating Anaerobic Fecal Bacteria (Obligate)

Culture Designation	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
FA-1	slender gram + rod singly and in chains; distinct rods uniformly spaced	very fine colonies; very anaerobic	heavy turbidity with slime developing	4+	4+	4+	2+	+	delayed Arc** with proteolysis	no liquefaction	7.0
				4+ slimy sediment	4+ slimy sediment	4+ slimy sediment	2+ slight slime	2+			
FA-2	slender gram + rod in chains, with tadpole formation	diffuse colonies very anaerobic	heavy with slime	4+ with silky turbidity	3+ with silky turbidity	3+ with silky turbidity	±	±	delayed Arc with proteolysis	no liquefaction	6.4
				4+ slime	3+ slime	3+ slime	+	±			
FA-3	medium to small gram negative elongate pointed rods in pairs	diffuse growth; heavy gas; very anaerobic	heavy with slimy sediment	4+ slimy sediment	4+ slimy sediment	4+ slimy sediment	4+ slimy sediment	4+ slimy sediment	delayed Arc with proteolysis and gas	no liquefaction	7.5
				4+ black sediment	4+ black sediment	4+ black sediment	4+ black sediment	4+ black sediment			
FA-4	slender gram positive, sometimes slightly curved rod, singly	small colonies; very anaerobic	moderate turbidity	4+ slime	4+ slime	4+ slime	2+ sediment	2+ sediment	Arc strong; delayed proteolysis	no liquefaction	5.6
				4+ slime	4+ slime	4+ slime	2+ sediment	2+ sediment			

* Results obtained under NASA Contract NASw-738
** Acid reduced curd

TABLE XXV (cont'd)

Culture Designation	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
FA-5	short, medium slightly curved gram positive rod, singly; often developing clusters	medium colonies, very anaerobic	moderate turbidity	4+ slime 4+ slime	4+ slime 4+ sediment	4+ slime 4+ sediment	4+ slime 4+ slime	± + -	delayed Arc** with proteolysis	no liquefaction	5.5-5.8
FA-6	gram positive medium rods, tending to form clusters some slightly curved	medium colonies, very anaerobic	clear slimy sediment	4+ slime 4+ slime	4+ slime 4+ slime	4+ slime 4+ slime	3+ slime 4+ slime	+ slight slime + slight slime	Arc	no liquefaction	6.6
FA-7	small gram negative slender rod tendency towards bipolar staining	fine colonies; very anaerobic	moderate turbidity slime	4+ slime 4+ slime	4+ slime 4+ slime	4+ slime 4+ slime	+ + slime	+ +	Arc delayed proteolysis	no liquefaction	6.6
FA-8	tiny gram negative slender rods, slightly curved	fine colonies; very anaerobic	clear with sediment	+ 3+	+ 3+	+ 3+	+ 3+	+ 3+	partial reduction orange color	no liquefaction	6.9

* Results obtained under NASA Contract NASw-738

** Acid reduced curd

TABLE XXV (cont'd)

Culture Designation	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
FA-9	medium to large pleomorphic gram positive rod in pairs and short chains; chain has characteristic hooked or loop shape -- older cultures form heavy gram positive aggregation	haze; very anaerobic	moderate turbidity	3+ slight slime 3+ moderate slime	3+ slight slime 3+ moderate slime	+ slime 3+ slime	± slime + slight slime	clear with slight slime +	delayed Arc** with ± proteolysis	no liquefaction	7.0
FA-10	very small gram positive rods in chains with a tendency for bipolar staining, sometimes slightly pointed	fine colonies very anaerobic	heavy with floccular sediment	4+ fluffy sediment 4+ sediment	4+ fluffy sediment 4+ sediment	4+ fluffy sediment 4+ sediment	3+ 4+ sediment	+ sediment 4+ sediment	delayed Arc with proteolysis	no liquefaction	6.7
FA-11	medium short gram positive rods, some slightly curved, older cultures tend toward gram positive aggregation	fine colonies very anaerobic	heavy turbidity	3+ 3+ sediment	3+ 3+ sediment	3+ sediment 3+ sediment	3+ 3+ sediment	± sediment clear with slight sediment	Arc with proteolysis	no liquefaction	6.5

* Results obtained under NASA Contract NASw-738
** Acid reduced curd

TABLE XXV (cont'd)

Culture Designation	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
FA-12	gram positive tiny pointed rods in chains with many coccoid forms	medium colonies very anaerobic with slight gas	heavy with slime	3+ slime 3+ slime	3+ slime 3+ slime	+ with slime 3+ slime	± slime + slime	± slime ± slime	delayed Arc** with proteolysis	no liquefaction	7.2
FA-13	small gram negative cocci in masses	fine colonies; heavy gas; very anaerobic	moderate turbidity	3+ gas black slime 3+ black slime	3+ gas black slime 3+ black slime	3+ gas black slime 3+ black slime	3+ gas black slime 3+ black slime	3+ gas black slime 3+ black slime	R***	no liquefaction	6.7
FA-14	gram negative rods long slender with gram positive areas	tiny colo= nies very anaerobic with heavy gas	heavy turbidity gas	4+ slight slime gas 4+	4+ slight slime 4+	+ 3+ sediment	± 3+ slime	± 3+ slime	R, whey carmelization	no liquefaction	6.75
FA-15	short fat gram negative rod, singly and in pairs; some with pointed ends	delayed haze; heavy gas; very anaerobic	heavy with slight slime	4+ slight slime 4+ slight slime	4+ slight slime 4+ slight slime	+ 4+ black slime	2+ slight slime 4+ slime	± ±	delayed Arc with whey	no liquefaction grey sediment	6.7

* Results obtained under NASA Contract NASw-738
** Acid reduced curd
*** Reduced

TABLE XXV (cont'd)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
FA-16	gram positive pleo rods; some curved and some tadpole forms	haze with anaerobic collar	heavy with slime	+ curly slime 3+ slime	+ curly slime 3+ slime	+ curly slime 3+ slime	clear slime + slime	-	ARC**	no lique-faction	6.8
FA-17	large gram posi-tive rod singly and in pairs form ing palisades and V's	fine colonies very anaerobic slight gas, occasionally	slight with finely gran-ular sedi-ment and side growth	clear with finely granular sediment	clear with finely gran-ular sedi-ment	clear with finely granular sedi-ment	clear with finely gran-ular sedi-ment	clear with finely gran-ular sedi-ment	ARC with proteolysis	no lique-faction	6.6
FA-18	gram positive long slender rods, irregular staining	fine colonies very anaerobic	slight with slime	± moder-ate slime ± moder-ate slime	± moder-ate slime ± moder-ate slime	± moder-ate slime ± moder-ate slime	± moder-ate slime ± moder-ate slime	± moder ate slime ± moder ate slime	ARC delayed	no lique-faction	6.3 to 6.6

TABLE XXV (cont'd)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
CT-1	tiny gram negative cocci in clusters	fine colonies with gas, very anaerobic	moderate with black granular sediment	+ with dark granular sediment and gas + with dark granular sediment & side growth	+ with dark granular sediment & gas + with dark granular sediment & side growth	+ with dark granular sediment & gas + with dark granular sediment & side growth	+with dark granular sediment & gas +with dark granular sediment & side growth	+with dark granular sediment & gas + with dark granular sediment & side growth	reduced with black bottom	no liquefaction black bottom & gas	7.5
CT-2	gram positive large pointed rods in chains	small colonies heavy gas, very anaerobic	heavy with granular sediment	3+ with slime & side growth 3+ with slime & side growth	3+ with slime & side growth 3+ with slime & side growth	3+ with slime & side growth 3+ with slime & side growth	+ with slime & side growth + with slime & side growth	+ with slime & side growth +with silky slime & side growth	ARC with proteolysis and whey	no liquefaction	7.25

TABLE XXV (cont'd)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
CT-3	gram positive slender rods, some in chains, some slightly curved	very fine colonies; very anaerobic	heavy with slight gas	4+ with slime & gas	3+ with slime & gas	+ with slime	4+ with heavy slime	+ with slight slime	ARC with delayed proteo-lysis	no lique-faction	5.6
				4+ with slime & gas	3+ with slime & gas	+ with slime	4+ with heavy slime	+ with slight slime			

TABLE XXV (cont'd)

SEVEN NEW TYPES OF OBLIGATE ANAEROBES (SPACE DIET - GD SERIES)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
G.D. 1	short gram negative rod in pairs and chains, some pointed	fine colonies heavy gas very anaerobic	heavy floccular sediment	4+ with slime 4+ with black slime	4+ with slime 4+ with black slime	4+ with slime 4+ with black slime	2+ with slime 4+ with black slime	1+ with slime 4+ with black slime	delayed Arc* with proteolysis	black bottom no liquefaction	6.7
G.D. 2	gram negative short rod in pairs	small colonies very anaerobic	moderate with floccular slime	4+ with heavy slime 3+ with heavy slime	4+ with heavy slime 3+ with heavy slime	4+ with heavy slime 3+ with heavy slime	4+ with heavy slime 3+ with heavy slime	3+ with floccular + slight floccular slime	Arc with proteolysis	no liquefaction	6.2 6.4
G.D. 3	gram negative pointed rods	tiny colonies very anaerobic	moderate with moderate black sediment sometimes fluffy	2+ with slime 3+ with slime sometimes dark	2+ with slime 3+ with slime sometimes dark	2+ with slime 3+ with slime	2+ with slime 3+ with slime	2+ with slime 3+ with slime	reduced	no liquefaction	6.8

* Acid reduced curd

TABLE XXV (Cont'd)

SEVEN NEW TYPES OF OBLIGATE ANAEROBES (SPACE DIET - GD SERIES)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litnus Milk	Gelatin	pH
G.D. 4	gram negative slender rods in pairs some pleomorphic	tiny colonies heavy gas very anaerobic	moderate with granular sediment sometimes dark	4+ with slime and gas 4+ with slime sometimes dark	4+ with slime and gas 4+ with slime sometimes dark	4+ with slime and gas 4+ with slime sometimes dark	4+ with slime and gas 4+ with slime sometimes dark	3+ with slime and gas 3+ with slime sometimes dark	delayed Arc* with slight proteolysis	no liquefaction	6.3 6.4
G.D. 5 and G.D. 5a	gram ± medium rods in short chains	small colonies very anaerobic	clear to moderate with balls of sediment	4+ with granular sediment or slime 4+ with slime or granular sediment sometimes black	4+ with granular sediment or slime 4+ with slime or granular sediment sometimes black	4+ with granular sediment or slime 4+ with slime or granular sediment sometimes black	4+ with granular sediment or slime 4+ with slime or granular sediment sometimes black	2+ with granular sediment 3+ with slime or granular sediment sometimes black	Arc with proteolysis	no liquefaction	6.6**

*. Acid reduced curd

** G.D. 5a pH 6.2 to 6.4

TABLE XXV (cont'd)

SEVEN NEW TYPES OF OBLIGATE ANAEROBES (SPACE DIET - GD SERIES)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
G.D. 6	gram negative short pleomorphic rods singly and in pairs	tiny colonies heavy gas very anaerobic	slight to moderate with slimy sediment	3+ with granular sediment 4+ with brown slime	3+ with granular sediment 4+ with brown slime	3+ with granular sediment 4+ with brown slime	3+ with granular sediment 4+ with brown slime	+ with slimy sediment 3+ with brown slime	delayed Arc* with proteolysis	no liquefaction	5.9
G.D. 7	gram ± short pleomorphic rods in pairs some pointed	tiny colonies heavy gas very anaerobic	4+ with dark slime	4+ with slime and heavy gas 4+ with heavy black slime	4+ with slime and heavy gas 4+ with heavy black slime	4+ with slime and heavy gas 4+ with heavy black slime	3+ with heavy slime and gas 4+ with heavy black slime	3+ with heavy slime and gas 4+ with heavy black slime	reduced	no liquefaction black bottom	6.8

* Acid reduced curd

TABLE XXV (cont'd)

Screen Tests for Predominating Anaerobic Fecal Bacteria (Facultative)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
FN-1	gram positive pointed rods in pairs and short chains	fine colonies facultative anaerobic	heavy with slime	4+ slime 4+ slime	4+ slime 4+ slime	3+ slime 4+ slime	3+ slime 4+ slime	3+ slime 4+ slime	delayed ARC	no liquefaction	6.7
FN-2	gram positive coccobacillus pairs and chains	medium colonies facultative anaerobic	clear with growth on sides and white sediment	3+ granular sediment 3+ granular sediment	3+ granular sediment 3+ granular sediment	3+ granular sediment 3+ granular sediment	+ granular sediment 3+ granular sediment	± + with sediment	ARC with proteolysis	no liquefaction	6.5
FN-3	small round cocci in short chains becoming less discrete with age	discrete colonies with heavy gas facultative anaerobic	moderate with white sediment	3+ granular sediment 4+ granular sediment	3+ granular sediment 4+ granular sediment	4+ sediment 4+ granular sediment	3+ 3+ granular sediment	± ±	ARC with proteolysis	no liquefaction	6.4
FN-4	gram positive elongate cocci in short chains	fine colonies facultative anaerobic	moderate	4+ slime 4+ slime	4+ slime 4+ slime	3+ slime 4+ slime	3+ slime 4+ slime	3+ slime 4+ slime	delayed; soft ARC	no liquefaction	6.5

TABLE XXV (cont'd)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
FN-5	gram positive diplococci in pairs and short chains; pleomorphic	fine colonies, facultative anaerobic	moderate with floccular sediment	3+ floccular sediment	3+ floccu- lar sedi ment	3+ floccu- lar sedi- ment	3+ floccu- lar sedi- ment	+ sedi- ment	ARC with slight proteolysis	no lique- faction	7.3 to 7.7
				4+ floccular sediment	4+ floccu- lar sedi- ment	4+ floccu- lar sedi- ment	4+ floccu- lar sedi- ment	+ sedi- ment			

TABLE XXV (Concluded)

Culture Number	Morphology	Agar Shake	Broth	Glucose	Sucrose	Lactose	Dextrin	Blank	Litmus Milk	Gelatin	pH
CN-1	gram positive rods, some slightly curved, some ovoid in chains	very fine colonies facultative anaerobic	slight with slime (dark?)	3+ with floccu-lant gran-ules and side growth	3+ with floccu-lant gran-ules and side growth	+ with slight slime	3+ with floccu-lant gran-ules and side growth	+ with slight slime	ARC	no lique-faction	5.8
				3+ with floccu-lant gran-ules and side growth	3+ with floccu-lant gran-ules and side growth	+ with slight slime	3+ with floccu-lant gran-ules and side growth	+ with slight slime			
CN-2	gram positive rods some in pairs; various sizes	small colonies facultative anaerobic	slight with slime	1+ with gran-ular slime	1+ with gran-ular slime	1+ with gran-ular slime	1+ with gran-ular slime	1+ with gran-ular slime	reduction	no lique-faction	7.3
				1+ with granular slime	1+ with gran-ular slime	1+ with gran-ular slime	1+ with gran-ular slime	1+ with gran-ular slime			

APPENDIX I

1. Aerobic Culturing Techniques

   a. Primary Culturing Technique

The primary aerobic culturing of the rectal samples was carried out at the Wisconsin Alumni Research Foundation by streaking the differential media listed in Appendix II with the rectal swab as described in Bailey and Scott. (4)

The aerobic counting plates were made from the anaerobic broth dilution series so that comparisons could be made of the relative numbers of aerobic and anaerobic bacteria carried in the same sample. The fecal aerobic "count" was made by placing 0.1 ml broth of Tube 3 of the anaerobic broth series into a Petri plate to which was added 10 ml of Gall's agar. The colonies were enumerated after 24 hours. Rogosa's agar was used as a pour plate, inoculated with two drops of Tube 2 for fecal samples.

   b. Secondary Culturing Technique

The agar plate cultures were sealed with a plastic sealer, refrigerated and returned to the Republic laboratories for further study. Selected colonies from each plate were picked into nutrient broth and all cultures showing growth were stained by the Hucker modification of the Gram stain and observed microscopically. The various morphological types of bacteria were separated into appropriate categories for identification by the following schema:

A. Blood Agar

   1. Colonies

      a. Described

      b. Representative colonies planted in nutrient broth

   2. Broth

      a. Incubated

      b. Slides made for morphological identification

   3. Morphological grouping

      a. Gram positive cocci in clumps and masses (Staphylococci)

         (1) Mannitol salt agar

         (2) All positives confirmed with coagulase test

b. Gram positive cocci in chains (Streptococci)

(1) Alpha hemolysis

(2) Beta hemolysis

(3) Gamma hemolysis

(4) Identification by sugar fermentation pattern

(5) Identification by typing antisera:

A, B, C, D, F, and G

c. Tiny gram negative rod (Haemophilus)

(1) Identified with typing antisera:

a, b, c, d, e, f

d. Gram negative cocci (Neisseria)

(1) Sugar screen test

(a) Glucose

(b) Maltose

(c) Sucrose

e. Gram positive rods

(1) Loefflers (Microscopic identification by morphology)

(2) All negative on Loefflers carried to:

(a) Glycerol agar

1. All colonies stained by Ziehl-Neelsen methods

(3) All negative on Glycerol agar carried to:

(a) Rogosa's S. L. agar

(4) All negatives observed for spore formation

f. Gram negative rods (Enterobacteriaceae)

(1) Expanded "Imvic" screen test

(a) TSI

(b) Indol

(c) Methyl red

(d) Voges-Proskauer

(e) Simmons Citrate

(f) Urease

(g) Nitrate

(h) Litmus milk

(i) Motility

(j) Gelatin

(k) Hemolysis

(l) KCN

(m) Phenylalanine

(n) Cytochrome oxidase

1. On all alkaline over alkaline TSI's

(2) Shigella typing antisera

Poly Groups A, B, C, D and Alkalescens-Dispar Group

(3) Salmonella typing antisera

a, b, c, d, i and Groups A, B, C_1, C_2, D and E

(4) *E. coli* typing antisera

(a) 026:B6

(b) 0127:B8

(c) 0111:B4

(d) 055:B5

(e) 086:B7

(f) 0128:B12

(g) 0119:B14

(h) 0125:B15

(i) 0126:B16

(j) 0124:B17

(5) Klebsiella typing antisera

Types 1, 2, 3, 4, 5, and 6

B. MacConkey's, BS, BG, SS

C. Tetrathionate Broth

1. Plated on MacConkey's, BS, BG and SS

2. Treated as under B

D. Mitia-Salivarius

1. Colonies observed and described for identification of S. mitis, S. salivarius, and enterococci

E. Rogosa's S. L. Agar

1. Colonies

a. Described

b. Slides made for morphological identification

F. Phytone Yeast Media

1. Colonies

a. Described

b. Planted onto cornmeal agar

(1) Growth observed for sporulation

A Gram stain was made from the original swabs to observe the types of bacteria present in the original samples.

The composition of the media used and the method of incubating and reading the various media is described in detail on the following pages.

2. Anaerobic Culturing Techniques

The anaerobic culturing techniques to be described include the primary culturing and the screen tests.

a. Primary Culture

The anaerobic broth series for the primary culture of the fecal swab was essentially the same as that used previously by Gall, et al (5) for culturing rumen anaerobes, and which has been recently successfully adapted in the Republic laboratories to the culture of human feces (6). This is a technique that can be adapted easily to work under field conditions. Figure 1 gives a schematic representation of the primary culturing technique, which was modified to culture from a rectal swab. It was assumed that the rectal swab carried about 0.01 gm of fecal matter, which is comparable to the amount of fecal matter adhering to the standard loop.

The rectal swab was placed directly into a tube containing 9 ml of Gall's broth prepared with two drops of cysteine and one drop of sodium bicarbonate. This tube was considered to represent roughly a 10^{-3} dilution to the rectal contents. Serial dilutions were made into 11 additional tubes with 9 ml of Gall's broth prepared as above by transferring 1 ml from the inoculated tube into the next tube, etc., the top 10 of which were labeled 1 to 10 and were incubated for five days or until growth occurred. Observations were made at 16 and 24 hours and daily thereafter. These ten tubes were considered to approximate a dilution of the sample from 10^{-4} to 10^{-13}. No dilution blanks were used, as each tube containing broth acts as a dilution blank for the next tube in the series. From Tubes 5 and 6 pour plates were made into anaerobic Petri dishes using Gall's medium with cysteine and bicarbonate added. The top three tubes showing growth were subcultured into agar shakes using Gall's medium to observe the anaerobic or aerobic character of the growth and to preserve the cultures for purification and study. Each culture was stained by Hucker's modification of the Gram stain and the slide was observed microscopically. Cultures from the top three dilutions of feces showing two or more distinct morphological types of bacteria were purified by plating and picking colonies using Gall's agar in an anaerobic Petri dish. Selected colonies on the anaerobic Petri dishes originating from Tubes 5 and 6 were picked and treated like the subcultures from the agar shakes as described above. Usually 4-6 different colony types appear on each anaerobic Petri plate adding 6-8 pure cultures to be run through the screen tests.

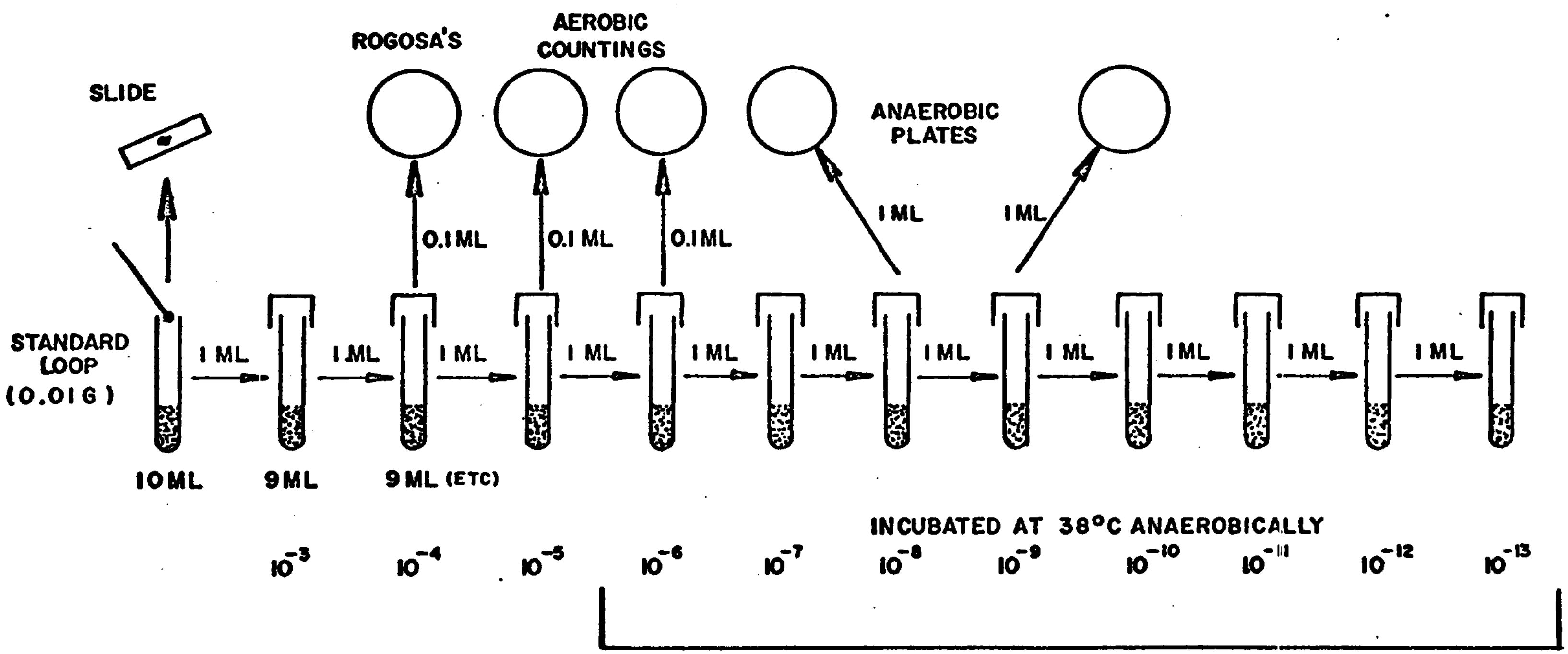

Figure 1. Anaerobic Dilution Series

In addition blood plates were streaked from the anaerobic swabs from the rectum by the same technique as the aerobic plates, and were incubated in the same anaerobic jar as the anaerobic broth series. Growth was recorded after 24 hours and the plates were treated in the same manner as the aerobic blood plates.

The compositions of the media and solutions used in this technique are listed below:

1. Gall's Media

   1% Peptone C (Albimi)

   1% Peptone S (Albimi)

   1% Beef Extract (Difco)

   1% Yeast Extract (Difco)

   0.1% K_2HPO_4

   0.1% KH_2PO_4

   0.1% Glucose

Make up to 100 ml with distilled water and tube in 9 ml amounts (pipetted for exactness of dilution) and sterilize exactly 10 minutes by autoclaving. Immediately before use, add aseptically 1 drop of sterile 10% $NaHCO_3$ and two drops of 10% cysteine-bicarbonate solution. This gives a pH of approximately 6.8 and an Eh of approximately -200 mv. Add 1.5% agar to the above when agar is needed for shakes and plates. This is done when originally making the media. In agar omit cysteine except where noted otherwise. To all broth and agar media 0.05% of bovine serum is added.

2. 10% Cysteine-Bicarbonate Solution

   20 gm Cysteine Hydrochloride

   100 ml 1N NaOH

   7% $NaHCO_3$

   Add the cysteine hydrochloride to the NaOH, giving an approximate pH of 7.0.

   More or less NaOH will be needed depending on the particular batch of cysteine hydrochloride.

   To 4 ml of this solution (15% as cysteine) in a test tube, add 2 ml of 7% $NaHCO_3$.

   Seal with melted vaspar. Autoclave at 15 lb for 10 minutes.

b. Physiological Studies

The physiological studies of the pure cultures of predominating flora included the following screen tests:

1. Gram stain to observe morphology

2. Final pH in 0.1% glucose broth

3. Fermentation of the following sugars in Gall's media with glucose omitted:

   (a) Glucose

   (b) Sucrose

   (c) Lactose

   (d) Dextrin

   (sugars added at 0.1% level aseptically after autoclaving)

4. Growth in Gall's broth with no carbohydrate added

5. Liquefaction of gelatin in Gall's media minus carbohydrate

6. Growth and reaction in litmus milk (to which 0.05% bovine albumin and 0.1% of peptone have been added)

7. Growth in agar shake containing Gall's media

All media contained bicarbonate and all media except the agar shake contained cysteine to produce an Eh of about -200 mv. The results of the screen test on each anaerobic culture were compared with a "key" setup with anaerobic cultures isolated in a NASA study on the predominating fecal flora of man(2) which appears in TableXXV. When possible the cultures isolated from the chimpanzee were assigned a designation (FA or FN) from the human "key". Otherwise the culture was tabulated as "unkeyed". In the event that several of these "unkeyed" cultures were alike, a new designation (CT) was setup which is described in Table XXV.

APPENDIX II

PRIMARY CULTURING MEDIA

BLOOD AGAR PLATE

Purpose: Cultivate fastidious microorganisms

Formula:

Base	Gms/Liter
Infusion from beef heart	10.0
Peptone "M"	10.0
Sodium chloride	5.0
Agar	15.0

pH 6.9

Then add:

5% defibrinated sheep blood

Technique: Streak the plate with the original specimen or a subculture from broth.

Procedure: Incubate 37°C for 18-24 hours

Reaction: Colonies of bacteria usually grow luxuriantly, and the hemolytic types exhibit clear distinct degrees of hemolysis.

Reference: Difco Manual,[7] p. 88.

MITIS SALIVARIUS AGAR

Purpose: The detection of fecal streptococci. Incubate exactly 24 hours at 37°C

Formula:

Peptone "M"	20.0 gms/liter
Dextrose	1.0 gms/liter
Sucrose	50.0 gms/liter
Di Potassium Phosphate	4.0 gms/liter
Agar	15.0 gms/liter
Trypan Blue	0.075 gm/liter
Crystal Violet	0.0008 gm/liter

pH 7.0

Technique: Streak the plate with the inoculum.

Reaction:

Streptococcus mitis: small or minute colonies
Streptococcus salivaris: blue (smooth or rough), gum drop colonies 1-5 mm
Enterococcus: dark blue or black raised colonies
Coliform: brown colonies
Pleuro-pneumonia: colorless mucoid colonies

Reference: Albimi Laboratories[8]

ROGOSA'S SL AGAR

Purpose: SL Agar is a selective medium for the cultivation of oral and fecal lactobacilli

Formula:

	Gms/Liter
Peptone "C"	10.0
Yeast extract	5.0
Monopotassium phosphate	6.0
Ammonium citrate	2.0
*Salt solution	5.0 ml
Dextrose	20.0
Sorhitan Mono-oleate	1.0
Sodium Acetate hydrate	25.0
Agar	15.0
Acetic acid	1.32

pH 5.4

*Salt Solution:

Magnesium sulfate $7H_2O$	11.5 gms
Magnesium sulfate $2H_2O$	2.4 gms
Magnesium sulfate $4H_2O$	2.8 gms
Ferrous sulfate $7H_2O$	0.68 gms
Distilled water	1000.0 ml

Technique: Melt agar then cool in water bath to 45°C. Add a drop of broth culture to agar; then make a pour plate.

Procedure: Incubate under partial anaerobic conditions.

Reaction: Selective for cultivation of lactobacilli

Reference: Difco Supplementary Literature,[9] p. 59

PHYTONE YEAST (BBL)

Purpose: For the isolation of dermatophytes especially T. nerrucosa from human and animal specimens.

Formula:

Phytone	10 gms
Yeast Extract	5 gms
Dextrose	40 gms
Streptomycin	.03 gms
*Chloramphenicol	.05 gms
Agar (dried)	17 gms

* Chloromycetin TM Parke Davis & Co.

Technique: Streak slant directly with heavy inoculum of fecal suspension or other suspicious material

Reaction: Typical colonies of the dermatophytes grow rapidly on phytone yeast agar.

Reference: Baltimore Biological Laboratories [10]

MAC CONKEY AGAR

<u>Purpose:</u> Primary differential plating media for coliforms.

<u>Formula:</u>

Peptone "M"	10.0 gms/liter
Lactose	10.0 gms/liter
Bile salts	1.5 gms/liter
NaCl	5.0 gms/liter
Agar	15.0 gms/liter
Neutral Red	0.025 gms/liter

pH 7.1

<u>Technique:</u> With an inoculating loop, streak the plate with the original specimen or subculture from a broth culture.

<u>Procedure:</u> Incubate plate at 35-37° C for 16-18 hours. Prolonged incubation may lead to confusion of results.

<u>Reaction:</u> Isolated colonies of coliform bacteria are brick red in color and may be surrounded by a zone of precipitated bile. This reaction is due to the action of the acids, produced by fermentation of lactose, upon the bile salts and the subsequent absorption of neutral red. Typhoid, paratyphoid and dysentery bacilli do not ferment lactose and do not greatly alter the appearance of the medium. These colonies are uncolored and transparent.

<u>Reference:</u> Difco Manual,[7] p. 131-132.

SALMONELLA AND SHIGELLA AGAR

Purpose: This selective medium is recommended for the isolation of shigella and salmonella from stools and other materials suspected of containing these organisms.

Formula:

Peptone "M"	5.0 gms/liter
Beef extract	5.0 gms/liter
Lactose	10.0 gms/liter
Bile salts	8.5 gms/liter
Sodium citrate	8.5 gms/liter
Sodium thiosulfate	8.5 gms/liter
Ferric citrate	1.0 gms/liter
Agar	13.5 gms/liter
Neutral red	0.025 gms/liter
Brilliant green	0.33 mg.

pH 7.0

Technique: With an inoculating loop, streak the plate with the original specimen or subculture from a broth culture.

Procedure: Incubate plates at 35-37°C for a full 24 hours.

Reaction: Shigella, salmonella and other organisms not fermenting lactose form opaque, transparent or translucent uncolored colonies, which generally are amooth.

Reference: Difco Manual,[7] p. 135.

TETRATHIONATE BROTH

Purpose:	This selective enrichment medium is employed in the isolation of members of the Salmonella group.
Formula:	Proteus Peptone 5 gms/liter Bile salts 1 gms/liter Calcium carbonate 10 gms/liter Sodium Thiosulfate 30 gms/liter
Technique:	Inoculate the broth by adding 1-3 gms of the original stool specimen. Mix the broth with a glass rod or pipette to suspend the particulate matter.
Procedure:	Incubate at 37°C for 12-24 hours
Reaction:	Tetrathionate broth inhibits or kills the coliform organisms and permits typhoid and the paratyphoids to grow almost unrestrictedly. If growth is present, subculture to differential and selective solid medium to aid in identification.
Reference:	Difco Manual[7] p. 157.

APPENDIX III

SECONDARY CULTURING MEDIA

TRIPLE SUGAR IRON (TSI)

Purpose: Preliminary screening of gram rods

Formula:

Peptone "M"	20.0 gms/liter
Lactose	10.0 gms/liter
Saccharose	10.0 gms/liter
Dextrose	1.0 gm/liter
Sodium Chloride	5.0 gms/liter
Iron Ammonium Citrate	0.5 gm/liter
Sodium Thiosulfate	0.5 gms/liter
Agar	15.0 gms/liter
Phenol Red	0.025 gms/liter

pH 7.3 ±

Technique: Using needle with inoculum, go into butt first, then zig zag on slant while withdrawing needle from butt. Incubate 20-24 hours.

Reaction: Acid butt (yellow), alkaline slant (red) - Glucose fermented acid throughout medium, butt and slant yellow - lactose or sucrose or both fermented. Blackening of the butt - hydrogen sulfide produced. Alkaline slant and butt (medium entirely red) - none of the three sugars fermented.

Reference: Albimi Laboratories[8]

BISMUTH SULFITE AGAR

Purpose: Bacto-Bismuth Sulfite Agar is a highly selective medium designed especially for the isolation of salmonella typhosa from feces, urine, sewage and other materials harboring this organism.

Formula:

Bacto-Beef Extract	5 gms
Bacto Peptone	10 gms
Bacto Dextrose	5 gms
Disodium Phosphate	4 gms
Ferrous Sulfate	3 gms
Bismuth Sulfite Indicator	8 gms
Bacto Agar	20 gms
Bacto-Brilliant Green	.025 gms

Technique: Streak or smear the surface of a plate with a heavy inoculum of the fecal material in such a way that on some portion of the plate the inoculum will be light, permitting the development of discrete colonies.

Reaction: The typical discrete surface typhoid colony is black and is surrounded by a black or brownish-black zone which may be several times the size of the colony. By reflected light, preferably daylight, the zone exhibits a distinctly characteristic metallic sheen.

Reference: Difco Manual,[7] p. 139.

BRILLIANT GREEN AGAR

Purpose: Brilliant green agar is a highly selective medium recommended for the isolation of salmonella, other than typhosa, directly from stools or other materials suspected of containing these organisms or after preliminary enrichment in tetrathionate broth.

Formula:

Bacto Yeast Extract	3 gms
Proteus Peptone No. 3, Difco	10 gms
Sodium Chloride	5 gms
Bacto Lactose	10 gms
Saccharose, Difco	10 gms
Bacto Phenol Red	.08 gms
Bacto Brilliant Green	.0125 gms
Bacto Agar	20 gms

Technique: Inoculate the surface of the plate with heavy suspensions of stools or other materials suspected of containing salmonella.

Reaction: Typical salmonella colonies appear as slightly pink-white opaque colonies surrounded by a brilliant red medium. The few lactose or sucrose fermenting organisms which may develop on the medium are readily differentiated due to the formation of a yellow-green colony surrounded by an intense yellow-green zone.

Reference: Difco Manual,[7] p. 145.

INDOL BROTH

Purpose:	Part of IMVIC schema for identifying Enterobacteriaceae

Formula:

Bacto peptone	20 gms
Sodium chloride	5 gms
Distilled water	1,000 ml

Sterilize at 121° C 15 minutes   Add 10 cc/tube

Technique: Inoculate broth and incubate for 48 hours at 37°C

Test Reagent: Kovac's

Pure amyl or isoamyl alcohol	150 ml
Paradimethylaminobenzaldehyde	10 gms
Concentrated pure hydrochloric acid	50 ml

Dissolve aldehyde in alcohol and then slowly add acid. The dry aldehyde should be light in color. Kovac's reagent should be prepared in small quantities and stored in the refrigerator when not in use.

Procedure: Add about 0.5 ml of reagent, shake tube gently. A deep red color develops in the presence of indol.

Reaction: The red color indicates production of indol from the amino acid.

Reference: Edwards & Ewing,[11] p. 248.

METHYL RED-VOGES PROSKAUER BROTH (MRVP)

Purpose: Part of IMVIC schema for identifying Enterobacteriaceae

Formula:

Buffered peptone (Peptone M)	7 gms
Glucose	5 gms
Dipotassium phosphate	5 gms
Distilled water	1,000 ml

Final pH 6.9 - adjust with HCl to 7.1 or 7.2 before autoclaving.

Technique:

MR: Inoculate 5 cc of broth and incubate at 37°C for 5 days.

VP: Inoculate 5 cc of broth and incubate at 37°C for 2 days.

Test Reagent:

MR:

Methyl red	0.1 gm
Ethyl alcohol (95 to 96%)	300 ml
*Water - Q.S. to	500 ml

*Dissolve dye in the alcohol and add sufficient distilled water to make 500 ml.

VP: O'Meara (Modified)

Potassium hydroxide	40 gms
Creatine hydrate	0.34 gm
Distilled water	100 ml

Procedure:

MR: Use 5 or 6 drops of reagent per 5 ml of culture. Reactions are read immediately.

Positive tests are bright red.
Weakly positive tests are red-orange.
Negative tests are yellow.

VP: Use reagent in proportion of 1 ml to 1 ml culture. Test may be placed at 37°C or left at room temperature. In either case, final readings after 4 hours. Tests should be aerated by shaking tubes. A positive test turns red.

Reaction:

MR: A positive reaction is indicated by a distinct red color showing the presence of acid. A negative reaction is indicated by a yellow color.

VP: A positive test is indicated by the color showing that the organism produces acetylmethylcarbinol.

Reference: Edwards & Ewing,[11] pgs. 249 and 256.

UREASE BROTH

Purpose: Rough grouping of Enterobacteriaceae into proteus, klebsiella, aerobacter or providence group.

Formula:

Urea	20.0 gms/liter
Monopotassium Phosphate	9.1 gms/liter
Disodium Phosphate	9.5 gms/liter
Yeast Extract	0.1 gm/liter
Phenol Red	0.01 gms/liter

pH 6.8 ±

Technique: A heavy inoculum is emulsified in the broth. Incubate 24 hours. Read at 2, 4, and 24 hour intervals.

Reaction: Urease activity is observed by a change of color in the indicator - from salmon to pink - due to the production of ammonia.

Reference: Albimi Laboratories[8]

* * * *

MOTILITY TEST MEDIUM

Purpose: Part of IMVIC schema for identifying Enterobacteriaceae

Formula:

Beef extract	3 gms
Peptone	10 gms
Sodium Chloride	5 gms
Agar	4 gms

Technique: The medium is inoculated by stabbing through the center of the medium about 1/3 of the length of the media and incubated at 37°C for a total of 48 hours. Read at 8, 24, and 48 hour intervals.

Reaction: Motility is manifested macroscopically by a diffuse zone of growth spreading from the line of inoculation. Certain species of motile bacteria will show diffuse growth throughout the entire medium, while others may show diffusion from one or two points only, appearing as modular outgrowths along the stab.

Reference: Edwards & Ewing,[11] p. 249.

PHENYLALANINE

Purpose: Part of IMVIC schema for identifying Enterobacteriaceae

Formula:

Yeast extract	3 gms
DL-phenylalanine	2 gms
(or L-phenylalanine)	(1 gm)
Disodium phosphate	1 gm
NaCl	5 gms
Agar	12 gms
Distilled water	1,000 ml

Tube and sterilize at 121°C for 10 minutes.

Technique: Inoculate broth and incubate 24 hours at 37°C.

Test Reagent: 10% Ferric chloride

Procedure: 4 or 5 drops of ferric chloride reagent are allowed to run over growth on slant. If phenylpyravic acid has been formed a green color develops in the syneresis fluid in the slant.

Reaction: The medium is used to test for the deamination of phenylalanine to phenylpyruvic acid.

Reference: Edwards & Ewing[11] p. 252.

SIMMONS CITRATE AGAR SLANT

Purpose: Part of IMVIC schema for differentiation of lactose-fermenting Enterobacteriaceae

Formula:

Sodium Citrate	2.0 gms/liter
Sodium Chloride	5.0 gms/liter
Ammonium Dihydrogen Phosphate	1.0 gms/liter
Dipotassium Phosphate	1.0 gms/liter
Magnesium Sulfate	0.2 gms/liter
Agar	15.0 gms/liter
Brom-Thymol Blue	0.08 gms/liter

pH 6.8±

Technique: Using a loop, inoculate lightly. Incubate at 37°C for 48 hours and read

Reaction: A positive test is indicated by the development of a Prussian blue color in the medium, showing that the organism can utilize citrate as a sole source of carbon.

Reference: Albimi Laboratories[8]

OXIDASE TEST FOR PSEUDOMONAS

Purpose: This rapid test allows for a convenient differentiation between pseudomonas and other gram-negative, lactose-negative colonies.

Formula: Reagent

A.	Ethylalcohol 95-96%	100 ml
	Alphanaphthol	1 gm
B.	Distilled water	100 ml
	Para-aminodimethylaniline HCl	1 gm

(Reagent B should be prepared frequently and should be stored in refrigerator when not in use.)

Technique: Nutrient agar slant cultures incubated at 37°C, or at a lower temperature if required are recommended. After incubation two or three drops of each reagent are introduced and the tube tilted so that the reagents are mixed and flow over the growth on the slant.

Reaction: Positive reactions are indicated by the development of a blue color in the growth within two minutes. The majority of positive cultures produce strong reactions within 30 seconds. Any very weak or doubtful reaction that occurs after two minutes should be ignored. Plate cultures may be tested by allowing an equal parts mixture of the reagents to flow over isolated colonies.

Reference: Bailey and Scott,[4] p. 160; Edwards & Ewing, [11] p. 251-2.

NITRATE BROTH

Purpose:	Part of IMVIC schema for identifying Enterobacteriaceae		
Formula:	Meat Extract	3 gms	
	Peptone	5 gms	
	Potassium Nitrate	1 gm	
	Distilled Water	1,000 ml	Put in 5 cc/tube
Technique:	Inoculate broth and incubate 48 hours at 37°C		
Test Reagent:	A. Dissolve 8 gms sulfanilic acid in 1,000 ml 5 N acetic acid		
	B. Dissolve 5 gms alphanaphtylamine in 1,000 ml of 5 N acetic acid		
Procedure:	Immediately before use equal parts of A and B are mixed and 0.1 ml of mixture is added to each culture. A positive test for reduction of nitrate to nitrite is a red color in few minutes.		
Reaction:	The red color indicates the reduction of nitrates to nitrites.		
Reference:	Edwards & Ewing[11] p. 250.		

BACTO-KCN BROTH BASE

Purpose: KCN broth base is recommended for the differentiation of Enterobacteriaceae, particularly to separate the salmonellae from the Bethesda-Ballerup group and to distinguish the klebsiella from Escherichia coli. Maeller showed that media containing potassium cyanide permitted differential growth of Enterobacteriaceae. E. coli, salmonella and shigella were inhibited in the medium while members of the klebsiella, Bethesda-Ballerup and Proteus groups grew unrestrictedly. E. freundii also grew in the medium.

Formula:

Proteose Peptone No. 3 Difco	3 gms
Disodium Phosphate	5.64 gms
Monopotassium Phosphate	.225 gm
Sodium Chloride	5 gms
KCN (add 15 cc of .5%)	15 cc

Technique: The tubes are inoculated heavily with 1 to 3 loops of a 24 hour broth culture of the test organisms.

Reaction: Observations for growth are made at the end of 24 and 48 hours incubation.

Reference: Difco Supplementary Literature,[9] p. 122.

MANNITOL SALT AGAR

Purpose: Isolation and identification of Staphylococci

Formula:

Peptone "M"	10.0 gms/liter
Beef Extract	1.0 gms/liter
Sodium Chloride	75.0 gms/liter
d-Mannitol	10.0 gms/liter
Agar	15.0 gms/liter
Phenol Red	0.025 gms/liter

pH 7.4

Technique: Streak the media with heavy inoculum of original material or with an inoculating loop streak from a secondary broth culture.

Reaction: Staphylococci are not inhibited by a concentration of 7.5 per cent sodium chloride. Pathogenic staphylococci produce colonies with yellow zones while nonpathogenic staphylococci produce small colonies surrounded by red or purple zones.

Reference: Albimi Laboratories[8]

LOEFFLER BLOOD SERUM AGAR

Purpose:	Loeffler Blood Serum is employed in the cultural diagnosis of diptheria. The growth of diphtheria bacilli are stimulated and other throat organisms are inhibited by this media.	
Formula:	Beef serum	70 gms/liter
	Dextrose broth infusion	2.5 gms/liter
	Whole egg	7.5 gms/liter
Technique:	Inoculate slant with original swab obtained from throat or subculture from broth with aid of inoculating loop. Incubate at 37°C for 18-24 hours.	
Reaction:	On Loeffler Blood Serum C. diphtheria grow luxuriantly and rapidly, developing morphologically typical organisms, in 12-16 hours.	
Reference:	Albimi Laboratories[8]	

GLYCEROL AGAR

Purpose:	Glycerol agar is a non-selective agar medium often used for cultivating tubercle bacilli.

Formula:

Beef Heart Infusion	500 gms
Bacto Tryptone	10 gms
Sodium Chloride	5 gms
Bacto Agar	15 gms
Glycerol	5%

Technique:	Inoculate the glycerol agar slant directly with the fecal suspension or other material suspected of containing the tubercle bacilli.
Reaction:	Typical colonies of the tubercle bacilli are formed.
Reference:	Difco Supplementary Literature,[9] p. 225.

* * * *

GALL'S GELATIN (i.e. 12%)

Purpose:	The use of gelatin in culture media for studies of gelatinolysis (elaboration of gelatinolytic enzymes) by bacteria.

Formula:

Bacto tryptone	10 gms
Bacto peptone	10 gms
Bacto yeast extract	10 gms
Bacto beef extract	10 gms
Monobasic potassium-phosphate	1 gm
Dibasic potassium phosphate	1 gm
Serum	1 cc
Gelatin	120 gms

LITMUS MILK

Purpose:	Litmus milk is recommended for propagating and carrying stock cultures of the lactic acid bacteria and also for determining the action of bacteria, upon milk.
Fomula:	Bacto Skim milk — 100 gms Bacto Litmus — .75 gms
Technique:	Inoculate litmus milk from a suspension of the test organism or directly from an isolated colony.
Reaction:	Litmus milk may be employed as a differential medium for bacteria on the basis of lactose fermentation, caseolysis, and casein coagulating properties. Litmus has the advantage of being readily reduced by certain bacteria. This reduction of the litmus is useful as a differential aid.
Reference:	Difco Manual,[7] p. 192.

* * *

CORN MEAL AGAR

Purpose:	Corn meal agar is recommended for the production of chlamydospores by Candida albicans and for the cultivation of phytopathological and other fungi.
Formula:	Corn Meal, Infusion from — 50 grms Bacto Agar — 15 gms
Technique:	Streak surface of the corn meal plate directly with suspicious material or with a culture that grew on preliminary solution medium.
Reaction:	Typical chlamydospores are produced by Candida albicans.
Reference:	Difco Manual,[7] p. 246

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13. ABSTRACT The effect of various diets on the normal fecal bacterial flora of chimpanzees in captivity is little understood. Since such information is of value in formulating programs for the care and feeding of chimpanzees in vivaria and since diet is known to change the intestinal flora of other animals, a study was undertaken to determine the effect of diet on the aerobic and anaerobic fecal flora of 12 chimpanzees separated from the colony in the vivarium at the 6571st ARL at Holloman AFB, NMex., and used as subjects on a nutrition study. The data obtained from the aerobic bacterial studies were summarized in tables grouping the occurrence of the enterobacteriaceae, streptococci and miscellaneous aerobes so that comparisons can be made by sampling period, diet, and for each animal. The data of the occurrence of the anaerobic bacterial cultures were summarized in tables as obligate anaerobes or facultative anaerobes, using the designation derived from the anaerobic "key" so that the same comparisons can be made as for the aerobic cultures. The aerobic bacteria isolated were more markedly influenced by the individual animal than by diet. The predominance of anaerobes over aerobes and the proportion of strict vs facultative anaerobes were influenced by the composition of the diet fed, and to a lesser extent, the proportion of strict vs facultative anaerobes was influenced by the individual animal. The length of time which the diet was fed also played an important role in the proportion of strict vs facultative anaerobes.

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