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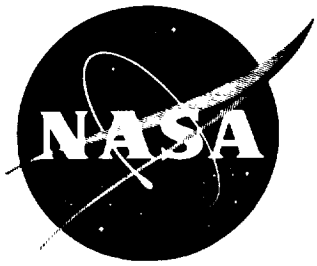

FOOD AND NUTRITION STUDIES FOR APOLLO 16

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACECRAFT CENTER

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FOOD AND NUTRITION STUDIES FOR APOLLO 16

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16. Abstract

A study has been conducted on nutrient intake and absorption during the Apollo 16 mission. Results indicate that inflight intakes of all essential nutrients were adequate and that absorption of these materials occurred normally.

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FOOD AND NUTRITION STUDIES FOR APOLLO 16

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SUMMARY

Results of nutritional studies indicate that preflight caloric consumption among the Apollo 16 crew approximately met the metabolic requirements, whereas in flight each crewmember received substantially less energy than his ground-based requirement. A body weight loss was encountered by each crewmember, and a body volume loss occurred in the command module pilot and the lunar module pilot. The average inflight potassium levels were considerably below the intakes prescribed for the Apollo 16 crew, but closely approximated average daily intakes normally observed in the population at large. Similarly, the inflight intake of other essential elements was found to be adequate. Protein intakes for each of the three crewmembers exceeded the minimum daily requirements to ensure positive nitrogen balance.

INTRODUCTION

As a result of unusual electrolyte losses among the crew of the Apollo 15 mission and associated physiological abnormalities, a requirement was levied to provide 140 ± 5 milliequivalents (meq) of potassium (K) in the Apollo 16 diets during flight and for 72 hours both preflight and postflight. In addition, nutrient intake and absorption for each Apollo 16 crewman were monitored during the entire period beginning 72 hours preflight and ending 72 hours postflight. The control of nutrient intake during this entire period would afford maximum opportunity to detect physiological changes accompanying transition to and from weightless flight. For these reasons, a 72-hour metabolic balance was conducted before and after flight during which food and fluid intake was measured and urine and fecal collections were made.

After numerous attempts at inflight menu formulations, it was decided that these requirements could not be met by using Apollo flight-qualified foods. For preflight and postflight menus, frozen preplated foods from commercial sources also were evaluated and were found insufficient in providing 140 meq of potassium per day and a nutrient match for the inflight foods. Therefore, the possibility of potassium fortification of qualified inflight foods was investigated, and the development of special preflight and postflight meals was undertaken. As part of this effort, a series of flight-qualified inflight foods was fortified with various potassium salts and evaluated by (1) literature search, (2) organoleptic testing by trained taste panels, (3) microbiological safety testing, and (4) a control feeding study. A series of menus for preflight and postflight foods was analyzed and taste tested for nutrient content.

FOOD FORTIFICATION

Coffee was selected as a highly acceptable food that seemed to offer good potential for potassium fortification. The following potassium compounds were added to black coffee at the level of 15 meq per serving: potassium iodide, potassium bromate, potassium iodate, potassium citrate, potassium phosphate, dipotassium phosphate, potassium chloride, and potassium gluconate.

Potassium iodide, bromate, iodate, and chloride resulted in very objectionable flavors in the black coffee. Potassium bromate and iodate did not readily go into solution. Potassium citrate did not produce major off-flavors, but it was deleted from the list of candidate fortification chemicals because it has been reported to stimulate diuresis if consumed in quantities greater than 2 grams over a 24-hour period. To maintain a daily potassium intake level of 140 ± 5 meq, it would be necessary to consume quantities of potassium citrate in excess of 2 grams.

Additional qualified Apollo foods and possible potassium compounds were evaluated by technical taste panels. The results of these studies are presented in table I. Potassium gluconate and citrate received the highest mean rating compared to other potassium compounds.

Triangle taste tests were performed with potassium gluconate added to various beverages and soups. Eight panel members were asked to identify which beverage or soup was different from the other two. Results of these tests are shown in tables II and III. These taste evaluations disclosed three potential potassium compounds suitable for fortification of selected Apollo foods. These compounds were potassium citrate, potassium gluconate, and dipotassium phosphate.

To provide 10 meq of potassium, the compound dipotassium phosphate does not require as much total compound addition per serving as potassium gluconate (0.87 gram compared to 2.35 grams). However, dipotassium phosphate proved more readily detectable by expert taste panelists. The difference in taste was not usually objectionable. One panelist, however, found it very objectionable when added to cocoa.

The difference in acceptability of dipotassium phosphate and potassium gluconate was attributed to differences in pH. A 10-meq solution of dipotassium phosphate had a pH of 9.1 compared to a pH of 7.4 for an equimolar solution of potassium gluconate. Ten meq of dipotassium phosphate increases the pH of Apollo orange drink from 3.2 to 4.0, while 10 meq of potassium gluconate increases the pH to 3.6. Potassium gluconate consistently received the highest taste panel rating when compared to other potassium salts. With the exception of pea soup, the samples containing potassium gluconate were indistinguishable by taste from other samples. These foods are more highly buffered and, therefore, less subject to change in pH.

A literature survey on the use of potassium compounds as food additives revealed reports of a significant increase in the occurrence of circumferential ulcerating and stenotic lesions of the small bowel in patients administered oral potassium therapy. These effects have been attributed to the use of potassium chloride in tablet or concentrated form. No untoward effects from the use of potassium gluconate at levels up to 40 meq daily in normal individuals are suggested in standard drug-use references (ref. 1).

Potassium gluconate was reported to be a nonirritating, biologically active potassium compound. It is a normal intermediary metabolite that is readily absorbed and produces no evidence of ulcerations at a dosage level of 80 meq/day. The suggested usual dosage is the equivalent of 10 meq of potassium four times daily (ref. 1).

Based upon these studies, it was decided that some Apollo 16 beverages and soup could be fortified with 10 meq of potassium per serving in the form of potassium gluconate. This fortification was accomplished by the addition of 2.35 grams of potassium gluconate per serving. The physiological safety of potassium gluconate for food fortification and supplementation was verified by extensive search of the literature (refs. 2 to 4) and review by Food and Drug Administration officials.

It was decided that Apollo grape drink, orange drink, pineapple-orange drink, pineapple-grapefruit drink, grapefruit with sugar, and cocoa could be fortified with potassium gluconate. If the desired potassium level could not be maintained in the Apollo 16 diet by the use of these fortified beverages, then certain soups could also be fortified.

More than 250 individual servings of Apollo beverages were supplemented by the addition of potassium gluconate. These beverages included Apollo 16 flight beverages, preflight and postflight beverages, backup and contingency supplies, and samples for the control study.

APOLLO 16 MENUS

Special menus were designed to support the Apollo 16 mission during flight and for 3 days both before and after flight. Caloric requirements were estimated for each crewman according to the formula suggested by the Food and Nutrition Board of the National Research Council (ref. 5) for the adjustment of calorie allowances for adult individuals of various weights and ages (at a mean environmental temperature of 20° (68° F), assuming light physical activity). The calculated daily caloric level for each crewman was as follows.

Crewman	Daily requirement, kcal
John Young, commander (CDR)	2750
Charles Duke, lunar module pilot (LMP)	2650
Ken Mattingly, command module pilot (CMP)	2500

Each menu was required to supply specified daily levels of certain nutrients as follows.

Nutrient	Daily requirement
Protein, g	90 to 125
Calcium, mg	750 to 850
Phosphorus, mg	1500 to 1700
Sodium, meq	100 to 200
Potassium, meq	135 to 145
Magnesium, mg	300 to 400

Preflight and postflight menus for Apollo 16 are shown in table IV.

Special menus were designed for the inflight phases of Apollo 16. Foods were selected for naturally high potassium content and crew preference. The maximum amount of potassium attainable by this method was 110 ± 5 meq/day. This fact indicated a need for supplementation by three beverages per day, each containing a 10 meq of potassium fortification. Menus based upon these requirements were designed. These Apollo 16 inflight menus are presented in tables V to X.

MICROBIOLOGICAL FOOD SAFETY

Twenty-one routine microbiological analyses were performed just before the launch of Apollo 16. These samples included the beverages fortified with potassium gluconate. A yeast and mold count and coagulase positive staphylococci determination on agar were also performed on each sample. Forty-nine samples of frozen preplated meals used for Apollo 16 preflight and postflight were also analyzed for total aerobic count and coliforms. All these foods were found to comply with the Apollo food microbiological requirements (ref. 6).

A series of detailed microbiological studies was conducted to verify the microbiological safety and selection of the beverage for the insuit drinking device used on the lunar surface. The beverage used for the insuit device must be microbiologically safe after being rehydrated and stored at room temperature for periods as long as 20 hours. Samples of cocoa, orange juice, orange drink, and several mixtures of orange drink and orange crystals were rehydrated with sterile water and analyzed periodically for as much as 114 hours of storage at room temperature. Stored samples were analyzed for total aerobic count and yeast and mold count. The microbiological shelf life of rehydrated orange crystals was improved by the addition of orange drink. Orange-grapefruit drink, grapefruit crystals, orange-pineapple drink, citrus beverage, and orange crystals fortified with 10 meq of potassium gluconate per serving were also

rehydrated and analyzed at intervals for periods as long as 114 hours. These tests revealed that the fortification by potassium gluconate in these beverages did not significantly alter the microbiological safety of the foods.

POTASSIUM FORTIFICATION CONTROL STUDY

Apollo 16 flight foods were assembled into two diets for a controlled ambulatory study. One diet was supplemented with potassium in the form of potassium gluconate, while the other was not fortified.

Two subjects consumed each of these diets for a period of 2 weeks. During this period, no untoward effects of any kind were observed in any physiological parameters including electrocardiogram and urinary and serum potassium levels. A slight loosening of the stools was observed on both diets and therefore could not be attributed to the presence of potassium gluconate.

In other studies conducted by NASA, quantities of potassium chloride as high as 125 meq/day were consumed in formula diets without eliciting any detrimental effect whatsoever on any biochemical, cardiographic, or gastrointestinal parameters.

RESULTS AND DISCUSSION

The CDR's average daily inflight caloric consumption (fig. 1) was 2152 kcal. This amount, compared with an estimated requirement of 2750 kcal, would indicate that this crewmember incurred a deficit of 598 kcal/day or 6576 kcal for the 11-day period. Actual weight loss for the CDR was 4.6 kilograms, and body volume losses for the CDR were insignificant. (Body volumes were determined by stereophotogrammetry, ref. 7.)

The LMP's average daily inflight caloric consumption (fig. 2) was approximately 1900 kcal. Compared with an estimated requirement of 2650 kcal, this amount would indicate that the crewmember incurred a deficit of 750 kcal/day or 8241 kcal for the 11-day period. The actual body weight loss for the LMP was 4.03 kilograms, and the body volume loss for the LMP was approximately 2.5 liters.

The CMP's average daily inflight caloric consumption (fig. 3) was 1408 kcal, which, compared with an estimated requirement of 2500 kcal, would indicate that this crewmember incurred a deficit of 1091 kcal/day or 12 007 kcal for the 11-day period. Actual weight loss for the CMP was 2.6 kilograms, and a body volume change of 6.9 liters occurred.

All nutrient intake and absorption (i.e., fecal) data are presented in tables XI, XII, and XIII.

The average daily inflight potassium intake (fig. 4) for the CDR was 113.6 meq, compared with an average daily preflight intake of 113.6 meq and an average daily postflight intake of 98.1 meq. During the inflight phase, approximately 6.4 meq/day were lost in the fecal content, while approximately 18.8 meq/day were lost

preflight and 20.5 meq/day postflight. Inflight available potassium levels were 107.2 meq, while preflight and postflight available levels were 94.8 and 77.6 meq, respectively. These levels were considerably below the daily intake of 140 ± 5 meq prescribed for the Apollo 16 crew and closely approximated the average daily intakes normally observed in equivalent population. During the periods of extravehicular activity (EVA), the CDR consumed a maximum of 152.4 meq.

The average daily inflight potassium intake (fig. 5) for the LMP was 114.7 meq, compared with an average daily preflight intake of 110.5 meq and an average daily postflight intake of 97.5 meq. During the preflight, inflight, and postflight phases, the average daily fecal losses were 33.5, 11.1, and 31.0 meq, respectively. The available daily potassium levels for preflight, inflight, and postflight phases were 77.0, 103.6, and 66.5 meq, respectively. These levels were less than recommended, but adequate for ground-based requirements. A peak level of 148 meq was consumed by the LMP on the lunar surface.

For the CMP, average daily preflight, inflight, and postflight dietary potassium intakes were 94.3, 79.9, and 82.4 meq, respectively (fig. 6). Fecal potassium for the same periods were 27.6, 6.3, and 26.2 meq, respectively. Available daily preflight, inflight, and postflight potassium levels were, therefore, 66.7, 73.6, and 56.2 meq, respectively. These levels of potassium were somewhat less than those generally experienced in the average U.S. diet. Potassium losses by the CMP could not have been adequately compensated by these minimal levels of dietary potassium. It is speculated that had complete urine collections been performed in flight, a profound negative potassium balance would have been observed. The correlation of preferential water loss and relatively low potassium intake in the crewmember experiencing longest exposure to null gravity is consistent with the fundamental hypothesis that potassium fortification of the diet has some efficacy in counteracting the metabolic anomalies associated with weightless flight.

Trend data for sodium and chloride for each crewmember are shown in figures 7 to 12; all other nutrient data are summarized in tables XI, XII, and XIII.

The average inflight protein intakes for the CDR, CMP, and LMP were 86.1, 51.4, and 68.9 grams, respectively. All these intakes exceeded the minimum daily requirement for protein intake recommended to ensure positive nitrogen balance.

Manned Spacecraft Center
National Aeronautics and Space Administration
Houston, Texas 77058, October 6, 1972
914-50-95-07-72

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TABLE I. - TASTE EVALUATION OF APOLLO FOODS SUPPLEMENTED WITH POTASSIUM

[10 meq of potassium salt; foods rated on a scale of 1 to 10]

Product	Evaluation			
	Mean	Median	Range	Standard deviation
Citrus beverage + potassium chloride	2.9	3	1 to 7	2.0
Citrus beverage + potassium citrate	4.8	3	1 to 8	2.3
Citrus beverage + potassium gluconate	4.5	4	1 to 8	2.3
Citrus beverage + dipotassium phosphate	2.9	3	1 to 5	1.7
Grapefruit + potassium chloride	4.9	5	3 to 8	2.0
Grapefruit + potassium citrate	6.6	7	5 to 9	1.2
Grapefruit + potassium gluconate	7.0	7	5 to 9	1.2
Grapefruit + dipotassium phosphate	6.8	7	4 to 9	1.6
Pineapple-grapefruit + potassium chloride	3.9	3	1 to 6	1.9
Pineapple-grapefruit + potassium citrate	5.9	2	3 to 9	1.9
Pineapple-grapefruit + potassium gluconate	6.0	6	3 to 9	1.9
Pineapple-grapefruit + dipotassium phosphate	5.4	6	3 to 7	1.5
Cocoa + potassium gluconate	6.6	7	4 to 9	1.7
Orange-grapefruit + potassium chloride	5.0	5	1 to 8	2.5
Orange-grapefruit + potassium gluconate	6.4	6	2 to 9	2.1
Applesauce + dipotassium phosphate	2.9	3	1 to 5	1.6
Vanilla pudding + dipotassium phosphate	5.8	6	4 to 8	1.8
Mixed fruit + dipotassium phosphate				
10 meq	2.5	2	1 to 4	1.2
15 meq	4.0	4	2 to 7	1.8

TABLE II. - RESULTS OF TRIANGLE TESTS WITH BEVERAGES FORTIFIED WITH POTASSIUM

[10 meq of potassium gluconate added to fortified beverages]

Beverage	Times selected	Comments
Grape drink + K	0	One tester detected no difference.
Grape drink	6	
Grape drink + K	0	
Skylab grapefruit juice + K	0	Two individuals commented that products with K were better tasting.
Skylab grapefruit juice + K	0	
Skylab grapefruit juice	5	Three testers detected no difference.
Citrus beverage	4	
Citrus beverage + K	1	
Citrus beverage + K	1	
Pineapple-orange	1	One tester detected no difference.
Pineapple-orange + K	4	
Pineapple-orange	1	
Orange crystals + K	0	All testers commented that all three tasted terrible.
Orange crystals + K	3	
Orange crystals	0	Four testers detected no difference.
Pineapple-grapefruit	1	Two testers detected no difference.
Pineapple-grapefruit + K	4	
Pineapple-grapefruit	0	
Orange drink	2	Four testers detected no difference.
Orange drink + K	2	
Orange drink + K	0	
Cocoa + K	0	Two testers detected no difference.
Cocoa + K	4	
Cocoa	2	

TABLE III. - RESULTS OF TRIANGLE TESTS WITH APOLLO SOUPS FORTIFIED WITH POTASSIUM

[10 meq of potassium gluconate added to fortified soups]

Product	Times selected	Comments
Corn chowder + K	0	One tester detected no difference.
Corn chowder	4	
Corn chowder	3	
Cream of tomato soup	1	Three testers detected no difference.
Cream of tomato soup + K	1	
Cream of tomato soup	3	
Potato soup	1	Four testers detected no difference.
Potato soup	2	
Potato soup + K	1	
Lobster bisque + K	0	Five testers detected no difference.
Lobster bisque	1	
Lobster bisque	2	
Pea soup	0	Two testers detected no difference.
Pea soup	0	
Pea soup + K	6	

TABLE IV. - APOLLO 16 PREFLIGHT AND POSTFLIGHT MENUS

Meal	Day 1 (T-3; R+1)	Day 2 (T-2; R+2)	Day 3 (T-1; R+3)	Day 4 (T-0; preflight only
A	(F) Orange crystals (S/L)[a] Plain omelet Cured ham Potato balls Pecan roll, butter Milk, 1 cup (F) Coffee, black (S/L) or A fortified beverage	(F) Grapefruit crystals (S/L) Link sausage Pancakes Butter, maple syrup Diced peaches (S/L) (F) Coffee, black (S/L) or A fortified beverage	(F) Orange crystals (S/L) Escalloped apples Plain omelet Bacon strips Pecan roll, butter (F) Cocoa	(F) Grapefruit crystals (S/L) Filet mignon Plain omelet Buttered English muffin Jam (S/L) (F) Coffee, black (S/L)
B	Boneless chicken breast Wild rice Buttered peas w/mushrooms Dinner roll, butter Chocolate ice cream (F) Coffee, black (S/L) or A fortified beverage	Roast beef au jus Potatoes Parisienne Green beans almandine Dinner roll, butter Diced pears (S/L) (F) Coffee, black (S/L) or A fortified beverage	Sirloin steak Buttered carrots Creamed broccoli Dinner roll, butter Vanilla wafers (S/L) Pineapple (S/L) (F) Coffee, black (S/L) or A fortified beverage Lemonade	
C	Filet mignon Stuffed baked potato Spinach souffle Dinner roll, butter Fudge cake Coffee, black (S/L) or A beverage	Lobster Newburg White rice Buttered asparagus spears Dinner roll, butter Butterscotch pudding (S/L) (F) Coffee, black (S/L) or A fortified beverage	Prime rib w/mushroom caps Stuffed baked potato Green beans w/pearl onions Dinner roll, butter Chocolate ice cream (F) Grapefruit crystals (S/L)	

[a]F = fortified; S/L = Skylab.

TABLE V. - APOLLO 16 MENU — RED (CDR, JOHN W. YOUNG)

Meal	Days [a]1, [b]5, 9, and [b]13		Days 2 and 10		Days 3 and 11		Days 4, [c]8, and 12	
	Item	Form (d)	Item	Form (d)	Item	Form (d)	Item	Form (d)
A	Peaches	WP	Fruit cocktail	R	Peaches	RSB	Mixed fruit	WP
	(Day 13, peaches)	(RSB)	Sausage patties	R	Scrambled eggs	RSB	(Day 12, fruit cocktail)	(R)
	Scrambled eggs	RSB	Spiced fruit cereal	RSB	Bacon squares (8)	IMB	Ham steak	WP
	Bacon squares (8)	IMB	Orange juice	R	Grits	RSB	Cornflakes	RSB
	Grits	RSB	Cocoa + K	R	Orange juice	R	White bread (1) and jelly	WP
	Orange juice	R			Coffee + K (day 11)	R	(Delete on day 12)	
	Cocoa + K	R			Cocoa + K	R	Orange juice	R
							Cocoa + K	R
B	Chicken and rice soup	RSB	Corn chowder	RSB	Lobster bisque	RSB	Pea soup	RSB
	Hamburger and		Turkey and gravy	WP	Bread, rye (2) and		Meatballs w/sauce	WP
	white bread (1)	WP	Vanilla pudding	WP	tuna spread	WP	Lemon pudding	WP
	Pears	IMB	White bread (1) and		Cherry food bar (2)	IMB	(Days 8 and 12, Pork	
	Instant breakfast	R	peanut butter	WP	Graham cracker		and scalloped potatoes)	(RSB)
	Cereal bar	DB	Apple food bar (2)	IMB	cubes (6)	DB	Sugar cookies (4)	DB
	Citrus beverage + K	R	Orange drink + K	R	Cocoa + K	R	Peaches	IMB
							Orange-grapefruit drink + K	R
C	Cream tomato soup	RSB	Cream potato soup	RSB	Romaine soup	RSB	Beef and gravy	WP
	Spaghetti w/meat		Frankfurters (4)	WP	Beef steak	WP	Chicken stew	RSB
	sauce	RSB	Chocolate pudding	RSB	Chicken and rice	RSB	Butterscotch pudding	RSB
	Peach ambrosia	RSB	Orange-grapefruit		Pineapple fruitcake (4)	DB	Chocolate bar	DB
	Brownies (4)	DB	drink + K	R	Pecans (6)	DB	Gingerbread (4)	DB
	Pecans (6)	DB			Grape drink + K	R	Citrus beverage + K	R
	Cocoa + K	R						

[a]Meal C only.

[b]Meal A only.

[c]Meals B and C only.

[d]DB = dry bite; IMB = intermediate moisture bite; R = rehydratable; RSB = rehydratable spoon bowl; WP = wet pack; SBD = Skylab beverage dispenser; RC = rehydratable can.

TABLE VI. - APOLLO 16 MENU — WHITE (CMP, THOMAS K. MATTINGL)

Meal	Days [a]1, 5, 9, and [b]13		Days 2, 6, and 10		Days 3, 7, and 11		Days 4, 8, and 12
	Item	Form (c)	Item	Form (c)	Item	Form (c)	Item
A	Peaches (Day 13, peaches) Scrambled eggs Bacon squares (8) Orange juice Coffee + K	WP (RSB) RSB IMB R R	Fruit cocktail Sausage patties Spiced fruit cereal Orange juice Coffee + K	R R RSB R R	Peaches Scrambled eggs Bacon squares (8) Grits Orange juice Coffee + K	RSB RSB IMB RSB R R	M[illegible]ed fruit (Day 12, fruit cocktail) H[illegible]m steak C[illegible]nflakes W[illegible]te bread (1), jelly (Delete on day 12) O[illegible]nge juice C[illegible]fee + K
B	Chicken and rice soup Hamburger and white bread (1) Pears Instant breakfast Cereal bar Citrus beverage + K	RSB WP IMB R DB R	Corn chowder Turkey and gravy Vanilla pudding White bread (1) and peanut butter Apricot food bar (2) Orange drink + K	RSB WP WP WP IMB R	Lobster bisque Rye bread (2) and ham spread (day 7) Cherry food bar (2) Graham cracker cubes (6) Cocoa + K Tuna spread (Day 11)	RSB WP IMB DB R WP	P[illegible] soup M[illegible]atballs w/sauce L[illegible]mon pudding (Days 8 and 12, pork and [illegible]calloped potatoes) S[illegible]ar cookies (4) A[illegible]ricots O[illegible]nge-grapefruit drink + [illegible]
C	Cream tomato soup Spaghetti w/meat sauce Peach ambrosia Brownies (4) Pecans (6) Cocoa + K	RSB RSB RSB DB DB R	Cream potato soup Frankfurters (4) Chocolate pudding Orange-grapefruit drink + K	RSB WP RSB R	Romaine soup Beef steak Chicken and rice Pineapple fruitcake (4) Pecans (6) Grape drink + K	RSB WP RSB DB DB R	B[illegible]ef and gravy C[illegible]icken stew B[illegible]tterscotch pudding C[illegible]ocolate bar C[illegible]ngerbread (4) C[illegible]trus beverage + K

[a]Meal C only.

[b]Meal A only.

[c]DB = dry bite; IMB = intermediate moisture bite; R = rehydratable; RSB = rehydratable spoon bowl; WP = wet pack; RC = rehydratable can; SBD = Skylab beverage dispenser.

TABLE VII. - APOLLO 16 MENU — BLUE (LMP, CHARLES M. DUKE)

Meal	Days [a]1, [b]5, 9, and [b]13		Days 2 and 10		Days 3 and 11		Days 4, [c]8, and 12	
	Item	Form (d)	Item	Form (d)	Item	Form (d)	Item	Form (d)
A	Peaches	WP	Fruit cocktail	R	Peaches	RSB	Mixed fruit	WP
	(Day 13, peaches)	(RSB)	Sausage patties	R	Scrambled eggs	RSB	(Day 12, fruit cocktail)	(R)
	Scrambled eggs	RSB	Spiced fruit cereal	RSB	Bacon squares (8)	IMB	Ham steak	WP
	Bacon squares (8)	IMB	Orange juice	R	Grits	RSB	Cornflakes	RSB
	Grits	RSB	Cocoa + K	R	Orange juice	R	White bread (1), jelly	WP
	Orange juice	R			Cocoa + K	R	(Delete on day 12)	
	Cocoa + K	R					Orange juice	R
							Cocoa + K	R
B	Chicken and rice soup	RSB	Corn chowder	RSB	Lobster bisque	RSB	Pea soup	RSB
	Hamburger and		Turkey and gravy	WP	Rye bread (2) and		Meatballs w/sauce	WP
	white bread (1)	WP	Vanilla pudding	WP	tuna spread	WP	Lemon pudding	WP
	Pears	IMB	White bread (1) and		Cherry food bar (2)	IMB	(Days 8 and 12, pork and	
	Instant breakfast	R	peanut butter	WP	Graham cracker		scalloped potatoes)	(RSB)
	Cereal bar	DB	Apple food bar (2)	IMB	cubes (6)	DB	Sugar cookies (4)	DB
	Citrus beverage + K	R	Orange drink + K	R	Citrus beverage + K	R	Peaches	IMB
							Orange-grapefruit drink + K	R
C	Cream tomato soup	RSB	Cream potato soup	RSB	Romaine soup	RSB	Beef and gravy	WP
	Spaghetti w/meat	RSB	Frankfurters (4)	WP	Beef steak	WP	Chicken stew	RSB
	sauce	RSB	Chocolate pudding	RSB	Chicken and rice	RSB	Butterscotch pudding	RSB
	Peach ambrosia		Orange-grapefruit		Pineapple fruitcake (4)	DB	Chocolate bar	DB
	Apricot cereal	DB	drink + K	R	Pecans (6)	DB	Gingerbread (4)	DB
	cubes (4)	DB			Grape drink + K	R	Citrus beverage + K	R
	Pecans (6)	R						
	Cocoa + K							

[a]Meal C only.

[b]Meal A only.

[c]Meal B and C only.

[d]DB = dry bite; IMB = intermediate moisture bite; R = rehydratable; RSB = rehydratable spoon bowl; WP = wet pack; RC = rehydratable can; SDB = Skylab beverage dispenser.

TABLE VIII. - APOLLO 16 COMMAND MODULE PANTRY STOWAGE ITEMS

Item	Quantity	Item	Quantity
Beverages		Soups, salads, meats	
Cocoa	6	Salmon salad	3
Coffee, black	16	Tuna salad	3
Instant breakfast	9	Shrimp cocktail	3
Grapefruit drink	6	Romaine soup	3
Orange beverage	6	Potato soup	3
Orange-grapefruit beverage	6	Pea soup	3
Orange juice	12	Spaghetti w/meat sauce	3
Orange-pineapple drink + K	6	Chicken stew	3
Breakfast items		Snack items	
Bacon squares (8)	6	Pecans (6)	3
Spiced fruit cereal	3	Apricots (IMB[a]) (38.5 g)	6
Cornflakes	3	Peaches (IMB[a]) (39 g)	8
Scrambled eggs	6	Pears (IMB[a]) (42 g)	6
Grits	3	Apricot food bar (1) (2[illegible] g)	9
Peach ambrosia	3	Apple food bar (1) (26 g)	9
Sausage patties	3	Lemon food bar (1) (26 g)	9
Sandwich spreads		Cherry food bar (1) (26 g)	9
Peanut butter	3	Cereal bar	6
Jelly	3	Chocolate bar	3
Ham salad	1	Sugar cookies (4)	3
Catsup[b]	7	Graham crackers (6)	3
Mustard[b]	7	Cheese cracker cubes (4)	3

[a]Intermediate moisture bite.

[b]Stowage locations to be determined.

TABLE IX. - APOLLO 16 LUNAR MODULE MENU — RED (CDR, JOHN W. YOUNG)

Meal	Day 5		Day 6		Day 7		Day 8	
	Item	Form (a)	Item	Form (a)	Item	Form (a)	Item	Form (a)
A			Peaches	IMB	Peaches	IMB	Peaches	IMB
			Ham steak	WP	Beef steak	WP	Ham steak	WP
			Scrambled eggs	RSB	Bacon squares (8)	IMB	Scrambled eggs	RSB
			Cinnamon toasted bread cubes (6)	DB	Spiced fruit cereal	RSB	Cereal bar	DB
			Instant breakfast	R	Instant breakfast	R	Apricot cereal cubes (6)	DB
			Grapefruit drink	R	Grapefruit drink	R	Orange beverage	R
			Apricot food bar (2)	IMB	Cherry food bar (2)	IMB	Cocoa	R
B	Cream tomato soup	RSB	Pea soup	RSB	Romaine soup	RSB	(b)	
	Rye bread (2) and tuna spread	WP	Salmon salad	RSB	Tuna salad	RSB		
	Apple food bar (2)	IMB	Frankfurters (4)	WP	Meatballs w/sauce	WP		
	Chocolate bar	DB	Peach ambrosia	RSB	Chicken and rice	RSB		
	Orange-grapefruit beverage	R	Pears	IMB	Butterscotch pudding	RSB		
			Cereal bar	DB	Gingerbread (6)	DB		
			Orange-grapefruit beverage	R	Citrus beverage	R		
			Cocoa	R	Cocoa	R		
C	Shrimp cocktail	RSB	(b)		(b)			
	Turkey and gravy	WP						
	Chocolate pudding	RSB						
	Graham cracker cubes (6)	DB						
	Cocoa	R						
	Citrus beverage	R						

[a]DB = dry bite; IMB = intermediate moisture bite; R = rehydratable; RSB = rehydratable spoon bowl; WP = wet pack.

[b]Available EVA foods: 6 in-suit food bars, 4 in-suit beverages.

TABLE X. - APOLLO 16 LUNAR MODULE MENU — BLUE (LMP, CHARLES M. DUKE)

Meal	Day 5		Day 6		Day 7		Day 8	
	Item	Form (a)	Item	Form (a)	Item	Form (a)	Item	Form (a)
A			Peaches	IMB	Peaches	IMB	Peaches	IMB
			Ham steak	WP	Beef steak	WP	Ham steak	WP
			Scrambled eggs	RSB	Bacon squares (8)	IMB	Scrambled eggs	RSB
			Cinnamon toasted bread cubes (6)	DB	Spiced fruit cereal	RSB	Cereal bar	DB
			Instant breakfast	R	Instant breakfast	R	Apricot cereal cubes (6)	DB
			Orange-grapefruit beverage	R	Orange-grapefruit beverage	R	Orange beverage	R
			Lemon food bar (2)	IMB	Cherry food bar (2)	IMB	Cocoa	R
B	Cream tomato soup	RSB	Pea soup	RSB	Romaine soup	RSB	(b)	
	Rye bread (2) and tuna spread	WP	Salmon salad	RSB	Tuna salad	RSB		
	Apple food bar (2)	IMB	Frankfurters (4)	WP	Meatballs w/sauce	WP		
	Chocolate bar	DB	Peach ambrosia	RSB	Chicken and rice	RSB		
	Orange-grapefruit beverage	R	Pears	IMB	Butterscotch pudding	RSB		
			Cereal bar	DB	Gingerbread (6)	DB		
			Citrus beverage	R	Citrus beverage	R		
			Cocoa	R	Cocoa	R		
C	Shrimp cocktail	RSB	(b)		(b)			
	Turkey and gravy	WP						
	Chocolate pudding	RSB						
	Graham cracker cubes (6)	DB						
	Cocoa	R						
	Citrus beverage	R						

[a]DB = dry bite; IMB = intermediate moisture bite; R = rehydratable; RSB = rehydratable spoon bowl; WP = wet pack.

[b]Available EVA foods: 6 in-suit food bars, 4 in-suit beverages.

TABLE XI. - INTAKE AND ABSORPTION DATA FOR CDR

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
T-3	Breakfast	--	762	31.3	49.5	46.3	0	4.82	137	502	51.1	28.6	83	33.5
	Lunch	--	1185	54.4	66.5	92.9	0	7.63	368	792	71.9	38.4	200	27.4
	Dinner	--	2042	62.0	84.8	226.9	0	10.43	528	976	99.[illegible]	61.0	190	69.2
	Total intake	3645	3989	147.7	200.8	366.1	0	22.88	1033	2270	222.[illegible]	128.0	473	130.1
	Feces	54	108	6.7	1.7	7.3	.86	2.10	269	298	4.[illegible]	8.7	127	.3
	Intake less feces	3591	3881	141.0	199.1	358.8	-.86	20.78	764	1972	217.[illegible]	119.3	346	129.8
	Urine	1090	--	--	--	--	--	--	--	--	--	--	--	--
T-2	Breakfast	--	782	11.6	29.4	123.1	0	4.10	169	266	41.[illegible]	25.3	40	25.8
	Lunch	--	804	44.3	34.1	79.9	0	4.48	381	631	48.[illegible]	43.7	136	16.3
	Dinner	--	1631	78.7	63.3	188.5	0	13.37	580	1027	94.[illegible]	57.2	248	81.4
	Total intake	3442	3217	134.6	126.8	391.5	0	21.95	1130	1924	183.[illegible]	126.2	424	123.5
	Feces	123	351	15.8	12.5	22.4	3.25	5.40	919	851	3.[illegible]	25.3	364	1.3
	Intake less feces	3319	2866	118.8	114.3	369.1	-3.25	16.55	211	1073	180.[illegible]	100.9	60	122.2
	Urine	1990	--	45.8	--	--	--	--	--	--	--	--	--	--
T-1	Breakfast	--	582	18.6	35.7	46.9	0	3.37	128	585	39.[illegible]	23.4	58	16.8
	Lunch	--	626	38.4	21.2	70.5	0	4.86	85	332	38.[illegible]	16.1	47	19.4
	Dinner	--	1194	46.5	36.0	148.3	0	6.01	367	760	43.[illegible]	46.9	121	23.9
	Total intake	2031	2402	103.5	92.9	265.7	0	14.24	580	1677	121.[illegible]	86.4	226	60.1
	Feces	76	276	16.8	9.3	12.5	2.17	5.39	945	803	20.[illegible]	22.5	342	.6
	Intake less feces	2555	2126	86.7	83.6	253.2	-2.17	8.85	-365	874	100.[illegible]	63.9	-116	59.5
	Urine	1250	--	35.2	--	--	--	--	--	--	--	--	--	--
T+0	Breakfast	350	490	40.8	29.3	15.9	0	2.64	121	459	15.[illegible]	18.4	38	21.2
	Lunch	274	562	17.7	25.8	63.0	.28	3.20	266	343	59.[illegible]	12.6	33	37.2
	Dinner	605	995	21.4	60.2	87.1	1.41	5.90	174	483	83.[illegible]	42.7	113	48.1
	Total intake	1229	2047	79.9	115.3	166.0	1.69	11.74	561	1285	158.[illegible]7	73.7	184	106.5
	Feces	36	78	5.2	2.4	4.1	.44	1.70	340	249	[illegible]7	7.4	120	.00[illegible]
	Intake less feces	1193	1969	74.7	112.9	161.9	1.25	10.04	221	1036	158.[illegible]	66.3	64	106.5
	Urine	--	880	35.2	53.0	131.5	5.17	5.1	362	554	40.[illegible]7	44.2	112	37.5
T+1	Breakfast	--	832	40.3	16.0	146.3	2.35	9.2	268	582	95.[illegible]5	50.1	89	113.1
	Lunch	--	709	6.3	15.2	134.6	1.46	5.0	252	486	47.[illegible]3	35.6	61	36.7
	Dinner	--	2421	81.8	84.2	412.4	8.98	19.3	882	1622	183.[illegible]5	129.9	262	187.3
	Total intake	2448	321	16.1	11.3	15.9	3.00	8.4	1095	945	35.[illegible]1	27.4	401	3.3
	Feces	82	2100	65.7	72.9	396.5	5.98	10.9	-213	677	148.[illegible]4	102.5	-139	184.0
	Intake less feces	2366	716	37.3	29.0	82.0	1.10	7.7	329	574	88.[illegible]6	48.5	86	60.2
T+2	Breakfast	--	504	14.1	22.6	68.0	.73	2.2	96	213	23.[illegible]7	7.6	14	20.2
	Lunch	--	407	23.4	4.0	71.8	.87	6.2	139	319	79.[illegible]4	21.4	40	68.1
	Dinner	--	1627	74.8	55.6	221.8	2.70	16.1	564	1106	184.[illegible]7	77.5	140	148.5
	Total intake	1750	--	--	--	--	--	--	--	--	--	--	--	--
	Feces	--	1627	74.8	55.6	221.8	2.70	16.1	564	1106	184.[illegible]7	77.5	140	148.5
	Intake less feces	1750	747	43.4	17.0	122.2	.99	4.8	200	685	51.[illegible]8	46.7	95	45.8
T+3	Breakfast	567	1059	20.8	27.2	172.3	4.93	6.5	233	554	81.[illegible]1	46.6	77	42.8
	Lunch	506	780	41.4	29.1	118.0	1.26	7.8	358	763	60.[illegible]0	36.1	70	80.3
	Dinner	556	2586	105.6	73.3	412.5	7.18	19.1	791	2002	201.[illegible]9	129.4	242	168.9
	Total intake	1629	--	--	--	--	--	--	--	--	--	--	--	--
	Feces	--	2586	105.6	73.3	412.5	7.18	19.1	791	2002	201.[illegible]9	129.4	242	168.9
	Intake less feces	1629	646	36.7	28.9	63.5	.85	7.4	308	557	81.[illegible]1	40.7	80	60.1
T+4	Breakfast	457	616	1.1	.7	159.5	1.90	3.1	396	233	1[illegible].4	27.6	28	.3
	EVA	1024	797	23.7	31.4	115.5	3.31	8.5	234	354	7[illegible].7	84.1	84	60.7
	Dinner	365	2059	61.5	61.0	338.5	6.06	19.0	938	1144	17[illegible].2	152.4	192	121.1
	Total intake	1846	--	--	--	--	--	--	--	--	--	--	--	--
	Feces	--	2059	61.5	61.0	338.5	6.06	19.0	938	1144	17[illegible].2	152.4	192	121.1
	Intake less feces	1846												

TABLE XI. - INTAKE AND ABSORPTION DATA FOR CDR - Continued

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
T+5	Breakfast	384	976	29.7	21.7	179.7	4.20	8.7	579	664	37.6	45.5	105	40.8
	EVA	960	--	--	--	--	--	--	--	--	--	--	--	--
	Dinner	685	1031	61.8	26.4	143.2	1.66	11.2	411	960	85.4	36.4	147	62.9
	Total intake	2029	2007	91.5	48.1	322.9	5.86	19.9	990	1624	123.0	81.9	252	103.7
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	2029	2007	91.5	48.1	322.9	5.86	19.9	990	1624	123.0	81.9	252	103.7
T+6	Breakfast	392	927	35.3	13.4	186.1	3.79	8.9	362	595	69.1	53.5	121	49.4
	EVA	870	452	0	.4	115.2	.12	1.6	360	165	16.0	49.2	49	.1
	Dinner	607	1046	57.1	45.6	99.6	1.93	10.3	240	721	134.8	44.3	106	136.8
	Total intake	1869	2425	92.4	59.4	400.9	5.84	20.8	962	1481	219.9	147.0	276	186.3
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1869	2425	92.4	59.4	400.9	5.84	20.8	962	1481	219.9	147.0	276	186.3
T+7	Breakfast	470	964	26.9	35.1	155.5	2.51	6.4	264	536	44.3	35.1	90	40.3
	EVA	870	452	0	.4	115.2	.12	1.6	360	165	16.0	49.2	49	.1
	Dinner	567	886	42.4	26.9	144.1	1.44	8.3	413	812	80.8	39.7	77	40.1
	Total intake	1907	2302	69.3	62.4	414.8	4.07	16.3	1037	1513	141.1	124.0	216	80.5
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1907	2302	69.3	62.4	414.8	4.07	16.3	1037	1513	141.1	124.0	216	80.5
T+8	Breakfast	457	646	36.7	28.9	63.5	.85	7.4	307	557	81.1	40.7	80	60.1
	Lunch	463	634	26.2	10.1	106.1	2.86	3.3	554	528	42.6	35.1	72	35.5
	Dinner	517	1125	34.0	64.3	100.2	2.29	9.2	194	598	129.8	57.3	120	73.9
	Total intake	1437	2405	96.9	103.3	269.8	6.00	19.9	1055	1683	253.5	133.1	272	169.5
	Feces	10	(a)	1.18	1.9	1.5	.22	1.3	97	66	16.6	1.8	21	(a)
	Intake less feces	1427	2405	95.72	101.4	268.3	5.78	18.6	958	1617	236.9	131.3	251	--
T+9	Breakfast	--	692	33.1	22.1	91.6	4.31	4.5	333	502	39.4	41.8	90	36.1
	Lunch	--	349	35.7	13.5	49.2	.63	7.3	36	407	82.9	19.9	61	129.6
	Dinner	--	391	2.6	.9	99.8	2.05	2.9	147	163	7.7	39.4	46	1.5
	Total intake	1216	1432	71.4	36.5	240.6	6.99	14.7	516	1072	130.0	101.1	197	167.2
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1216	1432	71.4	36.5	240.6	6.99	14.7	516	1072	130.0	101.1	197	167.2
T+10	Breakfast	--	654	36.9	25.9	77.1	1.02	6.6	274	466	79.3	31.7	67	91.5
	Lunch	--	954	28.9	43.2	119.2	3.21	12.7	233	528	94.5	41.4	74	47.4
	Dinner	--	755	56.0	36.3	71.7	1.31	6.5	56	478	79.5	26.9	68	61.6
	Total intake	2301	2363	121.8	105.4	268.0	5.54	25.8	563	1472	253.3	100.0	209	200.5
	Feces	88	268	17.7	6.8	16.2	2.35	8.5	1927	1193	18.2	29.6	333	2.3
	Intake less feces	2213	2095	104.1	98.6	251.8	3.19	17.3	-1364	279	235.1	70.4	-124	198.2
R+0	Breakfast[b]	--	--	--	--	--	--	--	--	--	--	--	--	--
	Lunch	--	559	35.4	26.7	44.3	0	4.15	305	541	27.7	23.6	98	15.4
	Dinner	--	1257	36.1	49.9	156.0	0	8.04	423	727	69.9	69.4	144	38.8
	Total intake	2432	1816	71.5	76.6	200.3	0	12.19	728	1268	97.6	93.0	242	54.2
	Feces	59	145	8.9	4.4	9.0	1.42	3.36	654	456	1.3	15.7	167	.4
	Intake less feces	2373	1671	62.6	72.2	191.3	-1.42	8.83	74	812	96.3	77.3	75	53.8
R+1	Breakfast	--	1214	14.0	39.5	207.2	0	4.79	218	300	45.2	45.8	66	26.5
	Lunch	--	531	28.9	3.3	97.5	0	1.99	189	409	5.9	46.3	44	.2
	Dinner	--	999	55.0	49.5	83.5	0	7.02	348	584	69.0	25.5	104	56.9
	Total intake	2895	2744	97.9	92.3	388.2	0	13.80	755	1293	120.1	117.6	214	83.6
	Feces	156	329	22.4	4.9	22.5	5.85	7.95	1221	1039	5.5	45.9	374	1.1
	Intake less feces	2739	2415	75.5	87.4	365.7	-5.85	5.85	-466	254	114.6	71.7	-160	82.5
	Urine	1200	--	--	--	--	--	--	--	--	--	--	--	--

[a]Insufficient sample.

[b]Consumption not known.

TABLE XI. - INTAKE AND ABSORPTION DATA FOR CDR - Concluded

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
R+2	Breakfast	--	320	14.8	22.1	15.0	0	3.59	87	437	30.7	38.3	50	29.1
	Lunch	--	781	33.3	36.7	80.4	0	5.34	227	444	52.0	45.1	93	31.9
	Dinner[c]	--	--	--	--	--	0	--	--	--	-	--	--	--
	Total intake	1655	1101	48.1	58.8	95.4	0	8.93	314	881	82.7	83.4	143	61.0
	Feces	(a)	(a)	(a)	(a)	(a)	.54	(a)	(a)	108	(a)	(a)	(a)	(a)
	Intake less feces	1655	1101	48.1	58.8	95.4	-.54	8.93	314	773	82.7	83.4	143	61.0
	Urine[d]	--	--	--	--	--	--	--	--	--	-	--	--	-
Unlogged items														
--	Feces	87.5	82	3.2	4.2	2.9	0	1.74	142	108	-	--	56	0.5
--	Feces	17.4	(a)	2.1	1.6	2.8	0	1.15	91	(a)	(a)	(a)	28	(a)

[a]Insufficient sample.

[c]Only two meals eaten.

[d]No specimen.

TABLE XII. - INTAKE AND ABSORPTION DATA FOR LMP

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
T-3	Breakfast	--	929	34.7	36.3	118.7	0	5.69	264	655	58.0	40.4	70	31.9
	Lunch	--	494	26.9	15.4	63.5	0	2.63	161	333	13.3	26.5	72	11.4
	Dinner	--	1946	59.1	62.3	170.3	0	9.88	386	884	108.3	52.7	249	88.8
	Total intake	4050	3369	120,7	114.0	352.5	0	18.20	811	1872	179.6	119.6	391	132.1
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	4050	3369	120.7	114.0	352.5	0	18.20	811	1872	179.6	119.6	391	132.1
	Urine	2835	--	--	--	--	--	--	--	--	--	--	--	--
T-2	Breakfast	--	820	14.6	21.3	163.4	0	4.19	239	337	37.1	37.1	64	22.6
	Lunch	--	595	45.3	22.0	52.3	0	3.00	96	459	20.1	18.9	52	12.0
	Dinner	--	1960	68.8	49.8	180.5	0	9.47	399	947	90.0	57.3	246	82.7
	Total intake	4285	3375	128.7	93.1	396.2	0	16.66	734	1743	147.2	113.3	362	117.3
	Feces	59	179	11.3	4.2	9.6	1.18	4.80	653	747	11.3	20.2	369	.7
	Intake less feces	4226	3196	117.4	88.9	386.6	-1.18	11.86	81	996	135.9	93.1	-7	116.6
	Urine	2955	--	--	--	--	--	--	--	--	--	--	--	--
T-1	Breakfast	--	414	14.4	10.4	66.7	0	3.45	168	596	31.7	22.2	44	13.3
	Lunch	--	558	39.9	21.6	50.9	0	2.60	45	327	27.0	11.7	35	16.9
	Dinner	--	1957	64.2	44.5	188.1	0	8.69	302	991	71.5	64.6	274	53.0
	Total intake	3348	2929	118.5	76.5	305.7	0	14.74	515	1914	130.2	98.5	353	83.2
	Feces	162	435	31.9	14.1	29.0	3.25	16.10	2121	1896	5.1	54.7	1008	3.4
	Intake less feces	3186	2494	86.6	62.4	276.7	-3.25	-1.36	-1606	18	125.1	43.8	-655	79.8
	Urine	1540	--	--	--	--	--	--	--	--	--	--	--	--
T+0	Breakfast	--	1228	42.1	62.8	131.6	0	5.72	313	692	43.7	52.5	90	25.1
	Lunch	--	562	17.7	25.8	63.0	.28	3.20	266	343	59.2	12.6	33	37.2
	Dinner	--	443	9.9	22.8	57.6	.39	2.40	90	265	22.7	26.4	53	19.8
	Total intake	1808	2233	69.7	111.4	252.2	.67	11.32	669	1300	125.6	91.5	176	82.1
	Feces	71	(a)	10.8	5.3	9.2	1.54	4.07	653	601	1.8	19.0	320	.8
	Intake less feces	1737	2233	58.9	106.1	243.0	-.87	7.25	16	699	123.8	72.5	-144	81.3
T+1	Breakfast	--	646	12.0	14.2	125.6	1.06	3.3	233	323	23.1	37.2	82	24.5
	Lunch	--	832	40.3	16.0	146.3	2.35	9.2	262	582	95.5	50.1	89	113.1
	Dinner	--	502	12.1	26.4	57.0	.88	4.2	101	231	50.9	22.9	26	72.6
	Total intake	2365	1980	64.4	56.6	328.9	4.29	16.7	596	1136	169.5	110.2	197	210.2
	Feces	87	306	17.2	10.2	14.5	1.92	6.5	931	70	4.4	29.9	443	1.8
	Intake less feces	2278	1674	47.2	46.4	314.4	2.37	10.2	-335	1066	165.1	80.3	-246	208.4
T+2	Breakfast	--	715	21.8	24.4	120.8	1.22	4.8	232	458	35.3	43.9	80	79.1
	Lunch	--	443	14.1	22.7	51.4	.83	2.4	141	224	25.1	17.6	14	20.1
	Dinner	--	430	23.5	4.0	71.8	.87	6.2	134	256	80.3	22.2	42	68.1
	Total intake	1794	1588	59.4	51.1	244.0	2.92	13.4	507	938	140.7	83.7	136	167.3
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1794	1588	59.4	51.1	244.0	2.92	13.4	507	938	140.7	83.7	136	167.3
T+3	Breakfast	523	594	40.4	15.8	88.8	.62	4.0	172	646	47.5	45.6	88	36.7
	Lunch	536	853	22.4	22.9	129.4	4.65	7.2	148	429	89.4	47.2	71	60.6
	Dinner	425	457	49.2	16.5	55.8	.77	7.7	193	552	72.4	36.7	68	93.4
	Total intake	1484	1904	112.0	55.2	274.0	6.04	18.9	513	1627	209.3	129.5	227	190.7
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1484	1904	112.0	55.2	274.0	6.04	18.9	513	1627	209.3	129.5	227	190.7
T+4	Breakfast	670	670	26.5	18.3	113.8	.81	5.8	281	390	68.8	46.5	74	78.8
	EVA	875	616	1.1	.7	159.5	1.90	3.1	396	233	16.4	64.9	28	.3
	Dinner	514	700	21.4	25.4	133.2	2.96	8.1	185	300	76.7	34.4	70	58.9
	Total intake	2059	1986	49.0	44.4	406.5	5.67	17.0	862	923	161.9	145.8	172	138.0
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	2059	1986	49.0	44.4	406.5	5.67	17.0	862	923	161.9	145.8	172	138.0

[a]Insufficient sample.

TABLE XII. - INTAKE AND ABSORPTION DATA FOR LMP - Continued

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
T+5	Breakfast	444	893	30.4	21.9	163.0	4.24	8.76	579	688	38.	50.0	116	40.7
	EVA	960	--	--	--	--	--	--	--	--	--	--	--	--
	Dinner	564	722	59.2	18.1	87.2	.95	9.10	306	666	63.	26.9	116	55.3
	Total intake	1968	1615	89.6	40.0	250.2	5.19	17.86	885	1354	102.	76.9	232	96.0
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1968	1615	89.6	40.0	250.2	5.19	17.86	885	1354	102.	76.9	232	96.0
T+6	Breakfast	518	871	7.3	17.9	168.9	4.22	8.06	276	721	41	55.1	128	13.5
	EVA	870	452	0	.4	115.2	1.20	1.60	360	165	16	49.2	49	.1
	Dinner	607	1046	9.1	45.6	99.6	1.93	10.30	240	721	134	44.3	106	136.8
	Total intake	1995	2369	16.4	63.9	383.7	7.35	19.96	876	1607	192	148.6	283	150.4
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1995	2369	16.4	63.9	383.7	7.35	19.96	876	1607	192	148.6	283	150.4
T+7	Breakfast	319	793	23.9	29.1	124.3	2.30	5.20	264	406	37	27.3	64	35.1
	EVA	870	452	0	.4	115.2	.12	1.60	360	165	16.	49.2	49	.1
	Dinner	567	789	40.1	21.6	93.0	.90	6.40	365	758	79.	37.7	62	46.0
	Total intake	1756	2034	64.0	51.1	332.5	3.32	13.20	989	1329	133.	114.2	175	81.2
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1756	2034	64.0	51.1	332.5	3.32	13.20	989	1329	133	114.2	175	81.2
T+8	Breakfast	545	591	19.9	23.0	89.1	.90	4.43	210	430	32	35.6	71	60.8
	Lunch	574	580	52.5	4.1	84.0	2.98	5.90	504	700	65	42.0	94	63.3
	Dinner	664	962	20.6	48.1	122.5	1.22	7.70	218	452	89	48.8	103	55.9
	Total intake	1783	2133	93.0	75.2	295.6	5.10	18.03	932	1582	187	126.4	268	180.0
	Feces	177	390	29.4	8.9	16.3	3.88	16.71	2191	1607	6	45.9	367	2.5
	Intake less feces	1606	1743	63.6	66.3	279.3	1.22	1.32	-1259	-25	181	80.5	-99	177.5
T+9	Breakfast	636	762	33.6	22.2	110.3	4.78	4.8	360	511	40	94.4	94.4	38.3
	Lunch	490	626	36.8	13.9	122.3	2.44	9.2	172	516	87	47.9	82.9	129.8
	Dinner[b]	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total intake	1126	1388	70.4	36.1	232.6	7.22	14.0	532	1027	127	142.3	177.3	168.
	Feces	--	--	--	--	--	--	--	--	--	-	--	--	--
	Intake less feces	1126	1388	70.4	36.1	232.6	7.22	14.0	532	1027	127	142.3	177.3	168.
T+10	Breakfast	--	661	20.5	23.1	107.6	1.15	4.73	231	447	35	43.4	76	60.
	Lunch	--	512	16.8	23.4	63.9	.93	6.90	77	276	42	22.4	47	51.
	Dinner	--	506	33.1	25.2	42.2	.65	6.30	81	391	77	27.5	54	66.
	Total intake	1645	1679	70.4	71.7	213.7	2.73	17.93	389	1114	153	93.3	177	178.
	Feces	54	319	15.9	13.6	14.0	1.97	6.55	681	495	51	27.5	187	5.
	Intake less feces	1591	1360	54.5	58.1	199.7	.76	11.38	-292	619	102	65.8	-10	172.
R+0	Breakfast[c]	--	--	--	--	--	--	--	--	--	-	--	--	--
	Lunch	1253	932	21.1	22.3	166.2	0	2.68	153	265	24	32.2	48	13.
	Dinner	1045	1653	53.0	75.4	181.2	0	8.62	415	882	104	55.6	117	71.
	Total intake	2298	2585	74.1	97.7	347.4	0	11.30	568	1147	129	87.8	165	85.
	Feces	394	913	49.9	33.1	57.1	13.26	19.70	2636	2953	75	93.0	684	6.
	Intake less feces	1904	1672	24.2	64.6	290.3	-13.26	-8.40	-2068	-1806	45	-5.2	-519	78.
	Urine	942	--	--	--	--	--	--	--	--	-	--	--	--
R+1	Breakfast	--	1259	15.9	27.4	243.4	0	4.35	251	368	35	45.3	54	20.
	Lunch	--	872	43.9	18.1	136.5	0	4.42	229	659	28	48.2	96	2.
	Dinner	--	1242	65.3	62.7	102.6	0	7.90	371	678	98	26.6	114	77.
	Total intake	3175	3373	125.1	108.2	482.5	0	16.67	851	1705	166	120.1	264	100.
	Feces	--	--	--	--	--	--	--	--	--	-	--	--	--
	Intake less feces	3175	3373	125.1	108.2	482.5	0	16.67	851	1705	166	120.1	264	100.
	Urine	1925	--	--	--	--	--	--	--	--	-	--	--	--

[b]Only two meals eaten.

[c]Consumption not known.

TABLE XII. - INTAKE AND ABSORPTION DATA FOR LMP - Concluded

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
R+2	Breakfast	1150	834	18.2	34.8	114.7	0	5.65	189	569	51.4	56.1	76	35.1
	Lunch	1096	1602	53.7	76.5	177.6	0	7.36	298	676	91.3	28.6	109	63.2
	Dinner[b]	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total intake	2246	2436	71.9	111.3	292.3	0	13.01	487	1245	142.7	84.7	185	98.3
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	2246	2436	71.9	111.3	292.3	0	13.01	487	1245	142.7	84.7	185	98.3
	Urine	2890	--	--	--	--	--	--	--	--	--	--	--	--

[b]Only two meals eaten.

TABLE XIII. - INTAKE AND ABSORPTION DATA FOR CMP

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
T-3	Breakfast	--	545	6.8	23.6	77.3	0	2.29	129	196	19	31.5	48	14.9
	Lunch	--	380	13.2	26.6	27.2	0	2.49	34	223	20	23.6	98	19.2
	Dinner	--	1277	56.0	63.1	98.4	0	8.85	403	722	90	42.9	159	67.4
	Total intake	2141	2202	76.0	113.3	202.9	0	13.63	566	1141	130	98.0	305	101.5
	Feces	130	293	19.2	9.4	21.2	3.90	6.46	925	866	8	29.6	414	1.0
	Intake less feces	2011	1909	56.8	103.9	181.7	-3.90	7.17	-359	275	121	68.4	-109	100.5
	Urine	725	--	--	--	--	--	--	--	--	--	--	--	--
T-2	Breakfast	--	518	6.7	23.6	71.6	0	2.09	134	171	18	30.8	46	14.9
	Lunch	--	319	11.5	22.8	8.5	0	1.92	25	185	14	10.3	83	14.9
	Dinner	--	1018	59.4	47.1	56.1	0	7.54	251	648	67	53.2	193	60.3
	Total intake	2610	1855	77.6	93.5	136.2	0	11.55	410	1004	100	94.3	322	90.1
	Feces	29	(a)	7.8	4.2	10.0	.75	3.30	514	(a)	1	14.2	219	.6
	Intake less feces	2581	1855	69.8	89.3	126.2	-.75	8.25	-104	1004	98	80.1	103	89.5
	Urine	955	--	--	--	--	--	--	--	--	--	--	--	--
T-1	Breakfast	--	732	10.5	24.3	121.2	0	3.51	197	342	27	34.1	68	21.4
	Lunch	--	356	5.1	11.4	59.0	0	2.04	35	131	16	14.1	62	12.8
	Dinner	--	1250	62.6	46.5	123.7	0	6.55	202	735	84	42.4	94	60.3
	Total intake	2356	2338	78.2	82.2	303.9	0	12.10	434	1208	127	90.6	224	94.5
	Feces	99	329	22.3	9.3	12.6	1.89	7.00	1185	977	2	34.1	471	1.0
	Intake less feces	2257	2009	55.9	72.9	291.3	-1.89	5.10	-751	231	125	56.5	-247	93.1
	Urine	809	--	--	--	--	--	--	--	--	--	--	--	--
T+0	Breakfast	--	618	10.7	31.9	101.6	0	3.12	192	262	25	36.9	57	24.8
	Lunch	--	562	17.7	25.8	35.2	.28	3.20	266	343	59	12.6	23	37.2
	Dinner	--	877	19.8	48.1	84.6	1.02	5.60	172	441	83	41.6	95	47.5
	Total intake	1753	2057	48.2	105.8	221.4	1.30	11.92	630	1046	167	91.1	175	109.
	Feces[a]	--	--	--	--	--	--	--	--	--	-	--	--	--
	Intake less feces	1753	2057	48.2	105.8	221.4	1.30	11.92	630	1046	167	91.1	175	109.
T+1	Breakfast	--	176	4.6	3.2	32.1	0	.2	124	127	9	16.0	25	6.
	Lunch	--	500	4.0	8.6	112.0	2.23	5.3	147	236	5	36.7	50	70.
	Dinner	--	718	21.4	46.2	57.2	1.15	6.2	111	318	73	26.4	35	116.
	Total intake	1292	1394	30.0	58.0	201.3	3.38	11.7	382	681	137	79.1	110	194.
	Feces	37	115	4.8	3.4	7.3	1.26	2.3	345	(a)	7	10.9	131	
	Intake less feces	1255	1279	25.2	54.6	194.0	2.12	9.4	37	681	130	68.2	-21	193.
T+2	Breakfast	--	198	11.3	4.9	27.6	.28	2.80	72	135	26	25.9	39	19.
	Lunch	--	504	14.1	22.6	68.0	.73	2.20	96	213	27	7.6	14	20.
	Dinner	--	350	22.6	4.0	52.2	.53	5.71	138	310	77	20.0	37	67.
	Total intake	1227	1052	48.0	31.5	147.8	1.54	10.71	306	658	131	53.5	90	107.
	Feces	--	--	--	--	--	--	--	--	--	-	--	--	--
	Intake less feces	1227	1052	48.0	31.5	147.8	1.54	10.71	306	658	131	53.5	90	107.
T+3	Breakfast	553	425	37.4	9.8	58.2	.41	3.0	116	523	49	39.3	69	11.
	Lunch	323	501	4.4	7.4	91.3	2.74	1.7	110	103	1	19.6	20	9.
	Dinner	556	780	41.4	29.1	118.0	1.26	7.8	388	763	61	36.1	70	80.
	Total intake	1432	1706	83.2	46.3	267.5	4.41	12.5	614	1389	122	95.0	159	100.
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1432	1706	83.2	46.3	267.5	4.41	12.5	614	1389	122	95.0	159	100.
T+4	Breakfast	210	114	1.5	.5	26.7	.24	1.00	21	54	3	11.4	24	1.
	Lunch	211	402	9.3	12.5	59.2	.17	.70	202	197	10	15.4	15	7.
	Dinner	665	599	14.3	11.5	115.0	1.27	4.00	177	244	39	18.6	58	32.
	Total intake	1086	1115	25.1	24.5	200.9	1.68	5.70	400	495	52	45.4	97	41.
	Feces	32	110	4.9	2.3	7.6	1.52	2.21	382	309	5	11.3	126	4
	Intake less feces	1054	1005	20.2	22.2	193.3	.16	3.49	18	186	46	34.1	-29	40.

[a]Insufficient sample.

TABLE XIII. - INTAKE AND ABSORPTION DATA FOR CMP - Continued

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
T+5	Breakfast	301	311	14.3	14.1	31.6	0.56	3.1	150	278	22.0	16.8	39	19.1
	Lunch	251	170	28.9	13.1	.8	.47	2.4	14	190	24.7	19.2	29	0
	Dinner	924	867	39.0	17.2	143.1	1.58	7.8	261	748	77.5	46.6	97	66.6
	Total intake	1476	1348	82.2	44.4	175.5	2.61	13.3	425	1216	124.2	82.6	165	85.7
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1476	1348	82.2	44.4	175.5	2.61	13.3	425	1216	124.2	82.6	165	85.7
T+6	Breakfast	481	186	2.1	.6	21.8	.49	1.5	43	78	4.9	30.7	37	1.4
	Lunch	152	357	8.4	14.2	54.9	.50	4.4	59	159	13.4	19.5	36	5.2
	Dinner	456	622	13.5	42.5	74.3	1.17	5.4	126	309	50.2	25.7	55	31.9
	Total intake	1089	1165	24.0	57.3	151.0	2.16	11.3	228	546	68.5	75.9	128	38.5
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1089	1165	24.0	57.3	151.0	2.16	11.3	228	546	68.5	75.9	128	38.5
T+7	Breakfast	481	256	5.3	.6	58.2	.41	2.3	99	131	9.8	25.7	40	11.4
	Lunch	217	328	4.4	5.4	58.6	1.00	1.1	345	98	7.3	18.8	20	3.6
	Dinner	777	853	38.9	18.7	117.0	.88	6.6	412	766	82.3	47.2	58	37.5
	Total intake	1475	1437	48.6	24.7	233.8	2.29	10.0	856	995	99.4	91.7	118	52.5
	Feces	144	343	21.9	7.5	20.8	2.52	10.0	1612	1352	28.3	47.2	416	2.6
	Intake less feces	1331	1094	26.7	17.2	213.0	-.23	0	-756	-357	71.1	44.5	-298	49.9
T+8	Breakfast	390	116	1.5	.5	27.3	.24	1.2	22	61	3.4	22.9	31	1.2
	Lunch	342	270	9.9	1.6	59.3	2.77	3.0	160	111	2.1	16.6	16	26.4
	Dinner	454	877	19.8	53.0	90.7	1.21	6.8	158	441	83.4	41.6	95	47.9
	Total intake	1186	1263	31.2	55.1	177.3	4.22	11.0	340	613	88.9	81.1	142	75.5
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1186	1263	31.2	55.1	177.3	4.22	11.0	340	613	88.9	81.1	142	75.5
T+9	Breakfast	390	116	1.5	.5	27.3	.24	1.2	22	61	3.4	22.9	31	1.2
	Lunch	180	147	3.5	10.6	113.9	2.35	7.9	73	88	1.6	4.2	29	2.7
	Dinner	478	656	36.7	9.0	15.4	.53	.8	156	491	80.1	46.2	79	101.1
	Total intake	1048	919	41.7	20.1	156.6	3.12	9.9	251	640	85.1	73.3	139	105.0
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1048	919	41.7	20.1	156.6	3.12	9.9	251	640	85.1	73.3	139	105.0
T+10	Breakfast	577	547	34.3	23.0	51.4	.89	6.7	273	451	76.0	42.2	68	55.0
	Lunch	361	683	24.1	25.7	67.6	.84	6.0	143	401	76.1	29.4	72	69.1
	Dinner	588	807	44.8	42.0	105.7	1.21	5.0	298	699	63.5	38.8	79	12.2
	Total intake	1526	2037	103.2	90.7	224.7	2.94	17.7	714	1551	215.6	110.4	219	136.3
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	1526	2037	103.2	90.7	224.7	2.94	17.7	714	1551	215.6	110.4	219	136.3
R+0	Breakfast[b]	--	--	--	--	--	--	--	--	--	--	--	--	--
	Lunch	--	785	6.3	22.6	138.9	0	2.40	194	282	30.5	19.0	30	23.2
	Dinner	--	1299	52.0	72.2	111.2	0	8.35	280	734	77.8	54.1	164	50.6
	Total intake	2387	2084	58.3	94.8	250.1	0	10.75	474	1016	108.3	73.1	194	73.8
	Feces	--	--	--	--	--	--	--	--	--	--	--	--	--
	Intake less feces	2387	2084	58.3	94.8	250.1	0	10.75	474	1016	108.3	73.1	194	73.8
	Urine	580	--	--	--	--	--	--	--	--	--	--	--	--
R+1	Breakfast	--	715	6.7	25.4	121.0	0	3.02	151	220	19.8	41.6	79	15.5
	Lunch	--	560	6.3	22.6	84.5	0	2.47	131	222	19.0	15.1	61	14.9
	Dinner	--	1199	70.8	64.6	83.5	0	8.27	388	731	82.4	30.3	131	62.9
	Total intake	2712	2474	83.8	112.6	289.0	0	13.76	670	1173	121.2	87.0	271	93.3
	Feces	190	428	26.2	7.6	26.8	3.32	9.87	1678	1365	8.3	53.5	477	2.1
	Intake less feces	2522	2046	57.6	105.0	262.2	-3.32	3.89	-1008	-192	112.9	33.5	-206	91.2
	Urine	350	--	--	--	--	--	--	--	--	--	--	--	--

[b]Consumption not known.

TABLE XIII. - INTAKE AND ABSORPTION DATA FOR CMP - Concluded

Day	Item	Water, g	kcal	Protein, g	Fat, g	CHO, g	Crude fiber, g	Ash, g	Ca, mg	P, mg	Na, meq	K, meq	Mg, mg	Cl, meq
R+2	Breakfast	--	560	6.8	23.6	81.1	0	2.73	139	218	19.3	47.1	70	15.0
	Lunch	--	1462	57.3	77.4	135.1	0	9.20	349	794	106.9	39.9	145	77.5
	Dinner[c]	--	--	--	--	--	0	--	--	--	--	--	--	--
	Total intake	1927	2022	64.1	101.0	216.2	0	11.93	488	1012	126.2	87.0	215	92.5
	Feces	62	214	13.4	3.7	13.0	1.36	4.67	791	655	1.8	25.2	234	.8
	Intake less feces	1865	1808	50.7	97.3	203.2	-1.36	7.26	-303	357	124.4	61.8	-19	91.7
	Urine	1020	--	--	--	--	--	--	--	--	--	--	--	--

[c]Only two meals eaten.

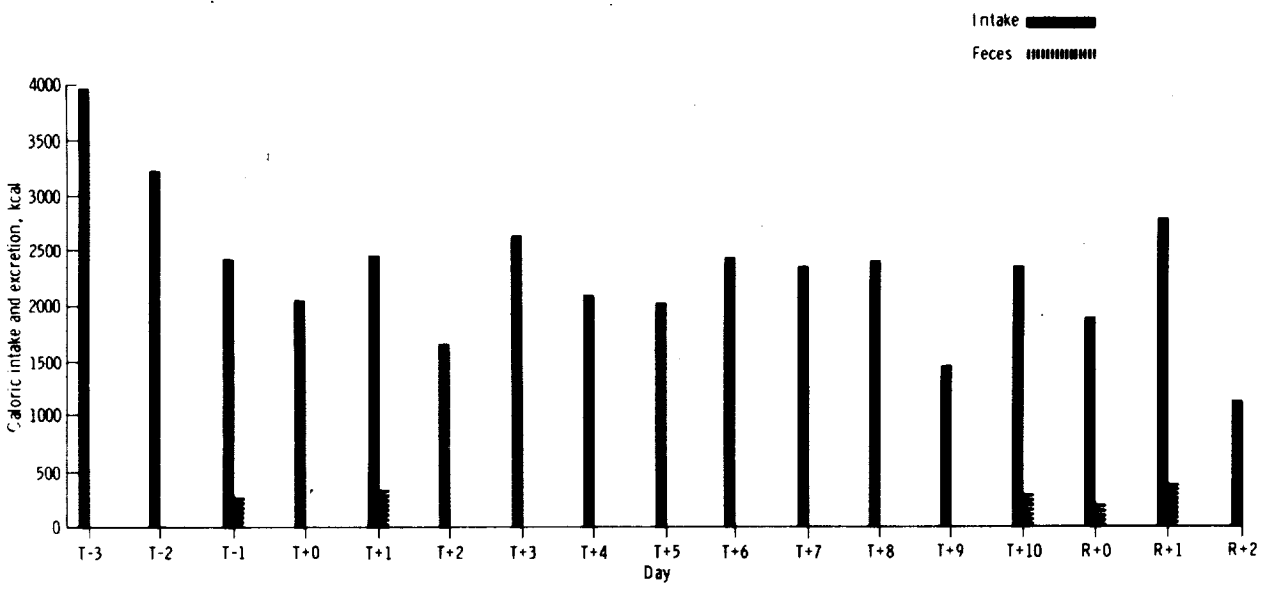

Figure 1. - Caloric data for CDR.

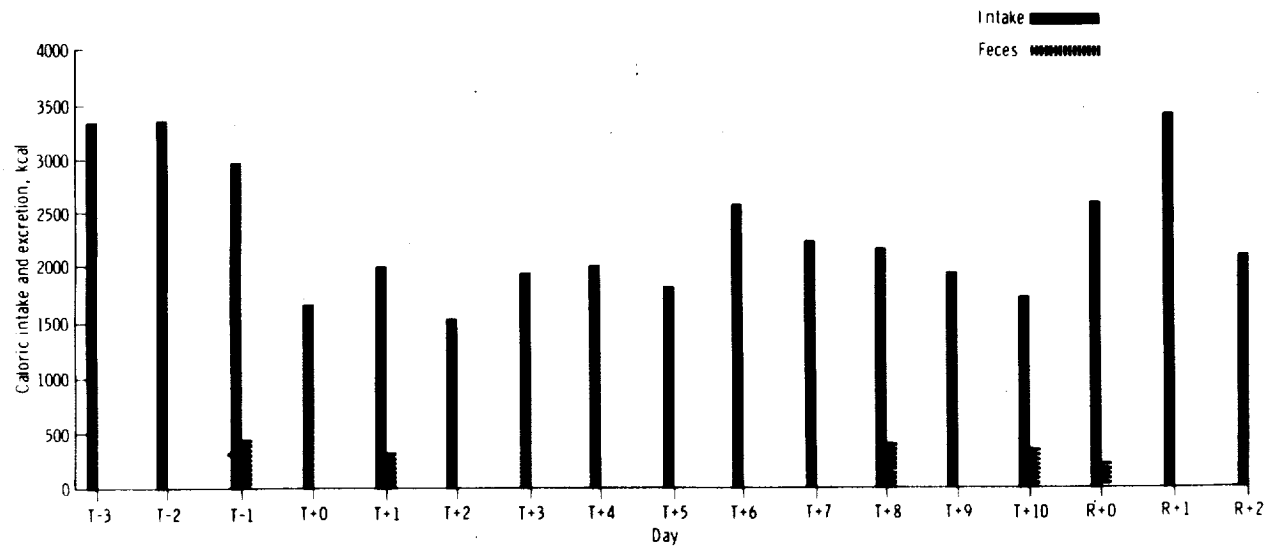

Figure 2. - Caloric data for LMP.

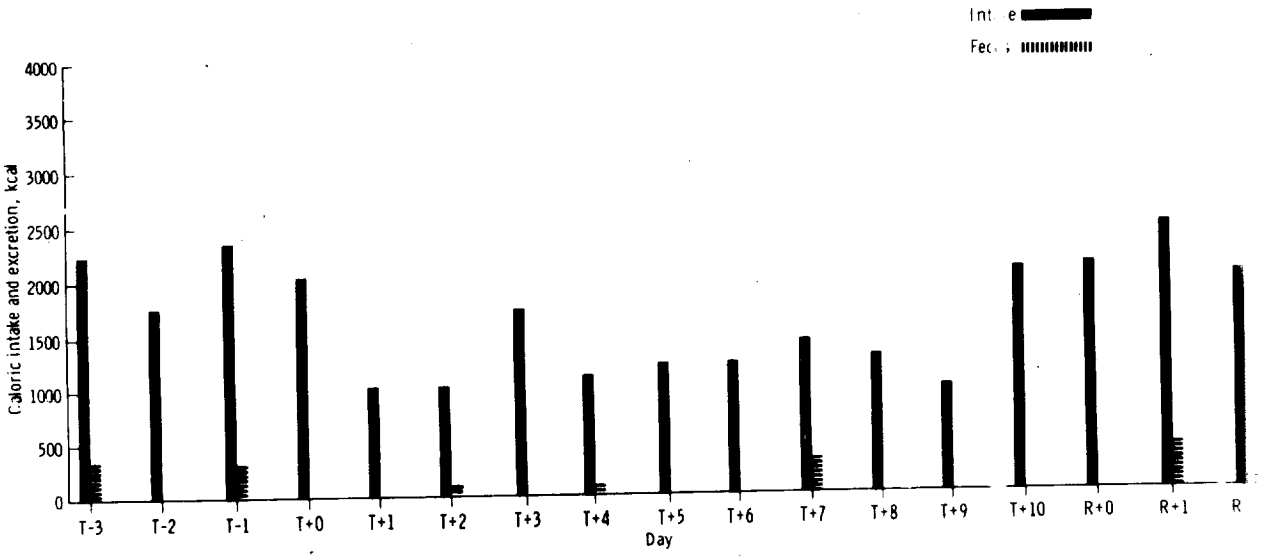

Figure 3. - Caloric data for CMP.

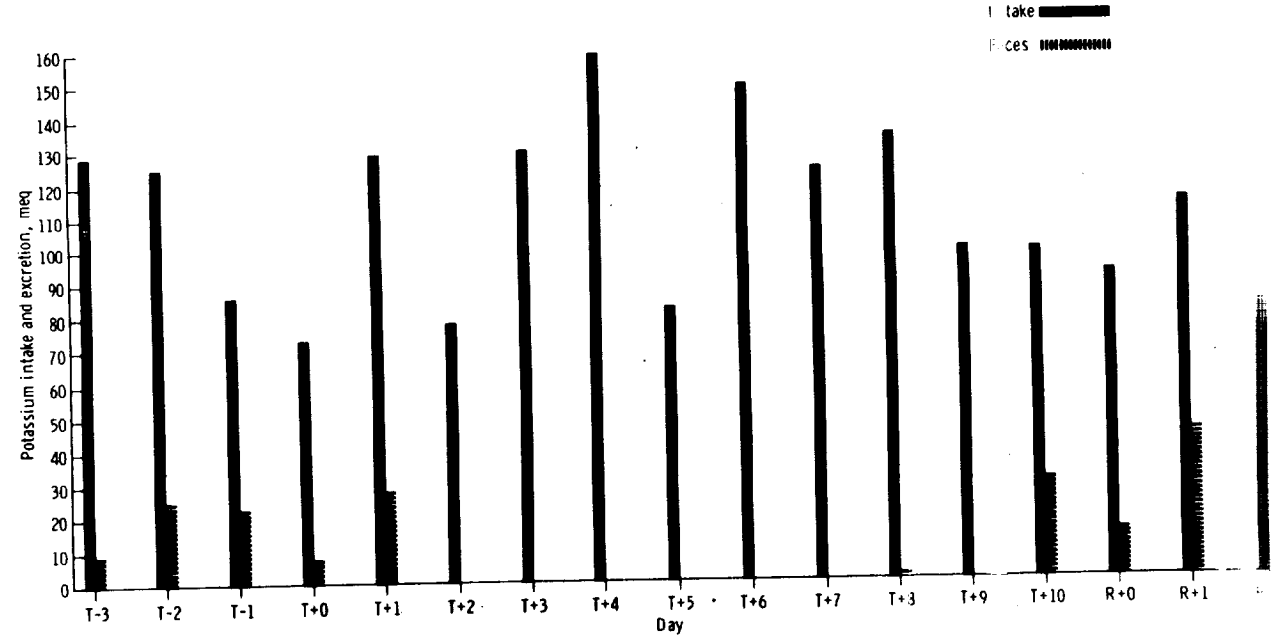

Figure 4. - Potassium absorption data for CDR.

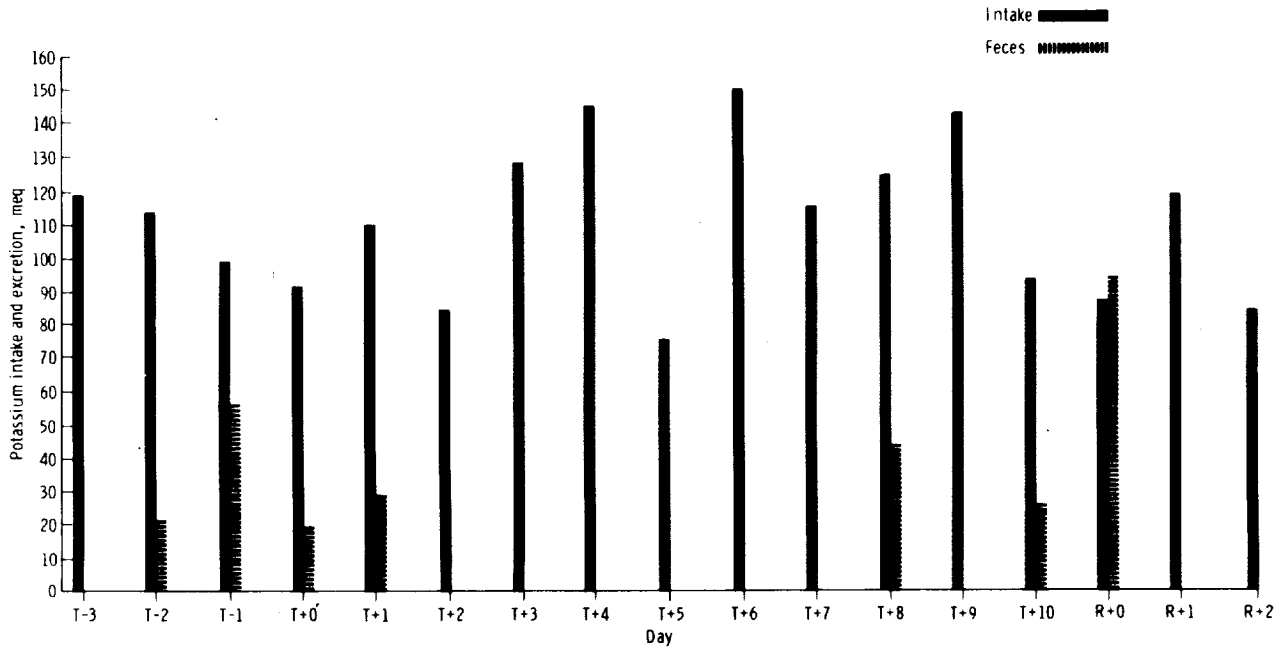

Figure 5. - Potassium absorption data for LMP.

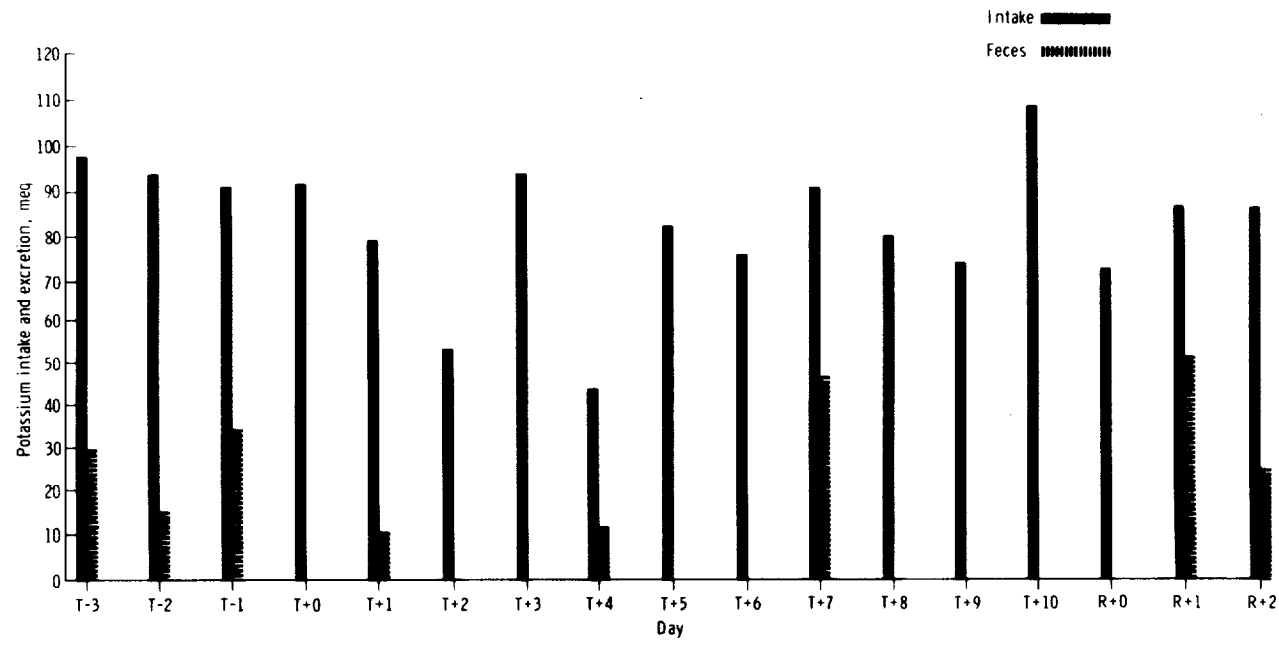

Figure 6. - Potassium absorption data for CMP.

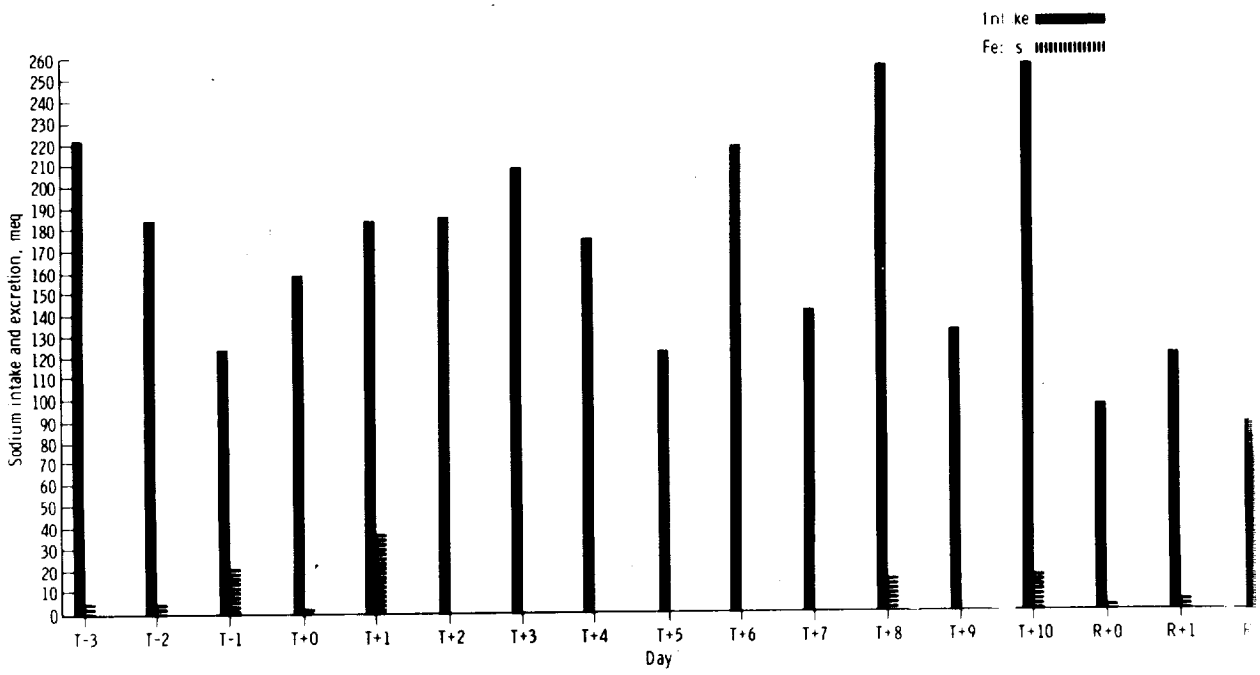

Figure 7. - Sodium absorption data for CDR.

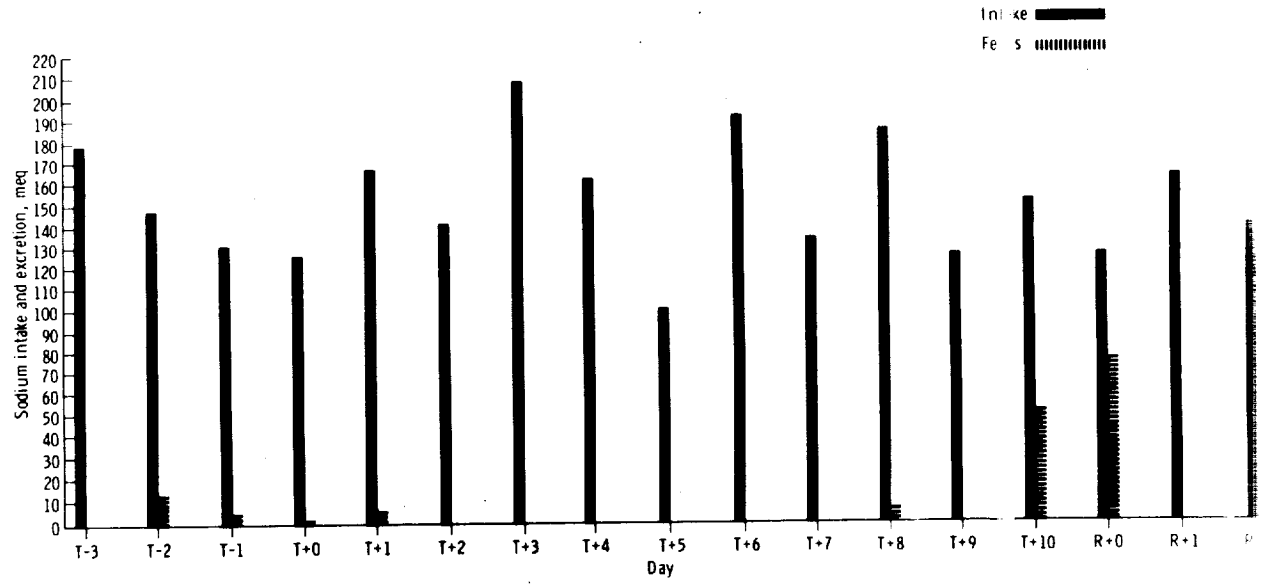

Figure 8. - Sodium absorption data for LMP.

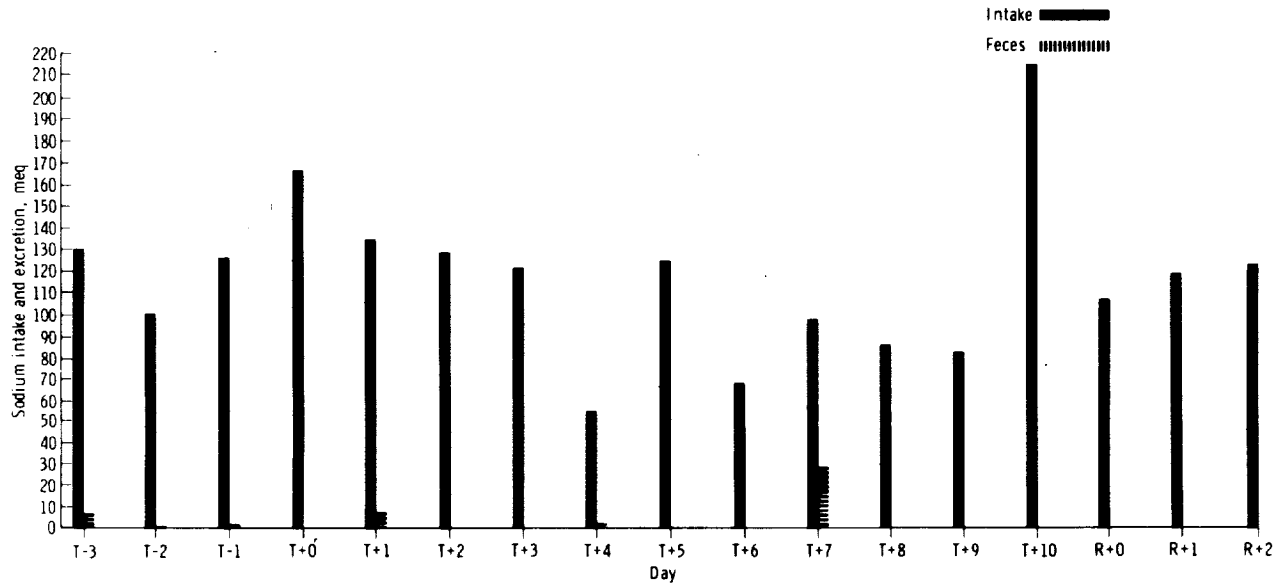

Figure 9. - Sodium absorption data for CMP.

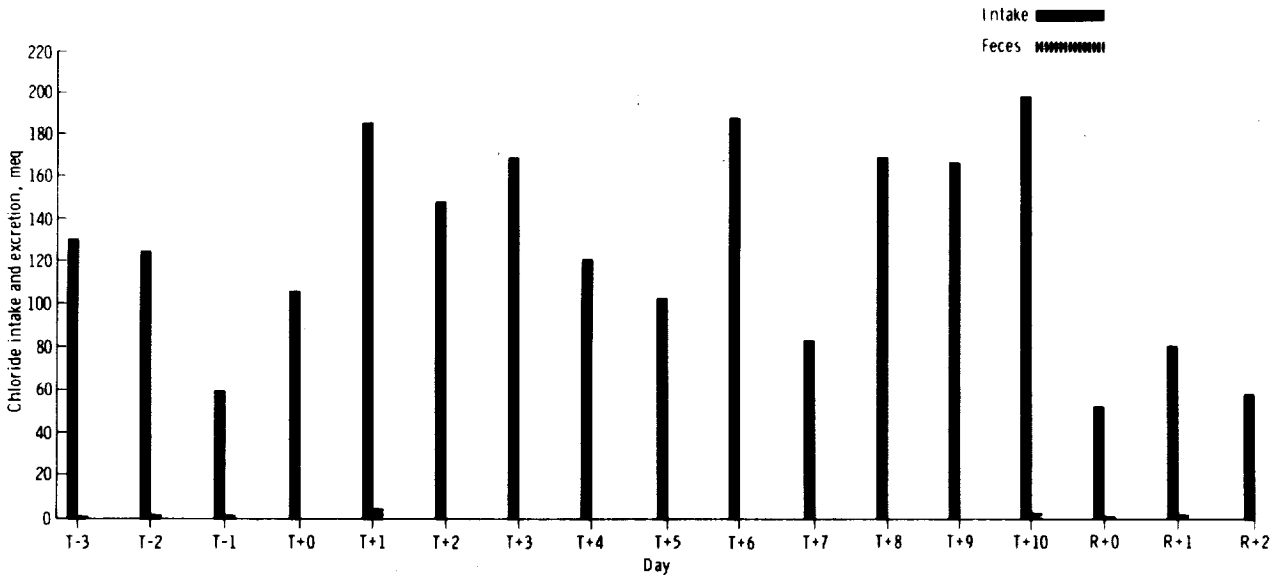

Figure 10. - Chloride absorption data for CDR.

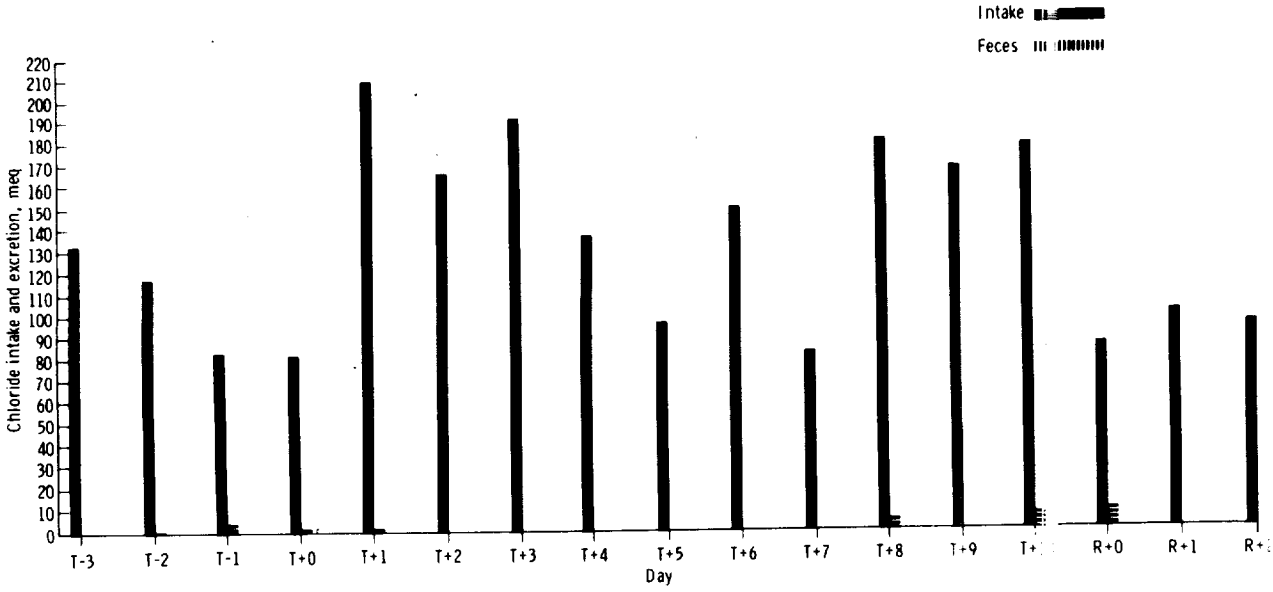

Figure 11. - Chloride absorption data for LMP.

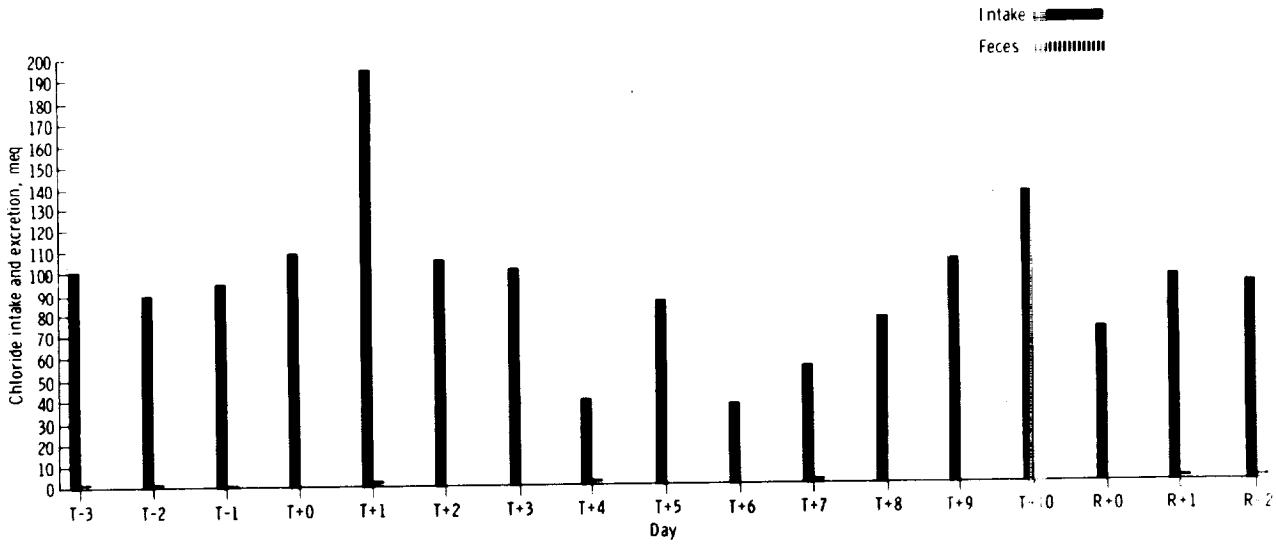

Figure 12. - Chloride absorption data for CMP.