NASA CONTRACTOR REPORT

Calcium and Nitrogen Balance Studies During Gemini-7 Flight

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Prepared under Contract No. NAS9-5375 by

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for
National Aeronautics and Space Administration

September, 1966

FACILITY FORM 602

N70-73117
(ACCESSION NUMBER)

(THRU)

195
(PAGES)

None
(CODE)

CR-109441
(NASA CR OR TMX OR AD NUMBER)

(CATEGORY)

INTRODUCTION

In considerations of the possible effects of long-term space flight on human physiology, the metabolic response of the musculo-skeletal system appears as a major probable stress response. Many studies have been carried out in the past of the effects of simulated weightlessness in individuals at ground-level conditions. Obviously, such studies can only give indications of possible phenomena that might be observed under conditions of true weightlessness such as would be experienced in space flight.

Weightlessness has been approximated experimentally using conditions of complete hospital bedrest or of prolonged continuous water immersion. Although these situations are only approximations of the zero gravity state, considerable information has been gathered of the circulatory, cardiac, muscular and skeletal responses to relative lack of gravity stress.

The early study of Cuthbertson (1) of eight normal subjects and patients confined to bedrest for varying periods of time up to two weeks demonstrated that urinary calcium excretion increased and nega-

tive calcium balance resulted within this period of time. In 1945, Keys at Minnesota (2) reported carefully controlled bedrest studies in several subjects, but unfortunately no measurements of calcium balance or of calcium metabolism were carried out. The highly controlled studies by Deitrick, Whedon, and Shorr (3) of immobilization of four healthy young men demonstrated quite clearly that the conditions of immobilization by controlled bedrest, with the added restraint of body casts, led to noticeable increases in urinary calcium, significantly negative calcium balances, as well as parallel changes in nitrogen and phosphorus metabolism. Considerable individual variation was noted amongst the four subjects, but this did not detract from significant observations because of the careful control of other factors that might influence calcium excretion, such as dietary composition and total body activity. Identical diets were used during a pre-bedrest control phase as were used during the bedrest phases and during the post immobilization control phases.

With the advent of space flight, additional studies have been

reported concerned with the effects of weightlessness on skeletal metabolism. Graveline, et al. (4) reported, in their study of the effect of one week of continous water immersion of one subject, that no increase was seen in urinary calcium excretion. On the other hand, Birkhead, et al. (5), studying four subjects during 42 days of bedrest and 18 days of controlled activity preceding and following the bedrest phase, demonstrated that even when minimal activity such as that connected with eating, bathing, and excretory functions were permitted, sustained increases in urinary calcium excretion developed and persisted throughout the phases of immobilization. Contract studies supported by N.A.S.A. carried out at the Texas Institute of Rehabilitation and Research (6) have shown similar phenomena, although of lesser magnitude and, in addition, demonstrated changes in bone density of the os calcis during bedrest.

Carefully controlled studies of calcium metabolism under varying conditions of physiology and pathology have demonstrated previously that significant changes in calcium excretion generally occur over

long periods of time, and are not significant unless careful collections are carried out under controlled conditions for periods for at least two weeks (7,8). Therefore, mineral balance studies were not attempted in the current Gemini program until the first long duration flight was scheduled, that of the Gemini VII mission. This flight, which was to last for fourteen days, allowed the design of appropriate protocols permitting, in addition to inflight observations, carefully controlled pre-flight and post-flight studies as well. An examination of musculoskeletal metabolism obviously involves more than simply measurement of dietary intakes, utilization and excretions of calcium and nitrogen. Muscle metabolism involves both nitrogen and phosphorus mechanisms. Bone physiology is dependent upon utilization, not only of calcium, but also of nitrogen and phosphorus, as well as of magnesium, sodium, and sulfur. Furthermore, the relative absorptions and excretions of these elements are under the influence of various endocrine systems as well as of dietary components such as fats, vitamins, sodium, and potassium. Thus, a

carefully designed study of musculoskeletal metabolism requires the measurements of balances of calcium, nitrogen, phosphate, magnesium, sodium, potassium, sulphate among the obvious factors. In addition, there should be estimates of endocrine activity such as adrenocortical activity. Measurements of the excretion of adrenocortical hormones and of sodium and potassium were previously incorporated as part of the scope of the M-7 experiment to be carried out in conjunction with the Gemini space flights. Close cooperation and collaboration, therefore, between the present experimenters and those associated with the hormonal body fluid studies was planned as part of the protocol for this study.

GENERAL PLAN

The experiment was designed to comprise four phases:

1. A dry run pre-flight phase involving volunteer subjects to test the various procedures to be utilized. Since this was designed primarily to test the laboratory techniques, the volunteers were to be selected from civilian personnel associated with the project and the phase was to be of relatively short duration.

2. Pre-flight control phase. This period of the study would involve the two astronauts of the prime crew and the two astronauts of backup crew of the Gemini VII mission. This would last ten days, from T-12 to T-2, and would consist of completely controlled intake and collections as described below.

3. The inflight phase was to involve the two flying astronauts. This was to last throughout the entire inflight phase of 14 days.

4. Post-flight phase to last 4 days beginning immediately upon recovery of the flight craft and to involve the two astronauts who had participated in the mission.

Various experimental factors were to be controlled throughout the entire study. Optimal experimental conditions require the accurate control and measurement of diet, urine, feces, sweat, and activity, as well as of fluid intake. Each of these factors will be discussed in more detail.

1. Diet. The diet of all three phases, for optimal interpretation of metabolic data, should be as similar as possible. Since each man would serve as his own control for comparison of pre-, in-, and post-flight phases, inter-individual variation would be permissible but, attempts should be made to keep the dietary intake as comparable as possible among the three phases. To provide this degree of control, therefore, the pre-flight phase was to be carried out at the Manned Space Operations Building at Cape Kennedy. A diet, constant in composition, would be planned by a specially trained metabolic dietician and prepared under her supervision at the crew quarters, to be fed to the crew under supervised meal situations. No additional snacks would be permitted and every attempt would be made to ensure

complete ingestion of the prepared menus. The inflight dietary intake would be easier to control since all of the food for the Gemini VII flight would be prepared beforehand according to previously arrived at protocols, and all food would be pre-packaged in the form of the usual Gemini flight food packs to be eaten in a prescribed sequence. Post-flight dietary control would be achieved by pre-packaging of the identical diet utilized during the pre-flight phase for use on board the recovery vessel for the first two days of the post-flight period and subsequent feeding at Cape Kennedy under the identical conditions used during the pre-flight phase.

2. Urine collections. Complete collections of urine are essential for calculations of metabolic balances. During the pre-flight and post-flight phases, collection facilities were to be established in the crew quarters and at various sites at Cape Kennedy where the crew would be undergoing training and preparation. Individual refrigerators and commodes were to be placed in the toilets in the crew quarters at the Flight Simulator Facility and at the blockhouse near the

Gemini VII craft. Individual plastic containers with labels and marking devices were located adjacent to the collection sites and a team of aides were to make regular rounds of the sites to recover the containers and return them to the preparative laboratory to be established in the Medical Operations area.

Inflight urine collection was to be accomplished utilizing the previously designed urine transport system. Engineering constraints did not permit all urine voided to be collected. The system was to provide a means for measurement of total volume of each voiding by means of a tracer dilution technique and for preservation of aliquots of each sample. Provision was also made for labeling of each sample with the astronauts initials and mission time of voiding.

3. Stool collections. Pre-flight and post-flight stool collections were to be carried out using the toilet and refrigeration facilities provided at Cape Kennedy. Inflight stool collections were to be made with the Gemini defecation devices previously designed.

4. Sweat collections. It would not be feasible to carry out

the complete sweat collections for the entire duration of all three phases. Therefore, during the pre-flight and post-flight phases, 24-hour sweat collections were to be scheduled. During these periods the subjects, after complete washing down of the entire skin surface, would don previously extracted flight underwear suits and would wear these for a continuous 24-hour period. At the end of this, another washing down would be carried out. The wash water and the suits were to be combined and the total fluid eventually concentrated into a form suitable for analysis. For the inflight phase, a total 14-day collection would be carried out with extraciton of the inflight underwear removed immediately after recovery.

4. Activity. Because of the constraints of pre-flight training, it was not considered feasible nor desirable to control physical activity. Therefore, during the pre-flight and post-flight phases ad lib activity was to be expected, and this was to be considered to be an additional variable in the study. Inflight activity was to consist of that necessary for maneuvers, plus a fixed program of exercise which was

to be arrived at by the astronauts and the staff of the Center Medical Operations.

6. Fluid intake. Fluid intake was to be ad libitum, but the quantities ingested were to be recorded. The majority of the fluids during the pre- and post-flight phase was to be obtained with the diet; calibrated cups were provided to each of the subjects for measurement of additional fluid intake in the course of the day. Inflight fluid intake was to be estimated from the water dispensing device on board the craft.

7. Specimen preservation and analyses. All pre-flight and post-flight specimens of urine, feces, sweat, and diet were to be assembled at a provisional laboratory established in the Medical Operations area. Pertinent measurements of volumes were to be carried out, aliquots of the urine samples were to be preserved by the addition of appropriate chemicals, frozen and shipped to the laboratories at Cornell University in Ithaca, New York for analyses. Aliquots of the same urine specimens were to be preserved with alternate chemicals, frozen and shipped to the

laboratories associated with M-5 study. Stool specimens were to be frozen and shipped similarly to the Ithaca laboratories. Inflight specimens were to be recovered from the craft as soon as possible and shipped for analysis to the appropriate laboratory. The specific chemical determinations to be carried from each sample are listed in Table I and are discussed below.

RESULTS

The results of this study of the effects of space flight on musculoskeletal metabolism as measured in the course of the 14-day Gemini VII flight of December, 1965, are far from unqualifiedly successful. The data were obtained from studies involving only two subjects, and therefore suggest only extremely preliminary, tentative conclusions. There were many problems, both forseeable and unforseeable, associated with the conduct of this experiment leading to variations in the observations for each subject. In addition, as predictable, the two subjects responded quite differently from each other. Despite these inadequacies, however, we believe that the experiment was of value in that it represents the first effort to obtain information on possible metabolic changes in man during space flight. In addition, the experience obtained can lead to the better planning of subsequent studies to obtain more conclusive data.

A. Variations from initial protocol. Despite the preparation of an extremely rigid protocol for the M-7 experiment, it was apparent

to the investigators that adherence to this protocol would not be completely possible in view of the factors which controlled the experimental environment under which this was carried out. The governing principle for all work in the space effort must, at present, be the practible engineering feasibility of putting man into orbit and then getting as soon as possible to the moon. In the course of the Gemini flight series, scientific information of all kinds has been gathered, particularly in the areas of astronomy, radiation, and geography. The primary goal of all of these studies has been the acquisition of knowledge of practical significance to the conquest of space. Flights essentially for obtaining knowledge for its own sake are now in the planning stage. To date, consideration of the effect of space flight on the functional integrity of man from the medical and physiological points of view, has claimed limited attention except for evaluation of cardiovascular and otolith functions. Medical studies at present must be justified only in terms of what <u>must</u> be learned for astronauts' safety in flights of up to two weeks duration and for

prediction of possible adverse influences on health and safety for flights of longer periods. Gemini VII was the eighth orbital flight, but only the first in which a specific effort was made to obtain physiologic data by complete collection of excreta in connection with planned controlled studies. Even in this flight, medically oriented studies were only a small part of an extensive list of operational and experimental activities required of the astronauts before, during, and after flight. For these reasons, it was impossible to carry out what would be considered an ideal experimental protocol, particularly from the point of view of mineral metabolism. Engineering, training, and flight restrictions forced many compromises in the acquisition of physiologic data.

1. Dietary control. It soon became apparent that a 10-day preflight control phase was not sufficient from the point of view of establishing constant dietary intake. It is well-recognized in ground based metabolic studies carried out under conditions of a hospital metabolic unit that variable periods of time of up to one week may be

necessary to establish constancy of dietary intake acceptable to the subject as well as to the experimental protocol. Since only ten days were available for the entire pre-flight phase, such control was not completely possible. As can be seen from Table II, considerable day to day variation occurred particularly in the first week of the study. It was necessary to add or remove items of food from the daily menus to insure palatability and acceptability of the menu. In addition, the mean intake of various nutrients was considerably in excess of that desirable from the point of view of a control study comparable to the projected inflight phase. Calcium intake was relatively the same as that projected for the inflight study, but dietary intakes of nitrogen, phosphorus, sulfate, sodium, and potassium were considerably in excess. The post-flight phase dietary control is quite comparable with the pre-flight phase since similar foods were used. As is apparent, the inflight intakes of all constituents except calcium were much lower than during the control phases. In addition, for reasons that remain obscure, it was impossible for the subjects to consume the inflight diet

in the programmed sequence. As a result, there was considerable day to day variation in the intakes of all nutrients. The diets had been planned for constant daily composition, but since the three meals were eaten out of sequence in each 24-hour period, this constancy was not achieved.

2. Urine collections. No difficulties were encountered in obtaining reproducible accurate collections during the pre-flight and post-flight phases. The relative constancy of the 24-hour excretions of urinary creatinine during these aspects of the study are witness to this conclusion (Table III). Inflight, however, various problems arose. Due to mechanical difficulties the inflight urine transport system did not function wholly effectively, and either variable quantities of urine were lost before the addition of the tritium tracer for estimation of total volume of voiding or inadequate mixing with tracer occurred. In addition, some of the storage bags for transport of the urine samples to the ground burst in the course of the flight or upon recovery, leading to further loss of urinary samples. Urinary creatinine excretions calculated on the basis of recovered samples were extremely

variable and low (Table IV). Such extreme differences as were noted between the pre-flight and the inflight date could not be accounted for on the basis of changes in renal function, and therefore must be attributed to either losses of urine prior to the addition of tritium or to undiscovered errors in the tritium dilution technique for calculation of volume. Therefore, with due acknowledgment of the probable error, it was decided to correct all inflight urinary excretion values on the basis of presumed "true" urinary creatinine excretion (Table IV). This latter value was calculated as the mean of urinary creatinine excretion of the 10 pre-flight control days plus the 4 post-flight control days for each of the two astronauts studied in flight.

3. Fecal specimens. No difficulties were encountered in the collection of fecal samples either pre-flight, inflight, or post-flight. As part of the preservative technique for the inflight phase, a lipid soluble dye preservative mixture was added immediately after passage of the stool. This dye led to false values for the estimations of inflight excretion of stool total lipids.

4. Sweat collections. No apparent difficulties were noted in the collection and estimation of sweat losses during any of the phases studied.

B. Measurements made. The analytical measurements made on the materials collected in the course of the M-7 experiment are summarized in Table I. The analytical techniques utilized for these measurements form Appendix A.

C. Analytical results.

1. Observations of urinary volume, pH and specific gravity are listed in Tables V - XIII.

2. Urinary excretion of various metabolites are listed in Table XIV for the dry run, Tables XV - XVIII for the pre-flight phase, Tables XIX and XX for the inflight phase, and Tables XXI and XXII for the post-flight studies.

3. Analyses of the fecal samples for the dry run are shown on Table XXIII, for the pre-flight phase in Tables XXIV and XXV, for the inflight phase Table XXVI, and for the post-flight phase Table XXVII. Since the stool collections for astronaut Lovell during the inflight

phase indicated incomplete passage of the ingesta for the purpose of calculations, the fecal excretions for this subject for the inflight and for the post-flight phase were combined and averaged.

4. Analyses of the individual foodstuffs utilized in the pre-flight and post-flight diets are summarized in Table XXVIII. Calculations based on these analyses were made from the actual weighed menus, which are shown in Tables XXIX - XLII, and the final figures for dietary intakes during the pre- and post-flight phases are listed in Table II. Analyses for inflight food packs are listed in Table XLIII. Table XLIV shows analyses of individual food items which were not eaten in conjunction with the total meal pack. Meal sequence actually followed was obtained from the inflight log, Table XLV, and 24-hour food consumption is summarized in Table II.

5. Sweat studies. Sweat studies were carried out as listed in Table XLVI. The results of analyses on these collections are also shown.

6. On the basis of the analyses described above, metabolic balances for various elements were calculated. These are shown in crude form in

Tables XLII - LIII, summarized with the standard deviations and statistical comparisons in Tables LIV - LVII and demonstrated graphically in Figures 1 - 7.

7. Since there was considerable variation in the conditions of the study, and therefore much question of the validity of changes observable among the different phases, it was desirable to perform multiple correlation calculations for the various parameters analyzed. These are summarized in Tables LVIII - LX.

DISCUSSION

The principal goal of these studies has been to measure changes, if any, that may have been produced by the period of near-zero gravity in space in total body metabolism related to the musculoskeletal system. Changes in excretion of other body constituents are of interest insofar as they may demonstrate effects on the primary targets systems.

Calcium Metabolism: Since 99% of the body calcium is in the skeleton, changes in the economy of this element reflect skeletal changes. Immobilization by disease, or as an experimental situation, results in increased bone resorption (9) leading to hypercalciuria and eventual skeletal osteoporosis. In Figure 8A, urinary excretion of calcium is plotted against time for astronaut F. B. No significant change was seen in the first seven days of space flight, but a marked increase occurred starting at about the eighth day, and persisted during the four days of observation after flight. Since dietary intake of calcium was somewhat lower during flight than during the pre- and post-control phases, and since fecal excretion of calcium remain relatively unchanged, the net

balance of calcium during flight (Figure 1A) was significantly more negative for this phase.

The data for astronaut J. L. are less striking. Urinary excretion of calcium (Figure 8B) during control phases was much less than that seen with F. B.; the excretion in flight was not significantly greater than pre-flight; however, the excretion during the second week was greater than that during the first week of flight, and remained so during the four days after recovery. Since, in this individual, too, dietary intake of calcium inflight was less than during the control phases, and since, furthermore, fecal excretion increased during flight, there was significantly less positive balance of calcium during the weightless phase (Figure 1B).

Of interest is that dermal losses of calcium, listed as "sweat", were low for both men in all phases and slightly higher during the relatively inactive post-flight recovery days.

The variability between the two men should be emphasized; this is particularly notable in comparing them with each other and with the other two astronauts, E. W. and M. C. (Figures 1C and 1D) during the pre-flight control phases.

Magnesium Metabolism: Approximately 5 to 40% of skeletal magnesium is available for turnover reactions, i.e., between 2 and 15 gms. (10). Urinary magnesium excretion is also a function of dietary intake, as well as of aldosterone production (11).

Urinary excretion of magnesium in astronaut F. B. is plotted in Figure 9A. No change occurred during the first week of space flight, but significantly increased amounts of magnesium were excreted in the second week, a pattern similar to that seen for calcium excretion. Starting in-flight and persisting through the four days of recovery phase, urinary magnesium excretion fell dramatically. When the balance data are examined (Figure 2A), the increased urinary excretion of magnesium during the in-flight phase becomes of greater significance because this was seen in the presence of reduced dietary intakes. The positive balance during the post-flight period results from decreased urinary and fecal excretion both, while dietary intake was increased, suggesting repletion of previous losses.

The data for astronaut J. L. (Figures 2B and 9B) are qualitatively similar, but of lesser degree. The most significant change in magnesium metabolism demonstrated was that of post-flight retention.

The data of dermal excretion demonstrated the relative insignificance of this route of loss in magnesium metabolism.

Of interest are the similarities in patterns of excretion of magnesium during the pre-flight control phase in all four subjects (Figures 2A, 2B, 2C, and 2D).

Phosphate Metabolism: Phosphate is present in the body as the principal anion in bone salt, as well as in protein and in soluble forms. Urinary excretion of phosphate is a function of dietary intake, bone salt turnover (45% of urinary calcium values), and of muscle metabolism (6.8% of urinary nitrogen excretion values) (12). In addition, carbohydrate metabolism may influence shifts of phosphate among body compartments.

The data obtained for astronaut F. B. (Figures 3A and 10A) demonstrate an increase in urinary phosphate over the first nine days of space flight, occurring during the time when dietary phosphate was half that of the control values. Thereafter, despite relatively constant dietary intake, urinary excretion dropped to control values. Despite decreased fecal excretion, the balances became more negative during the flight, returning to the control

levels after returning to ground level.

Similar results were obtained for astronaut J. L. (Figures 3B and 10B).

Sulfate Metabolism: Urinary sulfate is derived primarily from protein catabolism (approximately 7% of urinary nitrogen) (12). Fecal sulfate is usually constant over a wide range of intake values.

The sulfate excretion data for astronaut F. B. (Figures 4A and 11A) show a slight fall in the urinary excretion during the space flight, and with a rise to slightly above control values during the post-flight period. Since the curtailment of dietary intake inflight was marked, these changes in excretion resulted in negative balance during flight, and returned to control balance levels post-flight.

Similar data were obtained for astronaut J. L. (Figures 4B and 11B).

Nitrogen Metabolism: Fecal nitrogen is relatively constant over wide range of dietary intakes in any individual. Urinary nitrogen reflects dietary intake and protein metabolism.

In both astronauts F. B. and J. L. (Figures 12A and 12B) urinary nitrogen fell during flight and returned to pre-flight values during the post-

flight phase.

Dietary nitrogen was significantly less during the flight with the result that nitrogen balance became negative during this phase (Figures 5A and 5B).

Sodium Metabolism: Urinary sodium is a function of dietary intake, of aldosterone activity, and of glucocorticoid secretion. Restriction of intake produces secondary hyperaldosteronisn with reduction of urinary sodium excretion. Fecal losses of sodium usually are small and relatively constant.

The two astronauts studied showed different patterns. In F. B. (Figures 6A and 13A), despite the decrease in dietary sodium, there was an increased natriuresis during the first week of flight, return to control values during the second week, and significant retention in the early post-flight period.

Conversely, J. L. (Figures 6B and 13B) demonstrated no changes in sodium excretion during the first part of the space flight, a slight increase thereafter, and then marked retention post-flight.

Correlation of these observations with measurements of urinary

11-hydroxycorticosteroids and aldosterone may shed some light on the mechanism. These observations must be taken into account in explanation of changes in urinary calcium since a correlationship between urinary calcium and urinary nitrogen has been demonstrated.

Potassium Metabolism: Urinary excretion of potassium reflects protein metabolism, aldosterone secretion, and glucocorticoid action. The variability in response seen with F. B. and J. L. may be due to variations in endocrine responses.

F. B. (Figures 7A and 14A) showed an initial decrease in urinary potassium as a result of space flight in the presence of a marked decrease in dietary potassium. During the second week urinary potassium rose (which correlated with the simultaneous decrease in urinary sodium). Immediately post-flight potassium excretion fell to pre-flight values as the dietary intake was increased.

J. L. (Figures 7B and 14B) showed only a slight fall in urinary potassium in the first week of flight despite the marked restriction in intake. During the second week the excretion fell further and then rose to pre-flight values during the recovery phase.

Chloride Metabolism: Chloride metabolism is controlled primarily by renal excretion, following, passively, the excretion of cations. Since sodium forms the largest proportion of renal cation, control of chloride depends chiefly on the control of sodium.

J. L. (Figure 15B) showed a pattern of chloride excretion parallel to that of sodium excretion.

F. B., on the other hand, (Figure 15A), excreted chloride in parallel with potassium. The reason for this discrepancy is not apparent.

Balances of chloride were not calculated because of technical difficulties in measurement of dietary chloride.

Sweat Losses: Sweat was a significant route of loss only for sodium, potassium, and chloride in these studies. Sweat losses of calcium, magnesium, sulfate, phosphate, and nitrogen were low and insignificant in the calculations of balances.

SUMMARY AND CONCLUSIONS

1. An attempt was made to perform complete metabolic balance studies of two astronauts during ten days pre-flight control phase, fourteen days of space flight, and four days of post-flight recovery phase, measuring intake and excretion of calcium, magnesium, phosphate, sulphate, nitrogen, sodium, potassium, and chloride.

2. Problems of engineering and experimental design prevented optimal performance during the inflight phase, resulting in variations in dietary control and losses of urine samples.

3. Considerable inter-individual variability was demonstrated, as would be expected, in all experimental parameters measured.

4. In one subject, significant increases in urinary calcium occurred during the second week of flight and persisted during the recovery phase.

5. Significant losses of phosphate were found inflight for both subjects with rapid recovery post-flight.

6. Little change in nitrogen metabolism was noted in either subject.

7. Patterns of excretion of sodium, potassium and chloride were different for each subject and were suggestive of changes in adrenal corticosteroid production.

8. Sweat losses of calcium, magnesium, sulfate, nitrogen, phosphate were insignificant during all three phases.

9. In order to arrive at generalizations concerning the effects of space flight on bone and muscle metabolism, more studies will have to be carried out in more subjects to account for individual variability, and under better control of dietary intake and collection of excreta.

APPENDIX

A. Analytical Procedures.

1. Routine Urine Analysis.

a. Volume. Pre-flight urine volumes were measured using a graduate cylinder calibrated to 5 ml. and estimating volumes to the nearest 2 ml.

b. Specific gravity of the pre- and post-flight samples was measured by a standard hydrometer calibrated for urine specific gravity at room temperature.

c. pH. pH of pre- and post-flight urine samples was measured using standard pHydrion paper estimating values to the nearest 0.5 pH units.

d. Urine volume of the inflight samples was measured by the technique of tritium dilution. A precalibrated volume of tritium was injected via the urine transport system into the path of voiding and washed into the collection bag by the stream of urine. The urine and tritiated water tracer were mixed manually in the collection bag, and an aliquot

expressed into the sampling bag. For analysis, duplicate samples of 0.5 ml. of the urine were taken, using a calibrated pipet and added to 10 ml. of Bray's solution in a liquid scintillation counting vial. The samples were then counted in a Packard Instrument Company Liquid Scintillation Spectrometer Model No. 3002 with a counting energy window of 50-1000 and a gain of 62.4. Subsequently, 10 microliters of the original tritiated water solution were added with a calibrated pipet to each of the samples and they were again counted. The actual counts obtained for each of the samples recovered are listed in Table LXI. Volumes of tritium injected by the urine transport system were obtained from the Arde Incorporated Company who prepared the initial selector valve used. The values were 0.3102 ml. for the device used by Borman and 0.2929 ml. for the device used by Lovell. For the determination of the volume of urine measured by this device, the following formula was used: $V_u = K \times \frac{C_{u+s} - C_u}{C_u - B}$, where V_u = unknown volume to be measured; C_{u+s} = counts per minute of the urine aliquot + the added standard; C_u = counts per minute of the urine aliquot alone; B = background count. K was 15.9589 for Borman and 15.0689 for Lovell. The values obtained by this

calculation are listed in Table LXII, and are compared with volumes measured by an on-board flow meter. The correlation coefficient for the two methods of urine volume measurement was 0.35. The difference between the two methods was significant to 0.1.

e. Specific Gravity of Inflight Samples. Because the recovered volumes of many of the samples were extremely low, hydrometry could not be used for measurement of specific gravity. This was estimated using a refractometer (American Optical Company, Goldberg TS-Meter).

f. pH of Inflight Samples. This was not determined because the sample bags used for the inflight urine samples had been pretreated with benzoic acid as a preservative. This would be expected to affect the pH.

g. Preparation of Stool Samples for Analysis. Stool samples were combined into pools representing collection periods separated by the oral administration of nonabsorbable dyes, alternating the administration of Carmine Red and Brilliant Blue. The combined fecal samples for each period were homogenized with a carefully weighed amount of doubly distilled water with a Lourdes Homogenizer Model VM. The suspended material was then lyophilized in a VirTis freeze-drying apparatus Model No. 10-145 to a dry

powder. The total weight of this powder was then recorded. Aliquots were either analyzed directly, or ashed by an appropriate procedure as required for the individual analytical techniques.

h. Preparation of Diet Samples for Analyses. Solid foods were homogenized with volumes of water and lyophilized in the manner described for stool samples. Liquid foods were lyophilized directly or analyzed directly as appropriate to the analytical procedure.

i. Preparation of Sweat Samples for Analyses. The so-called sweat samples actually consist of extracts of underwear and skin washings and thus represent total dermal losses. The volume received was approximately 5 liters for each study. This was evaporated to 1 liter in a Lindberg Heavy Duty Convection Oven at a temperature of 60° C. The evaporated material was made to a final volume of 1 liter prior to actual analysis.

j. Determination of Calcium. Calcium was measured in all of the samples by the unpublished procedure of Lutwak and Belkin, an automatic atomic absorption spectrophometric technique. Samples of stool and diet were submitted to dry heat ashing at 400° C. for 6 hours. The resulting

white ash was dissolved in 10% HCl and diluted to an appropriate volume. Aliquots of the diluted ash, or of filtered acidified urine were placed into an AutoAnalyzer Sampler module. Aliquots of the samples were admixed with 1% lanthanum chloride solution in an AutoAnalyzer pumping module and pumped directly into a Perkin Elmer Model 303 atomic absorption spectrophotometer with acetylene gas pressure at 8 psi and air pressure at 30 psi. Readings were carried out using a calcium lamp at 4240A.

k. Determination of Magnesium. Magnesium was measured by the unpublished procedure of Lutwak and Belkin using an automatic atomic absorption spectrophotometric technique. Samples were prepared for analysis as described for calcium and were analyzed in a fashion similar to the method used for calcium, but with a magnesium lamp and the spectrophotometer set at 2085A.

l. Determination of Sodium. Solutions of dry ash samples of stool and diet and diluted samples of urine were analyzed for sodium by appropriate dilution with 1% Flaminox Solution and estimation in a Coleman Model 21 flame photometer.

m. Determination of Potassium. Potassium was determined in solutions of ashed diet and feces and in diluted urine samples by dilution with 1% Flaminox Solution and estimation in a Coleman Model 21 Flame Photometer.

n. Phosphate Analysis. Total inorganic phosphate was determined in solutions of dry ashed feces and diet, and directly in urine by the AutoAnalyzer modification of the Fiske-Subba Row Procedure. Appropriate aliquots of the solutions were diluted with 0.5 N hydrochloric acid and dialyzed against a solution of aminonaphthol sulfonic acid. The dialysate was mixed with a solution of ammonium molybdate in sulfuric acid and the resulting color measured at 660 mμ.

o. Determination of Sulfate. Total sulfur was determined by the procedure of Roe, Miller, and Lutwak (13) which is based on the precipitation of sulfate with a standard amount of barium and determination of excess barium by atomic absorption spectrophotometry. Solid samples were oxidized in a Schöniger Flask and liquid samples by Benedict's Method utilizing copper nitrate, and potassium chlorate. The oxidized samples containing the sulfur

in the form of sulfate were treated with 15% barium chloride and 5% lanthanum chloride solutions. After centrifugation, supernatants were discarded and the precipitates of barium sulfate washed, the final precipitates were dissolved in di-sodium EDTA solution and aspirated into the flame of the atomic absorption spectrophotometer. The total barium concentration was measured with a barium hollow cathode tube operated at 18 ma with the wave lamp set at 5500A. Air pressure was maintained at 30.0 psi at a flow rate of 7.5 liters per minute .

p. Determination of Chloride. Chloride was estimated in solutions of ash stool and diet dissolved in dilute nitric acid and in urine samples by means of a Buchler-Cotlove Chloridometer.

q. Determination of Total Nitrogen. Total nitrogen was determined on appropriate solutions by means of the AutoAnalyzer total nitrogen procedure. Urine samples were analyzed directly. Samples of foods and of feces were prepared for analysis by preliminary solubilization. Accurately weighed aliquots of the dried powders were mixed with concentrated sulfuric acid and digested for 2 hours to provide a clear solution. The solution was then diluted to a

final concentration of between 2 and 20 milligrams percent of total nitrogen. The solutions were aspirated into the apparatus, mixed with a digestant consisting of selenium oxide in concentrated sulfuric acid, heated in the flow digestor, diluted with water, and the concentration of ammonium sulfate determined by reaction with sodium phenate and sodium hypochlorite. The resulting color was measured at 630 mu.

r. Determination of Creatinine. Creatinine was measured in all of the urine samples by the AutoAnalyzer modification of the Jaffe reaction. The urine sample was mixed with sodium chloride solution and dialyzed against saline. A dialysate was then mixed with picric acid and sodium hydroxide and the final color product measured 505 mu.

TABLE I

ANALYSES PERFORMED

ANALYSES	MATERIAL*	METHOD
Volume	U	a) Routine, pre- and post-flight b) T_2O dilution, inflight
Specific Gravity	U	a) Routine, pre- and post-flight b) Refractometry, inflight
pH	U	Routine, pre- and post-flight
Creatinine	U	Autoanalyzer colorimetry
Calcium	U,F,D,S	Autoanalyzer Atomic Absorption
Magnesium	U,F,D,S	Autoanalyzer Atomic Absorption
Sodium	U,F,D,S	Flame Photometry
Potassium	U,F,D,S	Flame Photometry
Phosphate	U,F,D	Autoanalyzer colorimetry
Sulfate	U,F,D	Atomic Absorption
Chloride	U,F,D,S	Coulometry
Nitrogen	U,F,D,S	Autoanalyzer
Fat	F,D	Wistreich Extraction

*U= Urine; F= Feces; D= Diet; S= Sweat

TABLE II

ELEMENTAL COMPOSITION OF DIETS
(A) F.B.

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	N (gm.)
T-12	1.2873	.4340	268.8	114.4	2.5048	2.4202	25.481
T-11	1.3359	.4427	230.9	162.3	2.8645	2.7458	24.945
T-10	1.2558	.4391	177.6	143.9	3.1082	3.1083	28.094
T-9	1.3553	.4532	268.8	120.9	2.5189	2.3435	24.384
T-8	1.3483	.4522	263.5	169.1	2.9733	2.9491	27.452
T-7	1.2630	.4540	156.9	148.3	3.1292	3.1281	27.947
T-6	1.3354	.4438	232.7	116.7	2.4775	2.2876	22.314
T-5	1.3289	.4609	258.5	163.9	2.9258	2.9093	26.974
T-4	1.2840	.4549	174.6	146.9	3.1442	3.1497	28.248
T-3	1.3272	.4309	231.8	114.0	2.4415	2.2835	22.226
Mean	1.3121	.4466	226.4	140.0	2.8088	2.7325	25.807
s.d.	.0343	.0094	40.0	20.7	.2774	.3462	2.185
Inflight							
1	.8705	.2278	144.0	53.2	1.5372	.9533	18.275
2	1.1561	.1646	166.6	38.4	1.4247	.7311	13.046
3	.9702	.1386	137.4	20.9	1.3748	.6288	10.914
4	.7142	.2241	186.8	48.6	1.3263	.9472	15.495
5	1.2734	.2377	143.5	36.1	1.3212	.9215	15.625
6	1.3189	.2251	147.2	40.7	1.5416	1.0918	19.239
7	1.1651	.2436	88.9	22.7	1.2761	.8974	17.287
8	.8817	.1801	135.8	36.6	1.2150	.8876	17.526
9	.8279	.2373	121.7	35.8	1.1519	.9768	18.490
10	1.1039	.2222	125.7	36.9	1.4139	1.0937	17.502
11	.5555	.2013	199.4	42.4	1.0733	.9609	16.905
12	1.4700	.1773	128.2	39.4	1.5481	.7547	15.533

TABLE II

ELEMENTAL COMPOSITION OF DIETS
(A) F.B.

Continued

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	N (gm.)
Inflight							
13	1.3267	.1917	180.2	40.1	1.6457	.9042	16.497
14	.9551	.1013	125.5	23.5	1.2209	.4886	8.958
Mean	1.0421	.1981	145.1	36.8	1.3622	.8741	15.807
s.d.	.2513	.0404	28.4	8.9	.1613	.1632	2.847
Post							
1	1.2372	.3564	244.9	128.8	2.5485	2.5354	22.044
2	1.3913	.5260	294.8	169.3	3.2455	3.0358	28.920
3	1.1735	.4266	169.1	126.5	2.6297	2.6050	21.869
4	1.4118	.4100	245.7	106.1	2.4686	2.3906	22.244
Mean	1.3035	.4298	238.6	132.7	2.7231	2.6417	23.769
s.d.	.1009	.0613	44.9	22.9	.3070	.2403	2.977

TABLE II

ELEMENTAL COMPOSITION OF DIETS
(B) J.L.

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	N (gm.)
T-12	1.2940	.4076	253.6	113.9	2.3958	2.2311	21.981
T-11	1.3780	.4078	218.5	149.8	2.5854	2.5898	21.693
T-10	1.2773	.4340	134.8	133.9	2.9256	2.9370	25.019
T-9	1.3260	.4318	225.0	116.0	2.2969	2.1408	22.978
T-8	1.3483	.3949	226.1	140.8	2.6477	2.7127	23.510
T-7	1.2534	.4506	144.8	139.3	2.8846	2.8685	24.867
T-6	1.3074	.4126	224.7	114.7	2.4019	2.2503	22.048
T-5	1.3554	.4073	214.4	143.6	2.6764	2.7177	23.590
T-4	1.2423	.4272	134.4	135.3	2.8557	2.8604	24.732
T-3	1.3029	.3983	223.1	111.1	2.3537	2.2536	21.977
Mean	1.3085	.4172	199.9	129.8	2.6024	2.5562	23.240
s.d.	.0419	.0169	41.8	13.7	.2223	.2916	1.237
Inflight							
1	.8705	.2278	144.0	53.2	1.5372	.9533	18.275
2	1.1561	.1646	166.6	38.4	1.4247	.7311	13.275
3	.9702	.1386	137.4	20.9	1.3748	.6288	10.914
4	.7142	.2241	186.8	48.6	1.3263	.9472	15.495
5	1.2734	.2377	143.5	36.1	1.3212	.9215	15.625
6	1.3189	.2251	147.2	40.7	1.5416	1.0918	19.239
7	1.1651	.2436	88.9	22.7	1.2761	.8974	17.287
8	.8817	.1801	135.8	36.6	1.2150	.8876	17.526
9	.8279	.2373	121.7	35.8	1.1519	.9768	18.490
10	1.1039	.2222	125.7	36.9	1.4139	1.0937	17.502

TABLE II

ELEMENTAL COMPOSITION OF DIETS
(B) J.L.

Continued

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	N (gm.)
Inflight							
11	.5555	.2013	199.4	42.4	1.0733	.9609	16.905
12	.4700	.1773	128.2	39.4	1.5481	.7547	15.533
13	1.3267	.1917	180.2	40.1	1.6457	.9042	16.497
14	.9551	.1013	125.5	23.5	1.2209	.4886	8.958
Mean	1.0421	.1981	145.1	36.8	1.3622	.8741	15.807
s.d.	.2513	.0404	28.4	8.9	.1613	.1632	2.847
Post							
1	1.2537	.3379	184.1	124.8	2.4581	2.4355	19.841
2	1.3477	.4306	217.2	145.3	2.8991	2.7817	25.428
3	1.1250	.3932	130.5	128.2	2.6972	2.6879	24.091
4	1.4126	.4172	265.9	115.8	2.5067	2.4098	22.457
Mean	1.2835	.3947	199.4	128.5	2.6403	2.5787	22.954
s.d.	.1100	.0354	49.3	10.7	.1741	.1598	2.083

TABLE II

ELEMENTAL COMPOSITION OF DIETS

(C) E.W.

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	N (gm.)
T-12	1.1650	.3565	251.9	91.2	2.0865	2.0659	19.884
T-11	1.3581	.3994	291.6	150.8	2.6781	2.2080	23.609
T-10	1.2576	.4801	208.8	142.1	3.0999	2.9868	27.498
T-9	1.2864	.4395	270.1	111.4	2.4027	2.2616	27.046
T-8	1.4193	.4499	300.6	167.8	3.0001	3.0078	29.490
T-7	1.2697	.4355	247.3	137.7	3.1083	2.9819	26.911
T-6	1.2771	.4274	217.4	111.4	2.5200	2.4108	26.193
T-5	1.2311	.4200	240.6	162.9	2.7350	2.8010	26.837
T-4	1.2263	.4357	185.5	138.3	3.0543	2.9348	26.295
T-3	1.2780	.4289	250.1	112.2	2.5229	2.4127	26.206
Mean	1.2769	.4273	246.4	132.6	2.7208	2.6101	25.997
s.d.	.0668	.0307	34.0	23.8	.3268	.3490	2.456

(D) M.C.

T-12	1.3133	.4097	275.5	113.6	2.5330	2.3153	23.733
T-11	1.3643	.4167	248.8	151.1	2.7196	2.6202	23.362
T-10	1.2697	.5001	165.9	152.7	3.1819	3.0014	27.646
T-9	1.3257	.5011	244.4	140.0	2.6112	2.3661	27.444
T-8	1.3552	.4313	243.1	160.9	2.9425	2.9565	28.127
T-7	1.2565	.4617	162.8	154.0	3.2551	3.1506	30.072
T-6	1.3183	.4191	261.6	117.3	2.5739	2.4862	26.402
T-5	1.3447	.3877	246.6	134.1	2.9095	2.9501	27.714
T-4	1.2949	.4722	134.0	157.1	3.3330	3.1528	30.264
T-3	1.3331	.4471	267.0	122.0	2.6617	2.4941	26.566
Mean	1.3176	.4447	225.0	140.3	2.8721	2.7493	27.133
s.d.	.0335	.0386	48.0	16.7	.2830	.3093	2.162

TABLE III

24-HOUR URINARY CREATININE EXCRETIONS

PRE-FLIGHT PHASE

Day	F.B. (Gm.)	J.L. (Gm.)	E.W. (Gm.)	M.C. (Gm.)
T-12	2.2782	1.7693	2.6570	2.2216
T-11	2.2490	1.8499	2.6332	2.1940
T-10	2.1899	2.0545	2.5772	2.3300
T-9	2.4357	2.2465	2.8481	2.4253
T-8	2.2773	2.1299	3.0074	2.7678
T-7	2.2995	2.1831	2.7599	2.3635
T-6	2.4166	2.4570	3.0574	2.6948
T-5	2.3623	2.2022	2.9920	2.1441
T-4	2.2525	2.1980	2.9212	2.2209
T-3	2.0890	2.4046	2.9567	2.3617
Mean	2.2850	2.1495	2.8410	2.3724
s.d.	.0980	.2047	.1642	0.1985

TABLE IV

INFLIGHT 24-HOUR URINARY CREATININE EXCRETIONS

Day	F.B.* (Gm.)	J.L.+ (Gm.)
1	1.6760	1.1980
2	1.4721	1.4744
3	1.3216	----
4	1.5834	1.6672
5	1.4232	2.1074
6	1.4949	1.7365
7	2.1146	1.7632
8	1.4196	2.0850
9	1.4415	1.8489
10	1.7532	2.0317
11	1.9849	1.5812
12	2.0556	1.6242
13	1.6650	1.2397
14	1.2022	1.8944
Mean	1.6148	1.7545
s.d.	0.2677	0.2479

* - Mean of pre- and post-flight: 2.3968

+ - Mean of pre- and post-flight: 2.1963

TABLE V - PRE-FLIGHT URINE SAMPLES

DRY RUN

Subject	No.	Date	Time	Volume	Sp.Grav.	pH	24-Hr.Vol.
Ott	1	11-16-65	1315	330 ml.	1.0235	6.5	
	2	11-16	1600	210	1.022	6.5	
	3	11-16	2030	270	1.028	6.5	
	4	11-17	0700	420	1.026	6.5	
							1230 ml.
	5	11-17	1425	370	1.026	6.5	
	6	11-17	1845	220	1.027	6.0	
	7	11-17	2140	272	1.0225	6.5	
	8	11-18	0640	598	1.012	6.0	
							1460
	9	11-18	1207	325	1.0125	6.5	
	10	11-18	1622	237	1.023	6.0	
	11	11-18	2230	310	1.028	6.0	
	12	11-19	0758	470	1.020	6.5	
							1342
Rice	1	11-16	1310	390	1.014	6.5	
	2	11-16	1530	145	1.0185	6.5	
	3	11-16	1915	295	1.0165	6.0	
	4	11-17	0430	840	1.016	5.5	
	5	11-17	0630	277	1.508	6.5	
							1947
	6	11-17	1105	330	1.014	7.0	
	7	11-17	1520	255	1.0185	6.5	
	8	11-17	1920	254	1.019	6.5	
	9	11-17	2300	215	1.0175	6.5	
	10	11-18	0610	690	1.011	6.5	
							1744
	11	11-18	1120	297	1.016	6.5	
	12	11-18	1820	385	1.020	6.5	
	13	11-18	2230	280	1.020	6.5	
	14	11-19	0809	755	1.014	6.0	
							1717

TABLE VI - PRE-FLIGHT URINE SAMPLES

F.B. (a)

No.	Date	Time	Volume	Sp. Grav.	pH	24-Hr. Vol.
1	11-22-65	0920	99 ml.	1.022	6.5	
2	11-22	1230	750	1.005	7.0	
3	11-22	1600	785	1.006	6.0	
4	11-22	2030	480	1.011	5.5	
5	11-22	2320	462	1.508	5.5	
6	11-23	0700	515	1.012	6.0	
						3091 ml.
7	11-23	1125	575	1.0085	6.5	
8	11-23	1400	812	1.005	6.5	
9	11-23	1645	668	1.006	6.5	
10	11-23	2200	572	1.012	6.0	
11	11-24	0450	665	1.010	6.5	
12	11-24	0640	122	1.017	6.5	
						3414
13	11-24	0945	225	1.013	6.8	
14	11-24	1315	356	1.011	6.8	
15	11-24	1615	880	1.0055	7.0	
16	11-24	1730	325	1.009	7.0	
17	11-24	2315	805	1.010	6.8	
18	11-25	0330	235	1.020	6.0	
19	11-25	0650	187	1.019	6.0	
						3013
20	11-25	0930	260	1.011	5.5	
21	11-25	1145	279	1.0105	6.8	
22	11-25	1500	478	1.009	6.0	
23	11-25	1600	612	1.0025	6.5	
24	11-25	1715	450	1.003	6.8	
25	11-25	2110	515	1.010	5.5	
26	11-25	2300	420	1.006	6.0	
27	11-26	0610	480	1.014	5.5	
						3494
28	11-26	0940	342	1.010	6.5	
29	11-26	1200	400	1.008	7.0	
30	11-26	1400	405	1.006	6.3	
31	11-26	1500	655	1.003	6.8	
32	11-26	1615	340	1.006	6.8	
33	11-26	2000	300	1.015	6.3	
34	11-26	2300	510	1.009	6.5	
35	11-27	0630	485	1.0145	6.0	
						3437

TABLE VI - PRE-FLIGHT URINE SAMPLES

F.B. (b)

No.	Date	Time	Volume	Sp. Grav.	pH	24-Hr. Vol.
36	11-27-65	0900	360	1.010	6.0	
37	11-27	1000	350	1.005	7.0	
38	11-27	1220	630	1.006	7.0	
39	11-27	1610	915	1.007	7.0	
40	11-27	1800	303	1.010	6.8	
41	11-27	2330	380	1.0185	6.3	
42	11-28	0600	325	1.021	6.3	
						3263
43	11-28	0945	167	1.0185		
44	11-28	1030	370	1.003		
45	11-28	1200	373	1.005		
46	11-28	1610	590	1.011		
47	11-28	2020	410	1.014		
48	11-28	2345	650	1.007		
49	11-29	0630	332	1.017		
						2892
50	11-29	1030	463	1.0105		
51	11-29	1205	257	1.0085		
52	11-29	1340	232	1.009		
53	11-29	1645	880	1.006		
54	11-29	2030	344	1.014		
55	11-29	2300	340	1.0135		
56	11-30	0630	440	1.016		
						2956
57	11-30	1045	565	1.010		
58	11-30	1310	380	1.008		
59	11-30	1710	672	1.009		
60	11-30	2000	194	1.017		
61	11-30	2100	273	1.006		
62	11-30	2300	188	1.014		
63	12-01	0300	455	1.011		
64	12-01	0645	184	1.021		
						2911
65	12-01	1200	655	1.011		
66	12-01	1400	288	1.0095		
67	12-01	1600	685	1.005		
68	12-01	1900	240	1.015		
69	12-01	2100	720	1.0045		
70	12-01	2230	257	1.007		
71	12-02	0620	390	1.013		
						3235

TABLE VII - PRE-FLIGHT URINE SAMPLES

J.L. (a)

No.	Date	Time	Volume	Sp. Grav.	pH	24-Hr. Vol.
1	11-22-65	1300	275 ml.	1.023	6.5	
2	11-22	1700	210	1.022	6.0	
3	11-22	2345	355	1.023	6.5	
4	11-23	0700	445	1.0135	5.5	
						1285 ml.
5	11-23	1300	418	1.017	5.5	
6	11-23	1730	535	1.012	5.5	
7	11-23	2245	429	1.016	6.5	
8	11-24	0635	530	1.013	6.0	
						1912
9	11-24	7200	292	1.019	6.3	
10	11-24	1730	417	1.019	6.5	
11	11-24	2315	279	1.022	6.5	
12	11-25	0700	342	1.023	6.0	
						1330
13	11-25	0945	157	1.022	6.3	
14	11-25	1330	318	1.011	6.0	
15	11-25	1830	240	1.027	5.5	
16	11-25	2330	195	1.025	6.0	
17	11-26	0730	368	1.024	6.5	
						1278
18	11-26	1200	270	1.020	6.0	
19	11-26	1400	223	1.010	5.5	
20	11-26	1630	495	1.0075	6.5	
21	11-26	2345	350	1.024	6.3	
22	11-27	0630	270	1.026	5.5	
						1608
23	11-27	1015	540	1.009	6.0	
24	11-27	1200	265	1.009	6.2	
25	11-27	1520	480	1.0105	6.9	
26	11-27	1800	188	1.019	7.0	
27	11-27	2330	267	1.023	6.7	
28	11-28	0630	333	1.023	5.5	
						2073

TABLE VII - PRE-FLIGHT URINE SAMPLES

J.L. (b)

No.	Date	Time	Volume	Sp. Grav.	pH	24-Hr. Vol.
29	11-28-65	1000	120 ml.	1.026	5.5	
30	11-28	1300	130	1.026	5.5	
31	11-28	1600	248	1.024	6.7	
32	11-28	2030	152	1.028	6.5	
33	11-28	2345	160	1.029	6.5	
34	11-29	0715	385	1.020	6.8	
						1195 ml.
35	11-29	1045	423	1.009	6.3	
36	11-29	1340	258	1.0145	5.5	
37	11-29	1700	568	1.008	6.5	
38	11-29	2030	247	1.0175	6.0	
39	11-29	2200	140	1.021	6.3	
40	11-30	0630	325	1.023	5.8	
						1961
41	11-30	1115	345	1.018	6.4	
42	11-30	1645	540	1.013	6.4	
43	11-30	2000	190	1.020	5.5	
44	11-30	2230	187	1.0225	6.8	
45	12-01	0645	475	1.0175	6.2	
						1737
46	12-01	1205	355	1.020	6.0	
47	12-01	1600	265	1.021	6.6	
48	12-01	2300	325	1.026	5.5	
49	12-02	0730	265	1.026	5.9	
						1210

TABLE VIII - PRE-FLIGHT URINE SAMPLES

E.W. (a)

No.	Date	Time	Volume	Sp. Grav.	pH	24-Hr. Vol.
1	11-22-65	1345	378 ml.	1.015	6.8	
2	11-22	1735	310	1.021	6.6	
3	11-22	2345	348	1.024	6.0	
4	11-23	0715	483	1.016	6.3	
						1519 ml.
5	11-23	1105	348	1.012	6.8	
6	11-23	1705	486	1.018	6.5	
7	11-23	2220	362	1.023	6.5	
8	11-24	0700	830	1.011	6.3	
						2026
9	11-24	1150	385	1.016	5.5	
10	11-24	1750	575	1.016	6.3	
11	11-24	2120	445	1.012	6.8	
12	11-24	2320	295	1.014	6.5	
13	11-25	0635	838	1.010	6.2	
						2538
14	11-25	1150	275	1.020	6.3	
15	11-25	1500	400	1.010	5.5	
16	11-25	1720	590	1.005	6.5	
17	11-25	2325	440	1.021	6.3	
18	11-26	0615	428	1.020	5.0	
						2133
19	11-26	0930	335	1.014	6.0	
20	11-26	1400	690	1.009	6.8	
21	11-26	1730	162	1.022	6.3	
22	11-26	2335	390	1.024	6.5	
23	11-27	0715	425	1.021	6.5	
						2002
24	11-27	1230	538	1.014	6.3	
25	11-27	1500	825	1.006	6.4	
26	11-27	2215	425	1.0175	6.3	
27	11-28	0610	410	1.0235	6.5	
						2198
28	11-28	1300	325	1.0235	6.0	
29	11-28	1640	165	1.0275	6.0	
30	11-28	2025	277	1.022	6.0	
31	11-28	2330	538	1.011	6.8	
32	11-29	0710	640	1.016	6.4	
						1945

TABLE VIII - PRE-FLIGHT URINE SAMPLES

E.W. (b)

No.	Date	Time	Volume	Sp. Grav.	pH	24-Hr. Vol.
33	11-29-65	1200	697 ml.	1.011	6.0	
34	11-29	1530	392	1.013	6.0	
35	11-29	1745	203	1.016	6.0	
36	11-29	2325	585	1.017	6.3	
37	11-30	0605	650	1.014	6.0	
						2527
38	11-30	1230	292	1.021	5.5	
39	11-30	1630	205	1.025	6.0	
40	11-30	2220	405	1.025	6.0	
41	12-01	0740	555	1.018	5.5	
						1457
42	12-01	1700	455	1.025	6.0	
43	12-01	2300	520	1.021	5.5	
44	12-02	0615	655	1.0125	6.8	
						1630

TABLE IX - PRE-FLIGHT URINE SAMPLES

M.C. (a)

No.	Date	Time	Volume	Sp. Grav.	pH	24-Hr. Vol.
1	11-22-65	1330	255 ml.	1.025	6.0	
2	11-22	1730	284	1.023	6.0	
3	11-22	2200	215	1.025	6.0	
4	11-23	0700	350	1.030	6.5	
						1104 ml.
5	11-23	1130	210	1.024	5.5	
6	11-23	1710	274	1.0265	6.5	
7	11-23	2300	323	1.025	6.0	
8	11-24	0700	338	1.025	6.0	
						1145
9	11-24	0930	270	1.022	6.3	
10	11-24	1730	360	1.0215	7.5	
11	11-24	2100	288	1.025	6.0	
12	11-25	0745	410	1.024	6.0	
						1328
13	11-25	1000	190	1.015	7.0	
14	11-25	1800	460	1.016	6.0	
15	11-25	2130	310	1.0245	6.5	
16	11-26	0600	365	1.024	5.5	
						1325
17	11-26	1100	478	1.014	6.1	
18	11-26	1345	402	1.010	6.3	
19	11-26	1800	285	1.019	6.6	
20	11-26	2015	320	1.025	6.5	
21	11-27	0600	347	1.026	6.8	
						1832
22	11-27	1200	710	1.011	6.0	
23	11-27	1615	320	1.019	7.0	
24	11-27	2215	430	1.022	6.0	
25	11-28	0600	280	1.028	6.8	
						1740
26	11-28	0915	180	1.022	5.0	
27	11-28	1200	170	1.017	6.0	
28	11-28	1640	252	1.026	6.0	
29	11-28	2015	233	1.024	6.0	
30	11-28	2330	235	1.022	6.0	
31	11-29	0710	370	1.025	6.0	
						1440

TABLE IX - PRE-FLIGHT URINE SAMPLES

M.C. (b)

No.	Date	Time	Volume	Sp. Grav.	pH	24-Hr. Vol.
32	11-29-65	1310	792 ml.	1.007	6.7	
33	11-29	1800	265	1.025	6.4	
34	11-29	2100	267	1.0245	6.2	
35	11-30	0600	372	1.026	5.8	
						1696 ml.
36	11-30	1014	180	1.024	6.2	
37	11-30	1642	410	1.0245	6.2	
39	11-30	2100	240	1.027	5.5	
40	12-01	0700	467	1.0265	6.0	
						1297
41	12-01	1200	293	1.022	6.2	
42	12-01	1621	252	1.0245	6.4	
43	12-01	2100	360	1.026	5.0	
44	12-02	0600	340	1.0285	5.5	
						1245

TABLE X - INFLIGHT URINE SAMPLES
F.B.

No.	S/N #	G.E.T.	Volume of Aliquot (ml.)	Calculated Vol. (ml.)	Remarks		Sp. G.	(ml.) Volume taken for 24-hr. Pool	(a) Pool No.	Calculated 24-hr. Volume
1	7-11	04+54	40	363.5				13.7		
2	7-102	14+00	38	519.2				19.5		
3	7-95	21_33	50	318.7				12.0		
							1.0195		I	1201.4
4	7-61	32+24	35	258.0	Not Logged			12.0		
5	7-88	48+21	23	315.9				14.7		
							1.0295		II	573.9
6	7-68	56+25	40	233.8				10.0		
7	7-76	68+25	38	406.5				17.4		
							1.026		III	640.3
8	7-105	77+45	38	366.9				16.3		
9	7-09	89+06	45	225.7				10.0		
10	7-15	94+42	28	384.8	Not Logged			17.1		
							1.023		IV	977.4
11	7-108	99+24	42	398.3		)	1.0195			
12	7-12	102+14	35	311.3		)	1.0175			
13	7-109	112+10	48	478.5		) Not	1.019			
14	7-17	117+45	2	344.2	Loss From Bag	) Pooled	----			
15	7-33	123+14	57	529.6	Not Logged	)	1.0148			
									V	2406.1
x	----	128+07	----	----	Missing	)	----			
16	7-60	136+00	55	404.4		) Not Pooled	1.026			
17	7-02	143+39	36	369.6		)	1.0293			
									VI	774.0+
18	7-13	149+13	42	386.5	Not Logged			15.0		
19	7-55	159+46	55	542.5				21.1		
20	7-66	165+30	45	397.5				15.4		
21	7-106	170+00	42	413.9				16.1		
							1.0188		VII	1740.4

TABLE X - INFLIGHT URINE SAMPLES
F.B.

No.	S/N #	G.E.T.	Volume of Aliquot (ml.)	Calculated Vol. (ml.)	Remarks	Sp. G.	(ml.) Volume taken for 24-hr. Pool	(b) Pool No.	Calculated 24-hr. Volume
22	7-08	173+42	45	316.9			17.2		
23	7-04	185+00	50	304.9			16.6		
24	7-24	192+51	27	276.1			15.0		
						1.0183		VIII	897.9
25	7-65	195+12	42	375.4	Not Logged	1.0223			
26	7-85	207+40	40	368.1		1.029			
27	7-14	212+31	1	157.0	Loss From Bag	----			
28	7-117	215+13	48	218.8		1.013			
								IX	1276.3+
29	7-104	220+31	< 1	18.8	Not Logged; Loss From Bag)	----			
30	7-62	223+50	50	422.5	)	1.0125			
31	7-96	233+24	48	370.0	Not Logged)	1.009			
32	7-51	231+	42	686.8	Not)	1.0128			
33	7-05	237+49	40	302.7	Not Logged Pooled)	1.0245			
34	7-29	240+45	60	349.3	)	1.013			
								X	2168.8
35	7-32	247+58	50	339.0			17.1		
36	7-111	257+00	50	296.9	Not Logged		15.0		
38	7-113	266+40	52	452.3			22.9		
						1.0248		XI	1088.2
37	7-91	267+11	50	577.6			25.6		
39	7-16	282+52	58	534.1	Not Logged		23.7		
40	7-80	286+32	42	391.6			17.4		
41	7-48	290+40	47	338.6			15.0		
						1.0168		XII	1841.9
42	7-01	297+48	36	229.0	Not Logged		15.0		
43	7-114	308+17	43	399.5			26.2		
44	7-10	311+30	65	353.8	Not Logged		23.2		
						1.023		XIII	982.3

TABLE X - INFLIGHT URINE SAMPLES

F.B.

No.	S/N #	G.E.T.	Volume of Aliquot (ml.)	Calculated Vol. (ml.)	Remarks	Sp. G.	(ml.) Volume taken for 24-hr. Pool	(c) Pool No.	Calculated 24-hr. Volume
45	7-84	315+25	42	328.6	Not Logged		20.2		
46	7-118	322+50	40	244.5			15.0		
47	7-52	326+32	50	428.7			26.3		
ostflight 95		Post-Flight	556	556.		1.0138	34.1	XIV	1001.8

TABLE XI - INFLIGHT URINE SAMPLES

J.L.

No.	S/N #	G.E.T.	Volume of Aliquot (ml.)	Calculated Vol. (ml.)	Remarks	Sp. G.	Volume taken for 24-hr. Pool	Pool No.	(a) Calculated 24-hr. Volume
1	7-45	4+38	35	90.7		1.0328	5.0		
2	7-18	11+50	68	420.8		1.0303	23.2		
3	7-31	21+33	40	377.1		----	20.8		
								I	888.6
4	7-77	32+25	22	198.3	Not Logged		16.3		
5	7-47	46+00	33	218.8			18.0		
6	7-71	48+20	15	121.8	Half Lost		10.0		
						1.0335		II	538.9
w	----	52+06	----	----	Missing	----	----		
y	----	56+30	----	----	Missing	----	----		
z	----	68+50	----	----	Missing	----	----		
								III	----
7	7-22	77+46	12	101.8			4.8		
8	7-87	80+41	8	42.7			2.0		
9	7-103	89+00	50	187.5			8.8		
10	7-49	94+40	28	280.7	Not Logged		13.1		
						1.035		IV	612.7
11	7-92	102+13	35	277.7			17.7		
12	7-25	118+00	45	235.4	Not Logged		15.0		
13	7-112	121+08	43	320.2	Not Logged		20.4		
						1.0335		V	833.3
14	7-67	127+30	42	214.8			15.0		
15	7-41	140+10	55	346.7	Not Logged		24.2		
16	7-26	146+37	34	218.6			15.3		
						1.0273		VI	780.1
17	7-56	159+02	25	205.4			15.0		
18	7-78	165+51	45	279.2			20.4		
19	7-79	171+47	35	241.0			17.6		
						1.0323		VII	725.6

TABLE XI - INFLIGHT URINE SAMPLES

J.L.

(b)

No.	S/N #	G.E.T.	Volume of Aliquot (ml.)	Calculated Vol. (ml.)	Remarks	Sp. G.	Volume taken for 24-hr. Pool	Pool No.	Calculated 24-hr. Volume
20	7-53	185+17	58	313.8			16.6		
21	7-90	192+50	42	320.1			17.0		
22	7-69	197+28	34	283.0			15.0		
						1.031		VIII	916.9
23	7-97	209+09	54	319.3			24.8		
24	7-70	215+25	46	287.9			22.4		
25	7-21	220+33	35	193.2	Not Logged		15.0		
						1.0313		IX	800.4
26	7-36	231+52	40	267.2			12.0		
27	7-93	237+35	21	278.1	Not Logged		12.5		
28	7-98	244+00	20	326.3			14.7		
						1.0313		X	871.6
29	7-37	254+21	30	205.3	Leaks		15.0		
30	7-86	266+20	68	317.3			23.2		
31	7-100	272+10	46	318.0			23.2		
						1.028		XI	840.6
32	7-39	282+39	50	300.7			20.5		
33	7-81	286+00	48	328.1			22.4		
34	7-54	290+44	51	219.8			15.0		
						1.0255		XII	848.6
35	7-101	302+19	45	158.7			13.9		
36	7-42	308+21	56	317.9			27.8		
37	7-75	313+50	23	137.4	Not Logged		12.0		
						1.026		XIII	614.0
38	7-116	317+35	48	188.8	Not Logged		16.9		
39	7-83	322+50	55	206.4			18.4		
40	7-35	326+44	43	168.0	Not Logged		15.0		
P.F.97	----	Post-Flight	484	484.0			43.2		
						1.0185		XIV	563.2

TABLE XI - INFLIGHT URINE SAMPLES

J.L.

(c)

No.	S/N #	G.E.T.	Volume of Aliquot (ml.)	Calculated Vol. (ml.)	Remarks	Sp G.	Volume taken for 24-hr. Pool	Pool No.	Calculated 24-hr. Volume
	Unidentified								
	7-06		44	176-186)	Unassigned	1.0303			
	7-07		33	206-218)		1.0378			
	7-27		30	140-148)		1.034			
	7-34		45	268-284)		1.0323			

TABLE XII - POST-FLIGHT URINE SAMPLES

F.B.

No.	Date	Time	Vol. (ml.)	Sp.G.	pH	24-Hr. Vol. (ml.)
95	12-18-65	1210	505	1.009	6.8	To inflight XIV
96	12-18	1800	345	1.018	6.4	
97	12-18	2130	368	1.0125	5.6	
98	12-19	0600	645	1.014	6.0	
99	12-19	0835	428	1.0225	5.8	
100	12-19	1200	430	1.016	6.2	
						2216
101	12-19	1730	453	1.018	5.5	
102	12-19	2100	230	1.019	5.5	
103	12-19	2310	205	1.0225	6.0	
104	12-20	0600	303	1.022	6.2	
105	12-20	0800	213	1.011	6.0	
106	12-20	1000	342	1.009	6.6	
107	12-20	1200	352	1.011	6.8	
						2098
108	12-20	1400	480	1.006	6.2	
109	12-20	1510	347	1.006	6.0	
110	12-20	1830	588	1.009	6.2	
111	12-20	2100	530	1.0085	6.2	
112	12-20	2230	435	1.004	6.6	
113	12-21	0500	270	1.009	6.0	
114	12-21	0730	308	1.018	5.8	
115	12-21	1120	605	1.008	6.8	
						3563
116	12-21	1400	690	1.0055	6.4	
117	12-21	1500	495	1.005	6.2	
118	12-21	1710	625	1.004	6.6	
119	12-21	2000	230	1.012	6.2	
120	12-21	2230	655	1.0045	5.8	
121	12-22	0630	390	1.0175	6.0	
122	12-22	1000	182	1.016	6.0	
123	12-22	1200	540	1.007	6.8	
						3807

TABLE XIII - POST-FLIGHT URINE SAMPLES

J.L.

No.	Date	Time	Vol. (ml.)	Sp.G.	pH	24-Hr. Vol. (ml.)
97	12-18-65	1109	440	1.010	7.0	To Inflight XIV
98	12-18	1800	287	1.019	6.0	
99	12-18	2030	185	1.026	5.8	
100	12-19	1230	263	1.024	5.8	
						735
101	12-19	1500	290	1.022	6.0	
102	12-19	2230	325	1.0225	6.0	
103	12-20	0600	485	1.015	6.4	
104	12-20	1215	305	1.021	5.8	
						1405
105	12-20	1830	370	1.023	6.0	
106	12-20	2330	315	1.026	6.6	
107	12-21	0730	488	1.016	5.8	
108	12-21	0950	142	1.019	5.8	
						1315
109	12-21	1930	388	1.027	6.0	
110	12-22	0630	853	1.04	5.8	
111	12-22	0750	210	1.013	6.2	
112	12-22	1200	165	1.022	5.8	
						1616

TABLE XIV

24-HOUR URINARY EXCRETIONS

DRY RUN

Subject	Date (1965)	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)	Creatinine (gm.)
Ott	11-16	.258	.094	223.8	88.5	1.175	1.397	214.3	16.74	2.284
	11-17	.277	.103	158.3	81.9	1.146	1.285	173.3	17.65	2.334
	11-18	.309	.088	159.2	99.5	1.457	1.761	176.8	20.88	2.523
	Mean	.281	.095	180.4	90.0	1.259	1.481	188.1	18.42	2.380
	s.d.	.021	.006	30.7	7.3	.133	.204	18.6	1.77	.103
Rice	11-16	.388	.062	274.1	118.8	1.291	1.366	271.6	16.14	1.814
	11-17	.362	.066	204.9	90.5	1.266	1.286	187.8	17.26	1.832
	11-18	.335	.097	148.5	100.1	1.297	2.051	153.6	21.54	2.053
	Mean	.362	.075	209.2	103.1	1.285	1.568	204.3	18.32	1.900
	s.d.	.022	.016	51.4	11.8	.014	.343	49.6	2.33	.109

TABLE XV

24-HOUR URINARY EXCRETIONS

F.B. - PRE-FLIGHT

Date (1965)	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)	Creatinine (gm.)
11-22	.201	.102	195.7	70.7	1.295	1.316	158.8	21.54	2.278
11-23	.220	.123	173.7	107.6	1.374	1.502	147.1	21.69	2.278
11-24	.199	.137	186.2	99.9	1.298	2.073	152.1	24.23	2.190
11-25	.207	.116	190.1	87.4	1.127	1.442	126.2	22.84	2.436
11-26	.261	.109	181.6	123.2	1.338	1.295	143.8	27.70	2.277
11-27	.216	.102	174.0	121.9	1.285	1.328	150.1	26.82	2.300
11-28	.245	.143	140.1	85.4	1.518	1.113	130.4	20.98	2.417
11-29	.198	.125	151.9	113.5	1.340	1.317	159.7	19.35	2.362
11-30	.173	.109	157.1	99.7	1.344	1.265	135.4	23.45	2.253
12-01	.226	.105	173.2	79.7	1.311	.890	150.7	19.73	2.089
Mean	.215	.117	172.4	98.9	1.323	1.344	145.3	22.83	2.285
s.d.	.024	.014	16.8	17.0	.091	.292	10.9	2.65	.098

TABLE XVI

24-HOUR URINARY EXCRETIONS
J.L. - PRE-FLIGHT

Date (1965)	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)	Creatinine (gm.)
11-22	.160	.096	176.4	65.5	.966	1.397	144.6	16.83	1.769
11-23	.171	.087	168.8	78.8	1.154	1.983	175.8	18.39	1.849
11-24	.169	.103	153.1	72.6	1.279	1.408	144.1	17.96	2.055
11-25	.140	.099	98.9	63.2	1.247	1.003	94.7	20.99	2.247
11-26	.195	.096	97.9	81.4	1.202	.686	113.5	21.22	2.130
11-27	.167	.139	173.2	87.2	1.277	.679	125.3	24.56	2.183
11-28	.141	.112	135.9	75.8	1.387	.799	101.1	22.51	2.457
11-29	.155	.102	140.1	74.6	1.224	.687	137.5	19.00	2.202
11-30	.140	.084	152.8	81.2	1.423	.684	141.7	21.01	2.198
12-01	.150	.094	139.5	65.4	1.433	1.449	114.9	21.17	2.405
Mean	.159	.101	143.7	74.6	1.259	1.077	129.3	20.36	2.150
s.d.	.017	.015	26.3	7.6	.133	.433	23.0	2.20	.205

TABLE XVII

24-HOUR URINARY EXCRETIONS
E.W. - PRE-FLIGHT

Date (1965)	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)	Creatinine (gm.)
11-22	.128	.139	190.9	74.0	1.487	1.780	177.7	16.04	2.657
11-23	.181	.175	201.0	69.6	1.361	1.611	172.0	19.36	2.633
11-24	.157	.150	218.8	90.9	1.284	1.579	231.8	18.74	2.577
11-25	.178	.151	189.1	79.1	1.508	1.602	197.1	16.36	2.848
11-26	.185	.136	215.0	86.0	1.633	1.636	192.9	17.88	3.007
11-27	.184	.197	207.0	65.7	1.312	1.470	187.5	17.66	2.760
11-28	.155	.108	163.2	121.6	1.841	2.253	185.8	20.21	3.057
11-29	.155	.133	208.7	101.2	1.421	1.876	186.8	22.18	2.992
11-30	.144	.152	117.1	85.3	1.422	1.945	104.3	18.59	2.921
12-1	.173	.162	149.9	66.5	1.285	1.897	130.1	----	2.957
Mean	.164	.150	186.1	84.0	1.455	1.765	176.6	18.56	2.841
s.d.	.018	.023	31.1	16.5	.165	.221	33.8	1.79	.164

TABLE XVIII

24-HOUR URINARY EXCRETIONS
M.C. - PRE-FLIGHT

Date (1965)	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)	Creatinine (gm.)
11-22	.277	.133	138.8	72.7	1.469	1.962	140.0	22.13	2.222
11-23	.196	.120	133.1	83.3	1.521	1.602	112.1	20.76	2.194
11-24	.192	.110	169.0	94.2	1.417	1.782	159.0	21.89	2.330
11-25	.172	.113	163.9	78.3	1.388	2.647	149.2	17.59	2.425
11-26	.237	.166	202.4	102.2	1.778	1.870	190.0	22.55	2.768
11-27	.187	.130	167.6	111.3	1.310	1.560	162.7	21.59	2.364
11-28	.194	.137	110.1	120.6	1.758	1.921	116.8	25.67	2.695
11-29	.197	.124	137.2	103.4	1.431	1.927	130.5	21.95	2.144
11-30	.178	.121	119.4	103.4	1.556	2.116	104.6	24.91	2.221
12-01	.218	.137	122.3	73.3	1.452	1.677	125.3	23.76	2.362
Mean	.205	.129	146.4	94.3	1.508	1.906	139.0	22.28	2.372
s.d.	.030	.015	27.1	15.8	.150	.296	25.2	2.14	.199

TABLE XIX

24-HOUR URINARY EXCRETIONS*

F.B. - INFLIGHT

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)
1	.215	.137	209.6	76.8	1.144	.945	15.7	16.26
2	.215	.130	161.6	52.6	1.144	1.061	46.3	13.27
3	.214	.116	157.9	50.2	1.557	1.113	32.4	15.45
4	.195	.068	208.6	55.2	1.696	1.070	18.8	16.51
5	.249	.099	326.1	83.3	2.214	1.607	70.5	22.42
6	.215	.139	183.4	91.4	1.910	1.361	52.6	17.22
7	.260	.109	214.0	157.8	1.911	1.387	10.5	19.72
8	.264	.185	162.2	138.7	1.787	1.511	17.0	19.85
9	.296	.187	166.3	114.6	2.965	1.471	42.8	19.62
10	.273	.160	191.1	154.4	1.357	----	53.4	19.82
11	.242	.155	153.7	83.5	1.604	1.395	115.5	18.79
12	.268	.116	220.1	15.2	1.624	1.049	167.0	18.47
13	.252	.123	173.9	138.2	1.620	1.310	129.5	17.25
14	.178	.087	189.7	94.1	1.846	1.019	128.4	15.97
Mean	.238	.129	196.3	93.4	1.741	1.254	65.7	17.90
s.d.	.032	.033	41.1	41.6	.442	.210	47.5	2.27

* Corrected for mean of pre- and post-flight creatinine excretions. (2.397 gm./24-hr.)

TABLE XX

24-HOUR URINARY EXCRETIONS*

J.L. - INFLIGHT

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)
1	----	----	----	----	----	----	----	----
2	.122	.100	178.2	56.6	1.216	1.017	183.9	14.26
3	----	----	----	----	----	----	----	----
4	.143	.092	158.2	57.6	1.872	.966	106.0	15.70
5	.149	.089	194.5	55.9	1.714	1.026	132.2	16.50
6	.175	.092	189.4	54.5	1.539	.877	151.1	16.09
7	.160	.099	180.8	57.7	1.581	.911	148.2	16.78
8	.185	.107	193.2	56.0	1.602	1.019	156.6	18.07
9	.160	.108	192.1	45.0	1.549	1.006	161.2	17.78
10	.158	.117	174.3	41.5	1.391	1.253	144.3	17.58
11	.154	.093	238.2	50.0	1.688	1.137	175.4	19.74
12	.192	.126	164.9	47.8	1.584	1.044	138.8	15.50
13	.180	.066	175.1	49.2	1.609	1.075	149.6	14.14
14	.160	.078	142.7	38.8	1.573	.890	109.8	12.75
Mean	.162	.097	181.8	50.9	1.577	1.018	146.4	16.24
s.d.	.019	.016	22.6	6.3	.155	.102	22.1	1.86

* Corrected for mean of pre- and post-flight creatinine excretions. (2.196 gm./24-hr.)

TABLE XXI

24-HOUR URINARY EXCRETIONS

F.B. - POST-FLIGHT

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)	Creatinine (gm.)
Post									
1	.288	.099	109.6	84.3	2.035	2.323	60.6	30.86	3.046
2	.284	.083	103.9	95.3	1.321	1.863	100.6	27.38	2.283
3	.284	.099	187.2	91.2	1.545	1.461	181.5	21.79	2.637
4	.288	.083	159.5	90.4	1.353	1.110	164.0	21.36	2.739
Mean	.286	.093	140.1	90.3	1.563	1.689	126.7	25.34	2.676
s.d.	.002	.011	34.8	3.9	.286	.453	48.6	3.97	.273

TABLE XXII

24-HOUR URINARY EXCRETIONS

J.L. - POST-FLIGHT

Day	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	Cl (meq.)	N (gm.)	Creatinine (gm.)
Post									
1	.150	.083	47.0	48.9	1.287	1.418	47.9	15.07	2.196
2	.180	.095	65.9	54.6	1.256	1.559	45.1	22.55	2.382
3	.172	.100	78.3	64.2	1.366	1.686	57.9	21.76	2.195
4	.187	.095	106.9	86.0	1.276	1.454	111.2	20.30	2.479
Mean	.172	.093	74.5	63.4	1.296	1.529	65.5	19.92	2.313
s.d.	.014	.006	21.8	14.1	.042	.104	26.8	2.91	.122

TABLE XXIII - DRY RUN

FECAL SAMPLES

Subject/No.	(1965) Date	Time	Marker	(1965) Date Marker Admin.	Wet Wt. (gm.)	Dry Wt. (gm.)
Ott 1	11-17	1845	B	11-16	80.1	17.4
2	11-20	1355	R	11-19	178.6)	80.1
3	11-22	0900	R		156.6)	
Rice 1	11-17	0630	B	11-16	192.6)	
2	11-18	0700	B		137.6)	92.9
3	11-19	0900	B		117.1)	
4	11-19	2300	R	11-19	149.6)	53.2
5	11-20	0710	R		162.1)	

TABLE XXIV - PRE-FLIGHT

FECAL SAMPLES (A)

Subject	No.	(1965) Date	Time	Marker	Date Marker Admin. (1965)	Wet Wt. (gm.)	Dry Wt. (gm.)
F.	1	11-23	1130	13	11-22	98.6)	
	2	11-24	0650	13		90.6)	
	3	11-25	0935	----		63.4)	130.2
	4	11-26	0715	----		90.1)	
	5	11-27	0700	----		116.6)	
	6	11-28	0645	R	11-27)		
	7	11-28	2400	R	)		
	8	11-29	2150	----	)	493.5	126.9
	9	11-30	2130	----	)		
	10	12-01	1715	B(tr.)	12-01)		
J.	1	11-23	1300	----		41.6)	
	2	11-23	2100	B	11-22	116.6)	
	3	11-25	0945	B		121.4)	100.8
	4	11-25	2130	B(tr.)		81.8)	
	5	11-27	1230	----		85.6)	
	6	11-28	1100	R	11-27)		
	7	11-29	2030	R(tr.)	)		
	8	11-30	1710	----	)	337.5	85.3
	9	11-30	2245	----	)		
	10	12-01	1615	----	)		
	11	12-01	2100	B	12-01		

TABLE XXV

PRE-FLIGHT FECAL SAMPLES (B)

Subject	No.	(1965) Date	Time	Marker	Date Marker Admin. (1965)	Wet Wt. (gm.)	Dry Wt. (gm.)
E.	1	11-23	0730	B	11-22	44.6)	
	2	11-24	0830	B		134.6)	
	3	11-25	1520	B(tr.)		67.4)	100.4
	4	11-25	0800	B(tr.)		123.6)	
	5	11-26	1410	----		88.1)	
	6	11-26	1735	----		67.1)	
	7	11-27	1630	R	11-27)		
	8	11-28	0615	R	)		
	9	11-29	0730	R(tr.)	)	496.5	89.8
	10	11-30	1235	----	)		
	11	12-01	0750	----	)		
	12	12-01	2345	----	)		
	13	12-02	0815	B	12-01		
M.	1	11-23	2300	B	11-22	188.6)	
	2	11-24	2100	B(tr.)		99.6)	
	3	11-25	2130	----		104.1)	120.7
	4	11-26	2015	----		84.1)	
	5	11-28	2330	R	11-27)		
	6	11-29	1801	----	)	351.5	96.3
	7	11-30	2100	----	)		
	8	12-01	2100	B	12-01		

TABLE XXVI - INFLIGHT FECAL SAMPLES

Name	#	SN #	G.E.T.	Wet Wt. (gm.)	Dry Wt. (gm.)	Marker
Borman	1	1519	50+13	178.5	79.55	R
	2	1523	96+59	113.0	45.91	---
	3	1529	140+25	170.0	68.01	---
	4	1530	170+00	75.0	32.92	---
	5	1543	193+17	109.0	37.85	---
	6	1541	240+49	104.5	44.87	---
	7	1535	287+25	113.5	54.28	---
	8	1531	308+44	122.0	56.10	---
				TOTAL	419.49	
Lovell	1	1520	138+26	46.0	15.69	R
	2	1524	143+48	70.3	39.92	R
	3	1521	187+00	88.1	38.08	---
	4	1546	232+00	44.5	21.54	---
	5	1545	257+00	60.5	27.84	---
	6	1547	261+27	96.5	41.80	---
	7	1527	285+46	155.0	59.92	---
				TOTAL	244.79	

TABLE XXVII

POST-FLIGHT FECAL SAMPLES

Subject	No.	Date (1965)	Time	Marker	Date of Marker (1965)	Wet Wt. (gm.)	Dry Wt. (gm.)
Borman	100	12-19	0835	----	12-18	73.6	21.40
	101	12-19	2200	B		241.6)	
	102	12-20	1400	----		214.6)	94.60
	103	12-22	0800	----	12-22	91.6)	
Lovell	100	12-18	2030	----	12-18	130.6	57.91
	101	12-20	0600	B		79.6)	
	102	12-20	0800	B		294.6)	135.53
	103	12-22	1045	----	12-22	187.6)	

TABLE XXVIII

FOOD ANALYSES (per 100 gm. Fresh Weight)

PRE- AND POST-FLIGHT MEALS

Food	Ca (gm.)	Mg (gm.)	Na (meq.)	K (meq.)	PO_4 (gm.)	SO_4 (gm.)	N (gm.)
Ground Beef	.0086	.0223	2.34	9.10	.2230	.1932	3.064
Steak	.0072	.0230	2.45	9.10	.2211	.2075	2.742
Lamb	.0180	.0281	3.03	7.56	.2495	.2452	3.590
Chicken	.0270	.0260	1.61	8.21	.1234	.2200	2.859
Egg	.0556	.0100	4.39	3.31	.2268	.1890	3.728
Milk	.1583	.0159	2.17	3.64	.1509	.2427	0.632
Ice Cream	.1074	.0148	65.88	3.11	.0986	.0347	0.966
Lime Sherbert	.0250	.0050	2.30	0.56	.0385	.0970	0.029
Orange Sherbert	.0385	.0050	2.30	0.56	.0400	.0450	0.019
Cheese	.7200	.0220	21.30	2.05	.5820	.1900	0.420
Bread	.0925	.0150	4.48	3.10	.1217	.1082	1.618
Pan Rolls	.1174	.0204	4.86	2.46	.1480	.1274	1.658
Hamburger Rolls	.1021	.0153	2.18	2.46	.0878	.1281	1.545
Rice (cooked)	.0156	.0697	0.39	2.36	.1555	.0889	1.072
Potato	.0113	.0167	0.80	10.44	.0738	.0254	0.366
Broccolli	.0294	.0184	0.04	9.79	.1163	.0964	0.416
Carrots	.0285	.0099	1.89	3.08	.0241	.0109	0.120
Green Beans	.0279	.0210	0.21	2.44	.0283	.0142	0.271
Lima Beans	.0236	.0361	0.03	5.69	.0810	.0462	1.162
Onion	.0229	.0102	0.53	4.03	.0371	.0374	0.172
Peas	.0167	.0199	0.05	2.46	.0648	.0247	0.684
Apple Sauce	.0050	.0020	1.90	2.00	.0050	.0020	0.000
Apricots	.0110	.0050	1.20	6.00	.0115	.0040	0.000
Peaches	.0020	.0030	1.05	11.03	.0140	.0030	0.000
Pears	.0040	.0025	0.80	2.18	.0060	.0020	0.000
Pineapple	.0120	.0090	1.25	2.46	.0065	.0050	0.000
Butter	.0150	.0023	36.87	5.95	.1750	.0010	0.095
Sanka (inst.)	.0700	.1390	0.87	22.19	.2200	.1650	0.798
Tea (inst.)	.0700	.2300	14.00	116.15	.4600	.3450	1.970
Orange Juice	.0265	.0230	1.85	5.36	.0520	.0160	0.000
Lemon Juice	.0100	.0080	1.30	3.62	.0120	.0035	0.061
Honey	.0073	.0020	1.50	1.38	.0050	.0000	0.048
Blackberry Jelly	.0075	.0044	9.65	2.87	.0065	.0140	0.016
Russian Dressing	.0098	.0100	100.00	54.65	.1800	.0120	0.256
French Dressing	.0109	.0008	47.50	26.00	.1625	.0170	0.096
Italian Dressing	.0005	.0040	55.00	6.70	.0190	.0010	0.032
Mayonnaise	.0063	.0180	42.50	9.99	.1875	.0120	0.176
From Tables (U.S.D.A. Handbook #8)							
Lettuce	.020	----	0.39	4.38	.022	----	0.144
Tomatoes	.013	----	0.13	6.10	.027	----	0.176
Mushrooms	.006	----	0.65	10.35	.116	----	0.432

TABLE XXIX

PRE-FLIGHT MENU I - F.B.

Meal	Food	(gm.) Weight	Day 1 (11-22-65) Return	Day 1 (11-22-65) Extra	Day 4 (11-25-65) Return	Day 4 (11-25-65) Extra	Day 7 (11-28-65) Return	Day 7 (11-28-65) Extra	Day 10 (12-01-65) Return	Day 10 (12-01-65) Extra
Breakfast	Beef patty	120								
	Egg	50								
	Bread	50	25		25		25		25	
	Butter	80	10		10		10		18	
	Honey	30	15		15		15		15	
	Orange Juice	175								
	Milk	165				30		30		30
	Coffee	240				240		240		480
Lunch	Beef patty	240			240	105 Turkey				
	American Cheese	20			20					
	Onion Slice	30			30		30		30	
	Green peas	95				5		5		5
	Rolls	40								
	Lettuce	80								
	Italian Dressing	20								
	Orange Sherbert	100								
	Milk	160				35		35		35
	Tea	0.5		0.5		0.5				
	Lemon Juice	5		5.0		5.0				
Dinner	Chicken Breasts	180				+20 Cheese				
	Rice	60								
	Green Beans	100								
	Rolls	60	35		40		40		40	
	Lettuce	80								
	Tomatoes	75								
	Italian Dressing	20								
	Pineapple	100								
	Milk	25								

TABLE XXIX

PRE-FLIGHT MENU I - F.B.

Continued

Meal	Food	(gm.) Weight	Day 1 (11-22-65) Return	Day 1 (11-22-65) Extra	Day 4 (11-25-65) Return	Day 4 (11-25-65) Extra	Day 7 (11-28-65) Return	Day 7 (11-28-65) Extra	Day 10 (12-01-65) Return	Day 10 (12-01-65) Extra
Dinner	Tea	0.5		0.5		1.0		+480 Coffee		0.5
	Lemon Juice	5.0		5.		10.				5.
						Potato				
8:00 P.M.	Vanilla Ice Cream	150				240 Coffee				

TABLE XXX

PRE-FLIGHT MENU II - F.B.

Meal	Food	(gm.) Weight	Day 2 (11-23-65) Return	Day 2 (11-23-65) Extra	Day 5 (11-26-65) Return	Day 5 (11-26-65) Extra	Day 8 (11-29-65) Return	Day 8 (11-29-65) Extra
Breakfast	Meat Patty	120						
	Egg	50					2.5	
	Bread	25						
	Butter	70	10		12		15	
	Honey	15						
	Orange Juice	175						
	Milk	235				5		
	Coffee	240		240		240		240
Lunch	Chicken Breasts	180						
	Broccolli	95						
	Rolls	35	20			5		5
	Lettuce	80						
	French Dressing	20						
	Peaches	100						
	Milk	245						
	Tea	0.5						
	Lemon Juice	5.0						
Dinner	Beef Tenderloin	240				90		90
	Onions	30						
	Baked Potato	150					80	
	Carrots	95			5			
	Rolls	40			20		40	
	Lettuce	80						
	Tomatoes	75						
	Italian Dressing	20						
	Apricots	100						
	Tea	0.5		0.5		0.5		0.5
	Lemon Juice	5		5		5		5

TABLE XXX

PRE-FLIGHT MENU II - F.B.

Continued

Meal	Food	(gm.) Weight	Day 2 (11-23-65) Return	Day 2 (11-23-65) Extra	Day 5 (11-26-65) Return	Day 5 (11-26-65) Extra	Day 8 (11-29-65) Return	Day 8 (11-29-65) Extra
Dinner	Sanka	240						
8:00 P.M.	Vanilla Ice Cream	150						

TABLE XXXI

PRE-FLIGHT MENU III - F.B.

Meal	Food	(gm.) Weight	Day 3 (11-24-65) Return	Day 3 (11-24-65) Extra	Day 6 (11-27-65) Return	Day 6 (11-27-65) Extra	Day 9 (11-30-65) Return	Day 9 (11-30-65) Extra
Breakfast	Beef patty	120						
	Egg	50						
	Bread	25						
	Butter	70					5	
	Honey	15						
	Orange Juice	175						
	Milk	250				25		25
	Coffee	240						
Lunch	Lamb Chop	180						
	Rice	60	60		60		60	
	Lima Beans	95						
	Rolls	20			20			
	Lettuce	80						
	Tomatoes	75						
	Russian Dressing	20						
	Applesauce	100						
	Milk	285			10		10	
	Tea	0.5				0.5		
	Lemon Juice	5				5		
Dinner	Beef Tenderloin	330						
	Mushrooms	50						
	Green Beans	105			10		10	
	Rolls	40						
	Lettuce	80						
	French Dressing	20						
	Pears	100						
	Tea	0.5				1.0		0.5

TABLE XXXI

PRE-FLIGHT MENU III - F.B.

Continued

Meal	Food	(gm.) Weight	Day 3 (11-24-65) Return	Day 3 (11-24-65) Extra	Day 6 (11-27-65) Return	Day 6 (11-27-65) Extra	Day 9 (11-30-65) Return	Day 9 (11-30-65) Extra
Dinner	Lemon Juice	5				15		5.0
	Coffee	240				240		240
8:00 P.M.	Lime Sherbert	150						

TABLE XXXII

PRE-FLIGHT MENU I - J.L.

Meal	Food	(gm.) Weight	Day 1 (11-22-65) Return	Day 1 (11-22-65) Extra	Day 4 (11-25-65) Return	Day 4 (11-25-65) Extra	Day 7 (11-28-65) Return	Day 7 (11-28-65) Extra	Day 10 (12-01-65) Return	Day 10 (12-01-65) Extra
Breakfast	Eggs	50								
	Bread	25								
	Butter	80	5		15		15		33	
	Honey	15			15					
	Orange Juice	175								
	Milk	180								
	Coffee	240	25						240	
Lunch	Beef Patties	240			240	155 Turkey				
	American Cheese	20			20					
	Onion Slice	30			30		30			
	Green Peas	95								
	Hamburger Rolls	40								
	Lettuce	80								
	Russian Dressing	20								
	Orange Sherbert	100								
	Milk	175				10		10		10
	Tea	0.5						0.5		
	Lemon Juice	5.						5.		
Dinner	Chicken Breasts	180				20 Cheese				
	Rice	60								
	Green Beans	95				10		10		
	Rolls	60	20		20		20		20	
	Lettuce	80								
	Tomatoes	75								
	Mayonnaise	20								
	Pineapple	100								
	Tea	0.5				1.0		0.5		
	Lemon Juice	5.				10.		5.		

TABLE XXXII

PRE-FLIGHT MENU I - J.L.

Continued

Meal	Food	(gm.) Weight	Day 1 (11-22-65) Return	Day 1 (11-22-65) Extra	Day 4 (11-25-65) Return	Day 4 (11-25-65) Extra	Day 7 (11-28-65) Return	Day 7 (11-28-65) Extra	Day 10 (12-01-65) Return	Day 10 (12-01-65) Extra
Dinner	Coffee	240			240					
8:00 P.M.	Vanilla Ice Cream	150								

TABLE XXXIII

PRE-FLIGHT MENU II - J.L.

Meal	Food	(gm.) Weight	Day 2 (11-23-65) Return	Day 2 (11-23-65) Extra	Day 5 (11-26-65) Return	Day 5 (11-26-65) Extra	Day 8 (11-29-65) Return	Day 8 (11-29-65) Extra
Breakfast	Egg	50						
	Bread	25						
	Butter	75	15		15		10	
	Honey	15						
	Orange Juice	175						
	Milk	245						
	Coffee	240		240		120		240
Lunch	Chicken Breasts	180						
	Broccolli	95						
	Rolls	40						
	Lettuce	80						
	French Dressing	20						
	Peaches	100						
	Milk	255			10		10	
	Tea	0.5						
	Lemon Juice	5.0						
Dinner	Beef Tenderloin	240				90		90
	Onions	30						
	Carrots	95						
	Rolls	40						
	Lettuce	80						
	Tomatoes	75						
	Mayonnaise	20						
	Apricots	100						
	Tea	0.5						0.5
	Lemon Juice	5.						5.
	Coffee	240						
8:00 P.M.	Vanilla Ice Cream	150						

TABLE XXXIV

PRE-FLIGHT MENU III - J.L.

Meal	Food	(gm.) Weight	Day 3 (11-24-65) Return	Day 3 (11-24-65) Extra	Day 6 (11-27-65) Return	Day 6 (11-27-65) Extra	Day 9 (11-30-65) Return	Day 9 (11-30-65) Extra
Breakfast	Egg	50						
	Bread	25						
	Butter	75			15		10	
	Honey	15	15					
	Orange Juice	175						
	Milk	265			5		5	
	Coffee	240				360		240
Lunch	Lamb	180						
	Rice	60	30		60		60	
	Lima Beans	90						10
	Rolls	40						
	Lettuce	80						
	Tomatoes	75						
	Russian Dressing	20						
	Applesauce	100						
	Milk	275			20		20	
	Tea	0.5						
	Lemon Juice	5.						
Dinner	Beef Tenderloin	330						
	Mushrooms	50						
	Green Beans	95						
	Rolls	40						
	Lettuce	80						
	French Dressing	20						
	Pears	100						
	Tea	0.5				.5		.5
	Lemon Juice	5				5.		5.
	Coffee	240						
8:00 P.M.	Lime Sherbert	150						

TABLE XXXV

PRE-FLIGHT MENU I - E.W.

Meal	Food	(gm.) Weight	Day 1 (11-22-65) Return	Day 1 (11-22-65) Extra	Day 4 (11-25-65) Return	Day 4 (11-25-65) Extra	Day 7 (11-28-65) Return	Day 7 (11-28-65) Extra	Day 10 (12-01-65) Return	Day 10 (12-01-65) Extra
Breakfast	Egg	100								
	Bread	25								
	Butter	80						12		12
	Honey	15								
	Orange Juice	175								
	Milk	160			5		5		5	
	Coffee	240								
Lunch	Beef Patties	240			240	155 Turkey				
	American Cheese	20			20					
	Onion	30			30					
	Green Peas	100								
	Roll	40						40		40
	Lettuce	80								
	Italian Dressing	20								
	Orange Sherbert	100								
	Milk	160			5		5		5	
	Lemon Juice	30								
Dinner	Chicken Breasts	180				90		90		90
	Rice	60				20 Cheese				
	Green Beans	95				85 Potatoes				
	Rolls	60			20		20		20	
	Lettuce	80								
	Tomatoes	75								
	Italian Dressing	20								
	Pineapple	100								
	Milk	160			160		160		160	
	Tea	0.5		0.5		1.				.5
	Lemon Juice	5.0		5.		10.				5.
	Coffee	240								
8:00 P.M.	Vanilla Ice Cream	150								

TABLE XXXVI

PRE-FLIGHT MENU II - E.W.

Meal	Food	(gm.) Weight	Day 2 (11-23-65) Return	Day 2 (11-23-65) Extra	Day 5 (11-26-65) Return	Day 5 (11-26-65) Extra	Day 8 (11-28-65) Return	Day 8 (11-28-65) Extra
Breakfast	Egg	100						
	Bread	25						
	Butter	95				8	10	
	Blackberry Jelly	15					15	15 Honey
	Orange Juice	175						
	Milk	225			10		10	
	Coffee	240				240		
Lunch	Chicken Breasts	180				90		90
	Broccolli	100						
	Rolls	40					40	
	Lettuce	80						
	French Dressing	20						
	Peaches	100						
	Milk	230			15		15	
	Tea	0.5			0.5			
	Lemon Juice	5.			5.			
Dinner	Beef Tenderloin	240				90		90
	Onions	30						
	Baked Potato	150						
	Carrots	90						
	Rolls	60				60	60	
	Lettuce	80						
	Tomatoes	75						
	Italian Dressing	20						
	Apricots	100						
	Tea	0.5		0.5		1.0		0.5
	Lemon Juice	5.		5.		10.		5.
	Coffee	240				120		
8:00 P.M.	Vanilla Ice Cream	150						

TABLE XXXVII

PRE-FLIGHT MENU III - E.W.

Meal	Food	(gm.) Weight	Day 3 (11-24-65) Return	Day 3 (11-24-65) Extra	Day 6 (11-27-65) Return	Day 6 (11-27-65) Extra	Day 9 (11-30-65) Return	Day 9 (11-30-65) Extra
Breakfast	Egg	100						
	Bread	25						
	Butter	80	5			15		25
	Honey	15						
	Orange Juice	175						
	Milk	245				10		10
	Coffee	240			120			
Lunch	Lamb Chops	180						
	Rice	60			20		20	
	Lima Beans	90			95 Change to Peas			
	Rolls	40						
	Lettuce	80						
	Tomatoes	75						
	Italian Dressing	20						
	Applesauce	100						
	Milk	250				5		5
	Lemon Juice	30						
Dinner	Beef Tenderloin	330						
	Mushrooms	50						
	Baked Potato	150						
	Green Beans	95				10		10
	Rolls	60	20		20		60	
	Lettuce	80						
	French Dressing	20						
	Peas	100						
	Tea	0.5		0.5		0.5		1.
	Lemon Juice	5.		5.		5.		10.
	Coffee	240			240		240	
8:00 P.M.	Lime Sherbert	150						

TABLE XXXVIII

PRE-FLIGHT MENU I - M.C.

Meal	Food	(gm.) Weight	Day 1 (11-22-65) Return	Day 1 (11-22-65) Extra	Day 4 (11-25-65) Return	Day 4 (11-25-65) Extra	Day 7 (11-28-65) Return	Day 7 (11-28-65) Extra	Day 10 (12-01-65) Return	Day 10 (12-01-65) Extra
Breakfast	Egg	100								
	Orange Juice	175								
	Coffee	240		120		120				120
	Butter	80	10		25		25		20	
Lunch	Beef Patties	240			240	155 Turkey				
	American Cheese	20			20					
	Onion	30			30					
	Green Peas	95								
	Roll	40						40		40
	Lettuce	80								
	Russian Dressing	20								
	Orange Sherbert	100								
	Milk	180			15		15		15	
	Coffee	240					120			
Dinner	Chicken Breasts	180				90		90		90
	Rice	60				20 Cheese				
	Green Beans	100			5	150 Potato	5		5	
	Rolls	60								
	Lettuce	80								
	Tomatoes	75								
	Mayonnaise	20								
	Pineapple	100								
	Milk	170			5		5			
	Coffee	240				720		240		
8:00 P.M.	Vanilla Ice Cream	150								

TABLE XXXIX

PRE-FLIGHT MENU II - M.C.

Meal	Food	(gm.) Weight	Day 2 (11-23-65) Return	Day 2 (11-23-65) Extra	Day 5 (11-26-65) Return	Day 5 (11-26-65) Extra	Day 8 (11-29-65) Return	Day 8 (11-29-65) Extra
Breakfast	Egg	100						
	Orange Juice	175						
	Butter	70			10		10	
	Coffee	240		240		240		
Lunch	Chicken Breasts	180				90		90
	Broccolli	100			5		5	
	Rolls	40						
	Lettuce	80						
	French Dressing	20						
	Peaches	100						
	Milk	235			10		10	
	Coffee	240				120		
Dinner	Beef Tenderloin	240				90		90
	Onions	30						
	Baked Potato	150						
	Carrots	95						
	Rolls	60						
	Lettuce	80						
	Tomatoes	75						
	Mayonnaise	20						
	Apricots	100						
	Milk	235			5		5	
	Coffee	240		240		240		240
8:00 P.M.	Vanilla Ice Cream	150						

TABLE XL

PRE-FLIGHT MENU III - M.C.

Meal	Food	(gm.) Weight	Day 3 (11-24-65) Return	Day 3 (11-24-65) Extra	Day 6 (11-27-65) Return	Day 6 (11-27-65) Extra	Day 9 (11-30-65) Return	Day 9 (11-30-65) Extra
Breakfast	Egg	100						
	Butter	70	10		20		25	
	Orange Juice	175						
	Coffee	240		360				120
Lunch	Lamb Chops	180				90		90
	Rice	60			60		60	
	Lima Beans	100						
	Rolls	40						
	Lettuce	80						
	Tomatoes	75						
	Russian Dressing	20						
	Applesauce	100						
	Milk	245						
	Coffee	240				240		
Dinner	Beef Tenderloin	330						
	Mushrooms	50						
	Baked Potato	150						
	Sour Cream	30	30		30			
	Green Beans	100						
	Rolls	60						
	Lettuce	80						
	French Dressing	20						
	Pears	100						
	Milk	250			5		5	
	Coffee	240		240				240
8:00 P.M.	Lime Sherbert	150						

TABLE XLI

POST-FLIGHT MENUS

F.B.

Meal	RECOVERY - 1 Food	Weight	RECOVERY - 2 Food	Weight	RECOVERY - 3 Food	Weight	RECOVERY - 4 Food	Weight
Lunch	Beef Tenderloin	180	Lamb Chops	180	Lamb Chops	180	Beef Patty	120
	Broccolli	95	Lima Beans	95	Lima Beans	---	Cheese	20
	Rolls	40	Rolls	20	Rolls	20	Green Peas	100
	Lettuce	80	Lettuce	80	Lettuce	80	Rolls	40
	French Dressing	2	Tomatoes	75	Tomatoes	75	Lettuce	80
	Peaches	100	Russian Dressing	20	Russian Dressing	20	Italian Dressing	20
	Milk	245	Applesauce	100	Applesauce	100	Orange Sherbert	100
	Tea	1.0	Milk	275	Milk	275	Milk	195
	Lemon Juice	10	Tea	1.0	Tea	0.5	Tea	1.0
			Lemon Juice	10	Lemon Juice	5.	Lemon Juice	10.
Dinner	Beef Tenderloin	225	Beef Tenderloin	330	Beef Tenderloin	330	Chicken Breasts	180
	Onion	15	Onion	30	Mushrooms	50	Rice	60
	Carrots	75	Carrots	88	Green Beans	95	Green Beans	100
	Baked Potato	150	Baked Potato	150	Lettuce	80	Rolls	20
	Lettuce	80	Rolls	20	French Dressing	20	Lettuce	80
	Tomatoes	75	Lettuce	80	Pears	100	Tomatoes	75
	Italian Dressing	20	Tomatoes	75	Rolls	40	Italian Dressing	20
	Apricots	100	Italian Dressing	20	Tea	0.5	Pineapple	100
	Tea	1.0	Apricots	100	Lemon Juice	5.	Tea	2.0
	Lemon Juice	10.	Tea	1.0	Orange Sherbert	100	Lemon Juice	20.
			Lemon Juice	10				
			Coffee	240				
8:00 P.M.	Vanilla Ice Cream	150	Vanilla Ice Cream	150	Lime Sherbert	150	Vanilla Ice Cream	150

TABLE XLI

POST-FLIGHT MENUS

F.B.

Continued

Meal	RECOVERY - 1 Food	Weight	RECOVERY - 2 Food	Weight	RECOVERY - 3 Food	Weight	RECOVERY - 4 Food	Weight
Breakfast	Beef Patty	120	Beef Patty	120	Beef Patty	120	Beef Patty	120
	Egg	50	Egg	50	Egg	50	Egg	50
	Bread	25	Bread	25	Bread	25	Bread	25
	Butter	30	Butter	65	Butter	60	Butter	40
	Honey	15	Honey	15	Honey	15	Honey	15
	Orange Juice	175	Orange Juice	175	Orange Juice	175	Orange Juice	175
	Milk	240	Milk	275	Milk	195	Milk	240
	Coffee	270	Coffee	240	Coffee	240	Coffee	240

TABLE XLII

POST-FLIGHT MENUS

J.L.

Meal	RECOVERY - 1 Food	Weight	RECOVERY - 2 Food	Weight	RECOVERY - 3 Food	Weight	RECOVERY - 4 Food	Weight
Lunch	Beef Tenderloin	180	Lamb Chops	180	Lamb Chops	180	Beef Patty	240
	Broccoli	95	Lima Beans	78	Lima Beans	100	Cheese	20
	Rolls	40	Rolls	40	Rolls	40	Onion	15
	Lettuce	80	Lettuce	80	Lettuce	80	Peas	95
	French Dressing	5	Tomatoes	75	Tomatoes	75	Rolls	40
	Peaches	100	Russian Dressing	20	Russian Dressing	20	Lettuce	80
	Milk	245	Milk	255	Applesauce	100	Russian Dressing	20
	Tea	0.5	Tea	1.	Milk	270	Orange Sherbert	100
	Lemon Juice	5.	Lemon Juice	10.	Tea	0.5	Milk	185
					Lemon Juice	5	Tea	0.5
					Coffee	120	Lemon Juice	5.
Dinner	Beef Tenderloin	260	Beef Tenderloin	330	Beef Tenderloin	330	Chicken	180
	Onions	30	Onions	30	Mushrooms	50	Rice	60
	Carrots	80	Carrots	30	Green Beans	90	Green Beans	105
	Rolls	15	Potato	115	Rolls	35	Rolls	40
	Lettuce	40	Lettuce	80	Lettuce	80	Lettuce	80
	Tomatoes	75	Tomatoes	75	French Dressing	20	Tomatoes	75
	Mayonnaise	20	Mayonnaise	20	Pears	100	Mayonnaise	20
	Apricots	100	Apricots	100	Tea	0.5	Pineapple	100
	Tea	1.	Tea	1.	Lemon Juice	5.	Tea	1.
	Lemon Juice	10.	Lemon Juice	10.			Lemon Juice	10.
8:00 P.M.	Vanilla Ice Cream	150	Vanilla Ice Cream	150	Lime Sherbert	150	Vanilla Ice Cream	150

TABLE XLII

POST-FLIGHT MENUS

Continued

J.L.

Meal	RECOVERY - 1 Food	Weight	RECOVERY - 2 Food	Weight	RECOVERY - 3 Food	Weight	RECOVERY - 4 Food	Weight
Breakfast	Egg	50	Egg	50	Egg	50	Egg	50
	Bread	25	Bread	25	Bread	25	Bread	25
	Butter	40	Butter	60	Butter	55	Butter	40
	Honey	15	Honey	15	Honey	15	Honey	15
	Orange Juice	175	Orange Juice	175	Orange Juice	175	Orange Juice	175
	Milk	245	Milk	280	Milk	180	Milk	245
	Coffee	160	Coffee	240	Coffee	240	Coffee	240

TABLE XLIII

ANALYSES OF INFLIGHT FOOD PACKS

No.	Ca gm.	Mg gm.	Na meq.	K gm.	PO_4 gm.	Cl meq.	N gm.	SO_4 gm.
1-A	Not received							
1-B	.5257	.0653	79.4	17.4	.5733	0.7	5.777	.2960
1-C	.1788	.0518	58.1	13.1	.3396	0.5	4.691	.2970
2-A	.4703	.0862	40.3	20.6	.5226	0.4	7.169	.3381
2-B	.2635	.0637	53.1	17.0	.6607	0.3	5.822	.3393
2-C	.3168	.0690	37.2	15.6	.3363	0.3	4.773	.2906
3-A	.1367	.0779	50.7	15.6	.3539	0.0	5.284	.2759
3-B	.3524	.0648	51.0	12.9	.3620	0.2	3.345	.2500
3-C	.3136	.0303	50.0	5.5	.5151	0.2	2.496	.1445
4-A	.3672	.0551	80.8	13.4	.4774	1.3	3.846	.2671
4-B	.0814	.0855	66.1	18.4	.4884	0.8	5.348	.4088
4-C	.6016	.0821	22.9	15.1	.3996	0.2	6.467	.4377
5-A	.2362	.0338	34.7	4.4	.4875	0.4	4.206	.2341
5-B	.7204	.0832	78.3	15.4	.5742	0.1	5.605	.2551
5-C	.1430	.0679	58.1	13.1	.3396	0.2	5.342	.2576
6-A	.4891	.0965	15.9	6.0	.4719	0.5	7.390	.3316
6-B	.3475	.0789	36.1	11.6	.6717	0.5	7.164	.3131
6-C	.2656	.0835	39.9	16.8	.3605	0.0	6.301	.2713
7-A	.2056	.0393	16.1	4.7	.4648	0.3	6.694	.2803
7-B	.5330	.0792	14.9	3.6	.4646	0.1	4.555	.3082
7-C	.3816	.0400	51.8	3.7	.5253	0.3	3.363	.1447
8-A	.3698	.0641	88.2	14.1	.4703	0.2	5.608	.3410
8-B	.0553	.0790	62.2	16.4	.3950	0.4	6.211	.4517
8-C	.5427	.0549	18.4	12.1	.2680	0.2	4.636	.2878
9-A	.2642	.0264	45.3	4.9	.6040	0.5	3.112	.1957
9-B	.6909	.0749	80.2	18.6	.6169	1.0	5.846	.2929
9-C	.1548	.0547	57.6	12.8	.3420	0.3	4.847	.2920
10-A	.4976	.0777	20.5	6.1	.4418	0.0	6.366	.4054
10-B	.3147	.0729	62.4	17.0	.8711	0.0	5.672	.4088
10-C	.3204	.0702	41.4	15.5	.3240	0.5	4.577	.3216
11-A	.2326	.0843	23.8	5.3	.4230	0.8	5.544	.3448
11-B	.4973	.0890	61.6	18.9	.4106	0.0	6.141	.3103
11-C	.3842	.0414	44.7	8.7	.4306	0.5	4.214	.1538
12-A	.3456	.0600	61.8	15.1	.3638	0.0	5.728	.2910
12-B	.0551	.0866	79.9	14.5	.3675	0.7	6.330	.3779
12-C	.6278	.0774	73.1	14.4	.3440	0.0	6.611	.3416
13-A	.2854	.0432	56.2	9.0	.6055	0.0	4.920	.2104
13-B	.6419	.0792	53.5	18.3	.5746	0.4	5.977	.2565
13-C	.1430	.0644	53.6	14.0	.2860	1.5	5.082	.2725
14-A	.4523	.0886	44.3	16.6	.4430	0.9	7.864	.3595
14-B	.2859	.0743	63.9	15.4	.5963	1.1	6.559	.3667
14-C	Not received							
15-A	Not received							

TABLE XLIV

ANALYSES OF SOME INFLIGHT FOOD ITEMS

(per serving)

Item	Ca (gm.)	N (gm.)	SO_4 (gm.)
Brownies	.0185	1.110	.0430
Date Fruit Cake	.0260	1.386	.0659
Pineapple Fruit Cake	.0410	1.752	.0876
Ginger Bread	.0285	.927	.0549
Sausage	.0082	2.500	.1394
Beef Sandwich	.0126	1.893	.1025
Egg Bites	.1166	1.765	.1630
Peanut Cubes	.2015	2.189	.0979
Apricot Cubes	.1780	1.323	.0609
Apricot Cereal Cubes	.0078	.629	.0365

TABLE XLV
ACTUAL INFLIGHT MEAL SEQUENCE
(From Log)

G.E.T. Hours	Flight Day	Meal Pack No.	Remarks
07	I	2-A	
17		3-A	
22		2-B	
31	II	1-B	
42		2-C	
49		3-C	
52	III	15-B	Not available for analysis (n.a.f.a.); use 3-B
66		5-A	
72		7-C	
78	IV	6-C	
88		4-A	
95		4-B	
102	V	14-C	N.a.f.a.; use 10-C
112		15-A	N.a.f.a.; use 11-A
117		5-B	
124	VI	4-C	
137		8-A	
142		6-B	
149	VII	5-C	Only in pilot log
160		6-A	
166		7-B	
170	VIII	1-C	
186		7-A	
191		11-B	
196	IX	13-C	
206		14-A	
213		11-A	
220	X	10-C	
230		10-A	
239		14-B	
245	XI	9-C	
255		12-A	
259		12-B	
267	XII	9-C	Cf. 245 hrs. ? Use 8-C
281		13-A	
286		13-B	
291	XIII	12-C	
307		10-B	
312		11-C	
324	XIV	9-A	
?		9-B	

TABLE XLVI - SWEAT STUDIES

Subject	Phase	Date 1965	Ca gm.	Mg gm.	Na meq.	K meq.	SO_4 gm.	Cl meq.	N gm.
			per 24 hours						
Ott	Dry Run	11-17	.066	.021	11.6	6.3	.011	14.6	.22
Rice	Dry Run	11-17	.050	.014	18.7	10.2	.011	16.7	.14
F.B.	Pre-flight	11-23	.023	.006	27.8	9.5	.002	19.6	.20
	Pre-flight	11-26	.029	.007	21.6	11.3	.005	17.1	.18
	Inflight	12-4 to 12-18	.014	.006	2.3	1.1	.003	1.4	.03
	Post-flight	12-20	.043	.013	7.9	9.4	.003	12.7	.23
	Post-flight	12-21	.042	.017	16.1	12.5	.005	17.4	.28
J.L.	Pre-flight	11-23	.014	.005	25.1	12.9	.005	14.4	.31
	Pre-flight	11-26	.031	.007	25.2	15.9	.005	17.7	.40
	Inflight	12-4 to 12-18	.016	.007	2.9	1.6	.002	2.2	.04
	Post-flight	12-20	.041	.015	6.4	9.3	.007	13.3	.24
	Post-flight	12-21	.048	.018	13.2	13.4	.012	17.2	.34
E.W.	Pre-flight	11-23	.023	.009	37.6	13.0	.004	31.9	.34
	Pre-flight	11-26	.027	.008	42.5	12.7	.005	34.7	.34
M.C.	Pre-flight	11-23	.032	.009	41.0	11.4	.003	33.0	.24
	Pre-flight	11-26	.034	.008	21.3	9.6	.007	18.7	.28
Dry Run	Mean	(N=2)	.058	.018	15.2	8.3	.011	15.7	.18
	s.d.		.008	.004	3.6	2.0	.000	1.1	.04
Pre-flight	Mean	(N=8)	.027	.007	30.3	12.0	.005	23.4	.29
	s.d.		.006	.001	8.2	1.9	.001	7.8	.07
Inflight	Mean	(N=2)	.015	.007	2.6	1.4	.003	1.8	.04
	s.d.		.001	.001	0.3	0.3	.001	0.4	.01
Post-flight	Mean	(N=4)	.044	.016	10.9	11.2	.007	15.2	.27
	s.d.		.003	.002	3.9	1.8	.003	2.2	.04

TABLE XLVII
METABOLIC BALANCES
F.B.
PRE-FLIGHT

		T-12	T-11	T-10	T-9	T-8	T-7	T-6	T-5	T-4	T-3
Calcium -	Diet	1.287	1.336	1.256	1.355	1.348	1.263	1.335	1.329	1.284	1.327
(gm.)	Urine	.201	.220	.199	.207	.261	.216	.245	.198	.173	.226
	Sweat	.026	.026	.026	.026	.026	.026	.026	.026	.026	.026
	Feces	.862	.862	.862	.862	.862	.667	.667	.667	.667	.667
	Balance	+.198	+.228	+.169	+.260	+.199	+.354	+.397	+.438	+.418	+.408
Magnesium -	Diet	.434	.443	.439	.453	.452	.454	.444	.461	.455	.431
(gm.)	Urine	.102	.123	.137	.116	.109	.102	.143	.125	.109	.105
	Sweat	.007	.007	.007	.007	.007	.007	.007	.007	.007	.007
	Feces	.228	.228	.228	.228	.228	.214	.214	.214	.214	.214
	Balance	+.097	+.085	+.067	+.102	+.108	+.131	+.080	+.115	+.125	+.105
Sodium -	Diet	268.8	230.9	177.6	268.8	263.5	156.9	232.7	258.5	174.6	231.8
(gm.)	Urine	195.7	173.7	186.2	190.1	181.6	174.0	140.1	151.9	157.1	173.2
	Sweat	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7
	Feces	2.3	2.3	2.3	2.3	2.3	3.6	3.6	3.6	3.6	3.6
	Balance	+46.1	+30.2	-35.6	+51.7	+54.9	-45.4	+64.3	+78.3	-10.8	+30.3
Potassium -	Diet	114.4	162.3	143.9	120.9	169.1	148.3	116.7	163.9	146.9	114.0
(meq.)	Urine	70.7	107.6	99.9	87.4	123.2	121.9	85.4	113.5	99.7	79.7
	Sweat	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4
	Feces	8.2	8.2	8.2	8.2	8.2	7.6	7.6	7.6	7.6	7.6
	Balance	+25.1	+36.1	+25.4	+14.9	+27.3	+8.4	+13.3	+32.4	+29.2	+16.3
Phosphate -	Diet	2.505	2.865	3.108	2.519	2.973	3.129	2.478	2.926	3.144	2.442
(gm.)	Urine	1.295	1.374	1.298	1.127	1.338	1.285	1.518	1.340	1.344	1.311
	Feces	.620	.620	.620	.620	.620	.533	.533	.533	.533	.533
	Balance	+.590	+.871	+1.190	+772	+1.015	+1.311	+.427	+1.053	+1.267	+.598

TABLE XLVII
METABOLIC BALANCES
F.B.
PRE-FLIGHT

Continued

		T-12	T-11	T-10	T-9	T-8	T-7	T-6	T-5	T-4	T-3
Sulfate - (gm.)	Diet	2.420	2.746	3.108	2.344	2.949	3.128	2.288	2.909	3.150	2.284
	Urine	1.316	1.502	2.073	1.442	1.295	1.328	1.113	1.317	1.265	.890
	Sweat	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004
	Feces	.209	.209	.209	.209	.209	.154	.154	.154	.154	.154
	Balance	+.891	+1.031	+.822	+.689	+1.441	+1.642	+1.017	+1.434	+1.727	+1.236
Chloride - (meq.)	Diet										
	Urine	158.8	147.1	152.1	126.2	143.8	150.1	130.4	159.7	135.4	150.7
	Sweat	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4
	Feces	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	Balance										
Nitrogen - (gm.)	Diet	25.48	24.95	28.09	24.38	27.45	27.95	22.31	26.97	28.25	22.23
	Urine	21.54	21.69	24.23	22.84	27.70	26.82	20.98	19.35	23.45	19.73
	Sweat	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	Feces	1.81	1.81	1.81	1.81	1.81	1.75	1.75	1.75	1.75	1.75
	Balance	+1.94	+1.26	+1.86	-0.46	-2.25	-0.81	-0.61	+5.68	+2.86	+0.56

TABLE XLVIII
METABOLIC BALANCES
F.B.
INFLIGHT

		1	2	3	4	5	6	7
Calcium - (gm.)	Diet	.871	1.156	.970	.714	1.273	1.319	1.165
	Urine	.215	.215	.214	.195	.249	.215	.260
	Sweat	.014	.014	.014	.014	.014	.014	.014
	Feces	.796	.796	.796	.796	.796	.796	.796
	Balance	-.154	+.131	-.054	-.291	+.214	+.294	+.065
Magnesium - (gm.)	Diet	.228	.165	.139	.224	.238	.225	.244
	Urine	.137	.130	.116	.068	.099	.139	.109
	Sweat	.006	.006	.006	.006	.006	.006	.006
	Feces	.115	.115	.115	.115	.115	.115	.115
	Balance	-.030	-.086	-.098	+.035	+.018	-.035	+.014
Sodium - (meq.)	Diet	144.0	166.6	137.4	186.8	143.5	147.2	88.9
	Urine	209.6	161.6	157.9	208.6	326.1	183.4	214.0
	Sweat	2.3	2.3	2.3	2.3	2.3	2.3	2.3
	Feces	18.6	18.6	18.6	18.6	18.6	18.6	18.6
	Balance	-86.5	-15.9	-41.4	-42.7	-203.5	-57.1	-146.0
Potassium - (meq.)	Diet	53.2	38.4	20.9	48.6	36.1	40.7	22.7
	Urine	76.8	52.6	50.2	55.2	83.3	91.4	157.8
	Sweat	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	Feces	6.9	6.9	6.9	6.9	6.9	6.9	6.9
	Balance	-31.6	-22.2	-37.3	-14.6	-55.2	-58.7	-143.1
Phosphate - (gm.)	Diet	1.537	1.425	1.375	1.326	1.321	1.542	1.276
	Urine	1.144	1.144	1.557	1.696	2.214	1.910	1.911
	Feces	.311	.311	.311	.311	.311	.311	.311
	Balance	+.082	-.030	-.493	-.681	-1.204	-.679	-.946

TABLE XLVIII
METABOLIC BALANCES
F.B.
INFLIGHT

Continued

		1	2	3	4	5	6	7
Sulfate - (gm.)	Diet	.953	.731	.629	.947	.922	1.092	.897
	Urine	.945	1.061	1.113	1.070	1.607	1.361	1.387
	Sweat	.003	.003	.003	.003	.003	.003	.003
	Feces	.127	.127	.127	.127	.127	.127	.127
	Balance	-.122	-.460	-.614	-.253	-.815	-.399	-.620
Chloride - (meq.)	Diet							
	Urine	15.7	46.3	32.4	18.8	70.5	52.6	10.5
	Sweat	1.4	1.4	1.4	1.4	1.4	1.4	1.4
	Feces	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Balance							
Nitrogen - (gm.)	Diet	18.28	13.05	10.91	15.50	15.63	19.24	17.29
	Urine	16.26	13.27	15.45	16.51	22.42	17.22	19.72
	Sweat	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Feces	1.31	1.31	1.31	1.31	1.31	1.31	1.31
	Balance	+10.68	-1.56	-5.88	-2.35	-8.13	+0.68	-3.77

TABLE XLVIII
METABOLIC BALANCES
F.B.
INFLIGHT

		8	9	10	11	12	13	14
Calcium - (gm.)	Diet	.882	.828	1.104	.556	1.470	1.327	.955
	Urine	.264	.296	.273	.242	.268	.252	.178
	Sweat	.014	.014	.014	.014	.014	.014	.014
	Feces	.796	.796	.796	.796	.796	.796	.796
	Balance	-.192	-.278	+.021	-.496	+.392	+.265	-.033
Magnesium - (gm.)	Diet	.180	.237	.222	.201	.177	.192	.101
	Urine	.185	.187	.160	.155	.116	.123	.087
	Sweat	.006	.006	.006	.006	.006	.006	.006
	Feces	.115	.115	.115	.115	.115	.115	.115
	Balance	-.126	-.071	-.059	-.075	-.060	-.052	-.107
Sodium - (meq.)	Diet	135.8	121.7	125.7	199.4	128.2	180.2	125.5
	Urine	162.2	166.3	191.1	153.7	220.1	173.9	189.7
	Sweat	2.3	2.3	2.3	2.3	2.3	2.3	2.3
	Feces	18.6	18.6	18.6	18.6	18.6	18.6	18.6
	Balance	-47.3	-65.5	-86.3	+24.8	-112.8	-14.6	-85.1
Potassium - (meq.)	Diet	36.6	35.8	36.9	42.4	39.4	40.1	23.5
	Urine	138.7	114.6	156.4	83.5	15.2	138.2	94.1
	Sweat	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	Feces	6.9	6.9	6.9	6.9	6.9	6.9	6.9
	Balance	-110.1	-86.8	-127.5	-49.1	+16.2	-106.1	-78.6
Phosphate - (gm.)	Diet	1.215	1.152	1.414	1.073	1.548	1.646	1.221
	Urine	1.787	2.965	1.357	1.604	1.624	1.620	1.846
	Feces	.311	.311	.311	.311	.311	.311	.311
	Balance	-.883	-2.124	-.254	-.842	-.387	-.285	-.936

TABLE XLVIII
METABOLIC BALANCES
F.B.
INFLIGHT

Continued

		8	9	10	11	12	13	14
Sulfate - (gm.)	Diet	.888	.977	1.094	.961	.755	.904	.489
	Urine	1.511	1.471	---	1.395	1.049	1.310	1.019
	Sweat	.003	.003	.003	.003	.003	.003	.003
	Feces	.127	.127	.127	.127	.127	.127	.127
	Balance	-.753	-.624	---	-.564	-.424	-.536	-.660
Chloride - (meq.)	Diet							
	Urine	17.0	42.8	53.4	115.5	167.0	129.5	128.4
	Sweat	1.4	1.4	1.4	1.4	1.4	1.4	1.4
	Feces	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Balance							
Nitrogen - (gm.)	Diet	17.53	18.49	17.50	16.91	15.53	16.50	8.96
	Urine	19.85	19.62	19.82	18.79	18.47	17.25	15.97
	Sweat	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Feces	1.31	1.31	1.31	1.31	1.31	1.31	1.31
	Balance	-3.66	-2.47	-3.66	-3.22	-4.28	-2.09	-8.35

TABLE XLIX
METABOLIC BALANCES
F.B.
POST-FLIGHT

		1	2	3	4
Calcium - (gm.)	Diet	1.237	1.391	1.174	1.412
	Urine	.288	.284	.284	.288
	Sweat	.043	.043	.043	.043
	Feces	.769	.769	.769	.769
	Balance	+.137	+.295	+.078	+.312
Magnesium - (gm.)	Diet	.356	.526	.427	.410
	Urine	.099	.083	.099	.083
	Sweat	.015	.015	.015	.015
	Feces	.148	.148	.148	.148
	Balance	+.094	+.280	+.165	+.164
Sodium - (meq.)	Diet	244.9	294.8	169.1	245.7
	Urine	109.6	103.9	187.2	159.5
	Sweat	12.0	12.0	12.0	12.0
	Feces	6.5	6.5	6.5	6.5
	Balance	+116.8	+172.4	-36.6	+67.7
Potassium - (meq.)	Diet	128.8	169.3	126.5	106.1
	Urine	84.3	95.3	91.2	90.4
	Sweat	11.0	11.0	11.0	11.0
	Feces	9.6	9.6	9.6	9.6
	Balance	+23.9	+53.4	+14.7	-4.9
Phosphate -	Diet	2.549	3.246	2.630	2.469
	Urine	2.035	1.321	1.545	1.353
	Feces	.503	.503	.503	.503
	Balance	+.011	+1.422	+.582	+.613
Sulfate - (gm.)	Diet	2.535	3.036	2.605	2.391
	Urine	2.323	1.863	1.461	1.110
	Sweat	.004	.004	.004	.004
	Feces	.124	.124	.124	.124
	Balance	+.084	+1.045	+1.016	+1.153
Chloride - (meq.)	Diet				
	Urine	60.6	100.6	181.5	164.0
	Sweat	15.1	15.1	15.1	15.1
	Feces	0.3	0.3	0.3	0.3
	Balance				
Nitrogen -	Diet	22.04	28.92	21.87	22.24
	Urine	30.86	27.38	21.79	21.36
	Sweat	0.26	0.26	0.26	0.26
	Feces	1.21	1.21	1.21	1.21
	Balance	-10.29	+0.07	-1.39	-0.59

TABLE L
METABOLIC BALANCES
J.L.
PRE-FLIGHT

		T-12	T-11	T-10	T-9	T-8	T-7	T-6	T-5	T-4	T-3
Calcium - (gm.)	Diet	1.294	1.378	1.277	1.326	1.348	1.253	1.307	1.355	1.242	1.303
	Urine	.160	.171	.169	.140	.195	.167	.141	.155	.140	.150
	Sweat	.023	.023	.023	.023	.023	.023	.023	.023	.023	.023
	Feces	.618	.618	.618	.618	.618	.714	.714	.714	.714	.714
	Balance	+.493	+.566	+.476	+.545	+.512	+.349	+.429	+.463	+.365	+.416
Magnesium - (gm.)	Diet	.408	.408	.434	.432	.395	.451	.413	.407	.427	.398
	Urine	.096	.087	.103	.099	.096	.139	.112	.102	.084	.094
	Sweat	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006
	Feces	.170	.170	.170	.170	.170	.176	.176	.176	.176	.176
	Balance	+.136	+.145	+.155	+.157	+.123	+.130	+.119	+.123	+.101	+.122
Sodium - (meq.)	Diet	253.6	218.5	134.8	225.0	226.1	144.8	224.7	214.4	134.4	223.1
	Urine	176.4	168.8	153.1	98.9	97.9	173.2	135.9	140.1	152.8	139.5
	Sweat	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2
	Feces	2.3	2.3	2.3	2.3	2.3	7.5	7.5	7.5	7.5	7.5
	Balance	+49.7	+22.2	-45.8	+98.6	+100.7	-61.1	+56.1	+41.6	-51.1	+50.9
Potassium - (meq.)	Diet	113.9	149.8	133.9	116.0	140.8	139.3	114.7	143.6	135.3	111.1
	Urine	65.5	78.8	72.6	63.2	81.4	87.2	75.8	74.6	81.2	65.4
	Sweat	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
	Feces	6.3	6.3	6.3	6.3	6.3	7.4	7.4	7.4	7.4	7.4
	Balance	+27.7	+50.3	+40.6	+32.1	+38.7	+30.3	+17.1	+47.2	+32.3	+23.9
Phosphate -	Diet	2.396	2.585	2.926	2.297	2.648	2.885	2.402	2.676	2.856	2.354
	Urine	.966	1.154	1.279	1.247	1.202	1.277	1.287	1.224	1.423	1.433
	Feces	.378	.378	.378	.378	.378	.435	.435	.435	.435	.435
	Balance	+1.052	+1.053	+1.269	+.672	+1.068	+1.173	+.580	+1.017	+.998	+.486

TABLE L
METABOLIC BALANCES
J.L.
PRE-FLIGHT

Continued

		T-12	T-11	T-10	T-9	T-8	T-7	T-6	T-5	T-4	T-3
Sulfate - (gm.)	Diet	2.231	2.590	2.937	2.141	2.713	2.869	2.250	2.718	2.860	2.254
	Urine	1.397	1.983	1.408	1.003	.686	.679	.799	.687	.684	1.449
	Sweat	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005
	Feces	.097	.097	.097	.097	.097	.082	.082	.082	.082	.082
	Balance	+.732	+.505	+1.427	+1.036	+1.925	+2.103	+1.364	+1.944	+2.089	+.718
Chloride - (meq.)	Diet										
	Urine	144.6	175.8	144.1	94.7	113.5	125.3	101.1	137.5	141.7	114.9
	Sweat	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1
	Feces	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5
	Balance										
Nitrogen -	Diet	21.98	21.69	25.02	22.98	23.51	24.87	22.05	23.59	24.73	21.98
	Urine	16.83	18.39	17.96	20.99	21.22	24.56	22.51	19.00	21.01	21.17
	Sweat	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
	Feces	1.31	1.31	1.31	1.31	1.31	1.12	1.12	1.12	1.12	1.12
	Balance	+3.48	+1.63	+5.39	+0.32	+0.62	-1.17	-1.94	+3.11	+2.24	-0.67

TABLE LI
METABOLIC BALANCES
J.L.
INFLIGHT

(a)

		1	2	3	4	5	6	7
Calcium - (gm.)	Diet	.871	1.156	.970	.714	1.273	1.319	1.165
	Urine	----	.122	----	.143	.149	.175	.160
	Sweat	.016	.016	.016	.016	.016	.016	.016
	Feces	.766	.766	.766	.766	.766	.766	.766
	Balance	----	+.252	----	-.211	+.342	+.362	+.223
Magnesium (gm.)	Diet	.228	.165	.139	.224	.238	.225	.244
	Urine	----	.100	----	.082	.089	.092	.099
	Sweat	.007	.007	.007	.007	.007	.007	.007
	Feces	.109	.109	.109	.109	.109	.109	.109
	Balance	----	-.051	----	+.026	+.033	+.017	+.029
Sodium - (meq.)	Diet	144.0	166.6	137.4	186.8	143.5	147.2	88.9
	Urine	----	178.2	----	158.2	194.5	189.4	180.8
	Sweat	2.9	2.9	2.9	2.9	2.9	2.9	2.9
	Feces	10.3	10.3	10.3	10.3	10.3	10.3	10.3
	Balance	----	-24.8	----	+15.4	-64.2	-55.4	-105.1
Potassium - (meq.)	Diet	53.2	38.4	20.9	48.6	36.1	40.7	22.7
	Urine	----	56.6	----	57.6	55.9	54.5	57.7
	Sweat	1.6	1.6	1.6	1.6	1.6	1.6	1.6
	Feces	7.2	7.2	7.2	7.2	7.2	7.2	7.2
	Balance	----	-27.0	----	-17.8	-28.6	-22.6	-43.8
Phosphate - (gm.)	Diet	1.537	1.425	1.375	1.326	1.321	1.542	1.276
	Urine	----	1.216	----	1.872	1.714	1.539	1.581
	Feces	.289	.289	.289	.289	.289	.289	.289
	Balance	----	-.080	----	-.835	-.682	-.286	-.594

TABLE LI
METABOLIC BALANCES
J.L.
INFLIGHT

(a) Continued

		1	2	3	4	5	6	7
Sulfate - (gm.)	Diet	.953	.731	.629	.947	.922	1.092	.897
	Urine	----	1.017	----	.966	1.026	.877	.911
	Sweat	.002	.002	.002	.002	.002	.002	.002
	Feces	.096	.096	.096	.096	.096	.096	.096
	Balance	----	-.384	----	-.117	-.202	+.117	-.112
Chloride - (meq.)	Diet							
	Urine	----	183.9	----	106.0	132.2	151.1	148.2
	Sweat	2.2	2.2	2.2	2.2	2.2	2.2	2.2
	Feces	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Balance							
Nitrogen -	Diet	18.28	13.05	10.91	15.50	15.63	19.24	17.29
	Urine	----	14.26	----	15.70	16.50	16.09	16.78
	Sweat	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Feces	0.97	0.97	0.97	0.97	0.97	0.97	0.97
	Balance	----	-2.22	----	-1.21	-1.88	+2.14	-.50

TABLE LI
METABOLIC BALANCES
J.L.
INFLIGHT

(b) Continued

		8	9	10	11	12	13	14
Sulfate - (gm.)	Diet	.888	.977	1.094	.961	.755	.904	.489
	Urine	1.019	1.006	1.253	1.137	1.044	1.075	.890
	Sweat	.002	.002	.002	.002	.002	.002	.002
	Feces	.096	.096	.096	.096	.096	.096	.096
	Balance	-.229	-.127	-.257	-.274	-.387	-.269	-.499
Chloride - (meq.)	Diet							
	Urine	156.6	161.2	144.3	175.4	138.8	149.6	109.8
	Sweat	2.2	2.2	2.2	2.2	2.2	2.2	2.2
	Feces	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Balance							
Nitrogen - (gm.)	Diet	17.53	18.49	17.50	16.91	15.53	16.50	8.96
	Urine	18.07	17.78	17.58	19.74	15.50	14.14	12.75
	Sweat	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Feces	0.97	0.97	0.97	0.97	0.97	0.97	0.97
	Balance	-1.55	-.30	-1.09	-3.84	-.98	+1.35	-4.80

TABLE LI
METABOLIC BALANCES
J.L.
INFLIGHT

(b)

		8	9	10	11	12	13	14
Calcium - (gm.)	Diet	.882	.828	1.104	.556	1.470	1.327	.955
	Urine	.185	.160	.158	.154	.192	.180	.160
	Sweat	.016	.016	.016	.016	.016	.016	.016
	Feces	.766	.766	.766	.766	.766	.766	.766
	Balance	-.085	-.114	+.164	-.380	+.496	+.365	+.013
Magnesium - (gm.)	Diet	.180	.237	.222	.201	.177	.192	.101
	Urine	.107	.108	.117	.093	.126	.066	.078
	Sweat	.007	.007	.007	.007	.007	.007	.007
	Feces	.109	.109	.109	.109	.109	.109	.109
	Balance	-.043	+.013	-.011	-.008	-.065	+.010	-.093
Sodium - (meq.)	Diet	135.8	121.7	125.7	199.4	128.2	180.2	125.5
	Urine	193.2	192.1	174.3	238.2	164.9	175.1	142.7
	Sweat	2.9	2.9	2.9	2.9	2.9	2.9	2.9
	Feces	10.3	10.3	10.3	10.3	10.3	10.3	10.3
	Balance	-70.6	-83.6	-61.8	-52.0	-49.9	-8.1	-30.4
Potassium - (meq.)	Diet	36.6	35.8	36.9	42.4	39.4	40.1	23.5
	Urine	56.0	45.0	41.5	50.00	47.8	49.2	38.8
	Sweat	1.6	1.6	1.6	1.6	1.6	1.6	1.6
	Feces	7.2	7.2	7.2	7.2	7.2	7.2	7.2
	Balance	-28.2	-18.0	-13.4	-16.4	-17.2	-17.9	-24.1
Phosphate - (gm.)	Diet	1.215	1.152	1.414	1.073	1.548	1.646	1.221
	Urine	1.602	1.549	1.391	1.688	1.584	1.609	1.573
	Feces	.289	.289	.289	.289	.289	.289	.289
	Balance	-.676	-.686	-.266	-.904	-.325	-.252	-.641

TABLE LII
METABOLIC BALANCES
J.L.
POST-FLIGHT

		1	2	3	4
Calcium - (gm.)	Diet	1.254	1.348	1.125	1.413
	Urine	.150	.180	.172	.187
	Sweat	.045	.045	.045	.045
	Feces	.766	.766	.766	.766
	Balance	+.293	+.357	+.142	+.415
Magnesium - (gm.)	Diet	.338	.431	.393	.417
	Urine	.083	.095	.100	.095
	Sweat	.017	.017	.017	.017
	Feces	.109	.109	.109	.109
	Balance	+.129	+.210	+.167	+.196
Sodium - (meq.)	Diet	184.1	217.2	130.5	265.9
	Urine	47.0	65.9	78.3	106.9
	Sweat	9.8	9.8	9.8	9.8
	Feces	10.3	10.3	10.3	10.3
	Balance	+117.0	+131.2	+32.1	+138.9
Potassium - (meq.)	Diet	124.8	145.3	128.2	115.8
	Urine	48.9	54.6	64.2	86.0
	Sweat	11.4	11.4	11.4	11.4
	Feces	7.2	7.2	7.2	7.2
	Balance	+57.3	+72.1	+45.4	+11.2
Phosphate - (gm.)	Diet	2.458	2.899	2.697	2.507
	Urine	1.287	1.256	1.366	1.276
	Feces	.289	.289	.289	.289
	Balance	+.882	+1.354	+1.042	+.942
Sulfate - (gm.)	Diet	2.436	2.782	2.688	2.410
	Urine	1.418	1.559	1.686	1.454
	Sweat	.010	.010	.010	.010
	Feces	.096	.096	.096	.096
	Balance	+.912	+1.117	+.896	+.850
Chloride - (meq.)	Diet				
	Urine	47.9	45.1	57.9	111.2
	Sweat	15.3	15.3	15.3	15.3
	Feces	0.2	0.2	0.2	0.2
	Balance				
Nitrogen - (gm.)	Diet	19.84	25.43	24.09	22.46
	Urine	15.07	22.55	21.76	20.30
	Sweat	0.29	0.29	0.29	0.29
	Feces	0.97	0.97	0.97	0.97
	Balance	+3.51	+1.62	+1.07	+0.90

TABLE LIII
METABOLIC BALANCES
PRE-FLIGHT
CONTROL SUBJECTS

(A) E.W.

		T-12	T-11	T-10	T-9	T-8	T-7	T-6	T-5	T-4	T-3
Calcium - (gm.)	Diet	1.165	1.358	1.258	1.286	1.419	1.270	1.277	1.231	1.226	1.278
	Urine	.128	.181	.157	.178	.185	.184	.155	.155	.144	.173
	Sweat	.025	.025	.025	.025	.025	.025	.025	.025	.025	.025
	Feces	.665	.665	.665	.665	.665	.617	.617	.617	.617	.617
	Balance	+.347	+.487	+.411	+.418	+.544	+.396	+.432	+.386	+.392	+.415
Magnesium - (gm.)	Diet	.357	.399	.480	.440	.450	.436	.427	.420	.436	.429
	Urine	.139	.175	.150	.151	.136	.197	.108	.133	.152	.162
	Sweat	.009	.009	.009	.009	.009	.009	.009	.009	.009	.009
	Feces	.157	.157	.157	.157	.157	.140	.140	.140	.140	.140
	Balance	+.052	+.058	+.164	+.123	+.148	+.073	+.153	+.121	+.118	+.101
Sodium - (meq.)	Diet	251.9	291.6	208.8	270.1	300.6	247.3	217.4	240.6	185.5	250.1
	Urine	190.9	201.0	218.8	189.1	215.0	207.0	163.2	208.7	117.1	149.9
	Sweat	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1
	Feces	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
	Balance	+17.3	+46.9	-53.7	+37.3	+41.9	-3.4	+10.5	-11.8	+24.7	+56.5
Potassium - (meq.)	Diet	91.2	150.8	142.1	111.4	167.8	137.7	111.4	162.9	138.3	112.2
	Urine	74.0	69.6	90.9	79.1	86.0	65.7	121.6	101.2	85.3	66.5
	Sweat	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
	Feces	10.3	10.3	10.3	10.3	10.3	12.1	12.1	12.1	12.1	12.1
	Balance	-6.0	+58.0	+28.0	+9.1	+58.6	+48.8	-33.4	+38.5	+29.8	+22.5
Phosphate - (gm.)	Diet	2.087	2.678	3.100	2.403	3.000	3.108	2.520	2.735	3.054	2.523
	Urine	1.487	1.361	1.284	1.508	1.633	1.312	1.841	1.421	1.422	1.285
	Feces	.471	.471	.471	.471	.471	.471	.471	.471	.471	.471
	Balance	+.129	+.846	+1.345	+.424	+.896	+1.325	+.208	+.843	+1.161	+.497

TABLE LIII
METABOLIC BALANCES
PRE-FLIGHT
CONTROL SUBJECTS

(A) E.W.

		T-12	T-11	T-10	T-9	T-8	T-7	T-6	T-5	T-4	T-3
Sulfate -	Diet	2.066	2.208	2.987	2.262	3.008	2.982	2.411	2.801	2.935	2.413
(gm.)	Urine	1.780	1.611	1.579	1.602	1.636	1.470	2.253	1.876	1.945	1.897
	Sweat	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005
	Feces	.107	.107	.107	.107	.107	.092	.092	.092	.092	.092
	Balance	+.174	+.485	+1.296	+.548	+1.260	+1.400	+.046	+.813	+.878	+.404
Chloride -	Diet										
(meq.)	Urine	177.7	172.0	231.8	197.1	192.9	187.5	185.8	186.8	104.3	130.1
	Sweat	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3
	Feces	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	Balance										
Nitrogen -	Diet	19.88	23.61	27.50	27.05	29.49	26.91	26.19	26.84	26.30	26.21
(gm.)	Urine	16.04	19.36	18.74	16.36	17.88	17.66	20.21	22.18	18.59	---
	Sweat	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
	Feces	1.38	1.38	1.38	1.38	1.38	1.32	1.32	1.32	1.32	1.32
	Balance	+2.12	+2.53	+7.04	+8.97	+9.89	+7.53	+4.26	+2.94	+5.99	---

TABLE LIII
METABOLIC BALANCES
PRE-FLIGHT
CONTROL SUBJECTS

(B) M.C.

		T-12	T-11	T-10	T-9	T-8	T-7	T-6	T-5	T-4	T-3
Calcium - (gm.)	Diet	1.313	1.364	1.270	1.326	1.355	1.257	1.318	1.345	1.295	1.333
	Urine	.277	.196	.192	.172	.237	.187	.194	.197	.178	.218
	Sweat	.033	.033	.033	.033	.033	.033	.033	.033	.033	.033
	Feces	.830	.830	.830	.830	.830	.554	.554	.554	.554	.554
	Balance	+.173	+.305	+.215	+.291	+.255	+.483	+.537	+.561	+.530	+.528
Magnesium - (gm.)	Diet	.410	.417	.500	.501	.431	.462	.419	.388	.472	.447
	Urine	.133	.120	.110	.113	.166	.130	.137	.124	.121	.137
	Sweat	.009	.009	.009	.009	.009	.009	.009	.009	.009	.009
	Feces	.204	.204	.204	.204	.204	.169	.169	.169	.169	.169
	Balance	+.064	+.084	+.177	+.175	+.052	+.154	+.104	+.086	+.173	+.132
Sodium - (meq.)	Diet	275.5	248.8	165.9	244.4	243.1	162.8	261.6	246.6	134.0	267.0
	Urine	138.8	133.1	169.0	163.9	202.4	167.6	110.1	137.2	119.4	122.3
	Sweat	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2
	Feces	2.4	2.4	2.4	2.4	2.4	1.0	1.0	1.0	1.0	1.0
	Balance	+103.1	+82.1	-36.7	+46.9	+7.1	-37.0	+119.3	+77.2	-17.6	+112.5
Potassium - (meq.)	Diet	113.6	151.1	152.7	140.0	160.9	154.0	117.3	134.1	157.1	122.0
	Urine	72.7	83.3	94.2	78.3	102.2	111.3	120.6	103.4	103.4	73.3
	Sweat	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
	Feces	7.4	7.4	7.4	7.4	7.4	6.4	6.4	6.4	6.4	6.4
	Balance	+23.0	+49.9	+40.6	+43.8	+40.8	+25.8	-20.2	+13.8	+36.8	+31.8
Phosphate - (gm.)	Diet	2.533	2.720	3.182	2.611	2.943	3.255	2.574	2.910	3.333	2.662
	Urine	1.469	1.521	1.417	1.388	1.778	1.310	1.758	1.431	1.556	1.452
	Feces	.453	.453	.453	.453	.453	.358	.358	.358	.358	.358
	Balance	+.611	+.746	+1.312	+.770	+.712	+1.587	+.458	+1.121	+1.419	+.852

TABLE LIII
METABOLIC BALANCES
PRE-FLIGHT
CONTROL SUBJECTS

(B) M.C.

		T-12	T-11	T-10	T-9	T-8	T-7	T-6	T-5	T-4	T-3
Sulfate - (gm.)	Diet	2.315	2.620	3.001	2.366	2.957	3.151	2.486	2.950	3.153	2.494
	Urine	1.962	1.602	1.782	2.647	1.870	1.560	1.921	1.927	2.116	1.677
	Sweat	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005
	Feces	.151	.151	.151	.151	.151	.120	.120	.120	.120	.120
	Balance	+.197	+.862	+1.063	-.437	+.931	+1.466	+.440	+.898	+.912	+.692
Chloride - (meq.)	Diet										
	Urine	140.0	112.1	159.0	149.2	190.0	162.7	116.8	130.5	104.6	125.3
	Sweat	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9
	Feces	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3
	Balance										
Nitrogen - (gm.)	Diet	23.73	23.36	27.65	27.44	28.13	30.07	26.40	27.71	30.26	26.57
	Urine	22.13	20.76	21.89	17.59	22.55	21.59	25.67	21.95	24.91	23.76
	Sweat	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
	Feces	1.63	1.63	1.63	1.63	1.63	1.34	1.34	1.34	1.34	1.34
	Balance	-0.29	+0.71	+3.87	+7.96	+3.69	+6.88	-0.87	+4.16	+3.75	+1.21

TABLE LIV
SUMMARY OF BALANCES
F.B.

(a)

		PRE-FLIGHT		INFLIGHT		POST-FLIGHT		SIGNIFICANCE OF DIFFERENCE (P<)		
		Mean	s.d.	Mean	s.d.	Mean	s.d.	Pre- vs. In-	Pre- vs. Post-	In- vs. Post-
Calcium - (gm.)	Diet	1.312	.034	1.042	.251	1.304	.101	.01	.9	.1
	Urine	.215	.024	.238	.032	.286	.002	.1	.001	.02
	Sweat	.026		.014		.043				
	Feces	.765		.796		.769				
	Balance	+.307	.101	-.006	.373	+.206	.100	.05	.2	.4
Magnesium - (gm.)	Diet	.447	.009	.198	.040	.430	.061	.001	.5	.01
	Urine	.117	.014	.129	.033	.093	.011	.4	.01	.1
	Sweat	.007		.006		.015				
	Feces	.221		.115		.148				
	Balance	+.102	.091	-.052	.047	+.176	.067	.001	.2	.001
Sodium - (meq.)	Diet	226.4	40.0	145.1	28.4	238.6	44.9	.001	.7	.001
	Urine	172.4	16.8	196.3	41.1	140.1	34.8	.2	.1	.05
	Sweat	24.7		2.3		12.0				
	Feces	3.0		18.6		6.5				
	Balance	+26.4	40.5	-70.0	55.7	+80.1	76.9	.001	.2	.001
Potassium - (meq.)	Diet	140.0	20.7	36.8	8.9	132.7	22.9	.001	.7	.001
	Urine	98.9	17.0	93.4	41.6	90.3	3.9	.8	.4	.9
	Sweat	10.4		1.1		11.0				
	Feces	7.9		6.9		9.6				
	Balance	+22.9	8.6	-64.6	44.4	+21.8	21.0	.001	1.0	.01
Phosphate - (gm.)	Diet	2.809	.277	1.362	.161	2.642	.240	.001	.7	.001
	Urine	1.323	.091	1.741	.442	1.563	.286	.01	.05	.5
	Feces	.577		.311		.503				
	Balance	+.909	.292	-.690	.536	+.657	.503	.001	.3	.001

TABLE LIV
SUMMARY OF BALANCES
F.B.

(b)

		INFLIGHT - 1		INFLIGHT - 2		SIGNIFICANCE OF DIFFERENCE (P<)				
		Mean	s.d.	Mean	s.d.	Pre- vs. In 1	Pre- vs. In 2	Post- vs. In 1	Post- vs. In 2	In vs. In 2
Calcium - (gm.)	Diet	1.067	.206	1.017	.288	.01	.01	.1	.2	.8
	Urine	.223	.021	.253	.035	.6	.05	.001	.2	.1
	Sweat	.014		.014						
	Feces	.796		.796						
	Balance	+.034	.193	-.046	.487	.01	.1	.2	.4	.8
Magnesium - (gm.)	Diet	.209	.037	.187	.040	.001	.001	.05	.001	.4
	Urine	.114	.023	.145	.035	.8	.05	.2	.02	.1
	Sweat	.006		.006						
	Feces	.115		.115						
	Balance	-.026	.048	-.079	.026	.01	.001	.001	.001	.05
Sodium - (meq.)	Diet	144.9	27.8	145.2	28.9	.001	.001	.01	.01	1.
	Urine	208.8	52.4	179.6	20.9	.1	.5	.1	.1	.3
	Sweat	2.3		2.3						
	Feces	18.6		18.6						
	Balance	-84.7	62.1	-55.3	43.7	.001	.01	.01	.01	.4
Potassium - (meq.)	Diet	37.2	11.2	36.4	5.7	.001	.001	.001	.001	.9
	Urine	81.0	34.8	105.8	44.1	.3	.7	.7	.6	.3
	Sweat	1.1		1.1						
	Feces	6.9		6.9						
	Balance	-51.8	40.1	-77.4	44.8	.001	.001	.02	.01	.4
Phosphate - (gm.)	Diet	1.400	.098	1.324	.199	.001	.001	.001	.001	.5
	Urine	1.654	.374	1.829	.486	.05	.01	.8	.4	.5
	Feces	.311		.311						
	Balance	-.564	.429	-.816	.599	.001	.001	.01	.01	.5

TABLE LIV
SUMMARY OF BALANCES
F.B.

(a)

		PRE-FLIGHT Mean	PRE-FLIGHT s.d.	INFLIGHT Mean	INFLIGHT s.d.	POST-FLIGHT Mean	POST-FLIGHT s.d.	SIGNIFICANCE OF DIFFERENCE (P<) Pre- vs. In-	Pre- vs. Post-	In- vs. Post-
Sulfate - (gm.)	Diet	2.733	.346	.874	.163	2.642	.240	.001	.7	.001
	Urine	1.344	.292	1.254	.210	1.689	.453	.4	.2	.05
	Sweat	.004		.003		.004				
	Feces	.182		.127		.124				
	Balance	+1.193	.339	-.526	.186	+.825	.431	.001	.2	.001
Chloride - (meq.)	Diet									
	Urine	145.3	10.9	65.7	47.5	126.7	48.6	.001	.4	.05
	Feces	18.4		1.4		15.1				
	Sweat	0.1		0.2		0.3				
	Balance									
Nitrogen - (gm.)	Diet	25.81	2.19	15.81	2.85	23.77	2.98	.001	.3	.001
	Urine	22.83	2.65	17.90	2.27	25.34	3.97	.001	.3	.001
	Sweat	0.19		0.03		0.26				
	Feces	1.78		1.31		1.21				
	Balance	+1.00	2.14	-3.43	2.60	-3.05	4.21	.001	.05	.9

TABLE LIV
SUMMARY OF BALANCES
F.B.

(b)

		INFLIGHT - 1		INFLIGHT - 2		SIGNIFICANCE OF DIFFERENCE (P<)				
		Mean	s.d.	Mean	s.d.	Pre- vs. In 1	Pre- vs. In 2	Post- vs. In 1	Post- vs. In 2	In vs. In 2
Sulfate - (gm.)	Diet	.882	.142	.867	.181	.001	.001	.001	.001	.9
	Urine	1.221	.218	1.293	.194	.4	.7	.1	.2	.6
	Sweat	.003		.003						
	Feces	.127		.127						
	Balance	-.469	.219	-.594	.103	.001	.001	.001	.001	.3
Chloride - (meq.)	Diet									
	Urine	35.3	20.5	93.4	51.3	.001	.02	.01	.4	.05
	Sweat	1.4		1.4						
	Feces	0.2		0.2						
	Balance									
Nitrogen - (gm.)	Diet	15.70	2.72	15.92	2.97	.001	.001	.01	.01	.9
	Urine	17.26	2.76	18.54	1.36	.01	.01	.01	.01	.4
	Sweat	0.03	0.03							
	Feces	1.31		1.31						
	Balance	-2.90	3.04	-3.96	1.92	.02	.001	1.	.7	.5

TABLE LV
SUMMARY OF BALANCES
J.L.

		INFLIGHT-1 Mean	INFLIGHT-1 s.d.	INFLIGHT-2 Mean	INFLIGHT-2 s.d.	Significance of Difference (P<) Pre- vs. In-1	Pre- vs. In-2	Post- vs. In-1	Post- vs. In-2	In-1 vs. In-2
Calcium - (gm.)	Diet	1.067	.206	1.017	.288	.01	.01	.2	.2	.8
	Urine	.150	.018	.170	.014	.4	.4	.2	.9	.1
	Sweat	.016		.016						
	Feces	.766		.766						
	Balance	+.194	.209	+.066	.278	.01	.01	.5	.2	.5
Magnesium - (gm.)	Diet	.209	.037	.187	.040	.01	.001	.1	.001	.4
	Urine	.093	.007	.099	.020	.3	.9	.9	.6	.5
	Sweat	.007		.007						
	Feces	.109		.109						
	Balance	+.011	.031	-.028	.037	.001	.001	.001	.001	.2
Sodium - (meq.)	Diet	144.9	27.8	145.2	28.9	.02	.02	.1	.1	1.
	Urine	180.2	12.5	182.9	27.6	.02	.02	.001	.001	.9
	Sweat	2.9		2.9						
	Feces	10.3		10.3						
	Balance	-46.8	40.3	-50.9	23.4	.05	.01	.01	.001	.9
Potassium - (meq.)	Diet	37.2	11.2	36.4	5.7	.001	.001	.001	.001	.9
	Urine	56.5	1.2	46.9	5.3	.001	.001	.1	.05	.01
	Sweat	1.6		1.6						
	Feces	7.2		7.2						
	Balance	-28.0	8.8	-19.3	4.7	.001	.001	.001	.001	.1
Phosphate - (gm.)	Diet	1.400	.098	1.324	.199	.001	.001	.001	.001	.5
	Urine	1.584	.218	1.571	.084	.01	.001	.1	.001	.9
	Feces	.289		.289						
	Balance	.495	.274	-.536	.235	.001	.001	.001	.001	.9

(b) Continued

TABLE LV
SUMMARY OF BALANCES
J.L.

		INFLIGHT-1 Mean	INFLIGHT-1 s.d.	INFLIGHT-2 Mean	INFLIGHT-2 s.d.	Significance of Difference (P<) Pre- vs. In-1	Pre- vs. In-2	Post- vs. In-1	Post- vs. In-2	In-1 vs. In-2
Sulfate - (gm.)	Diet	.882	.142	.867	.181	.001	.001	.001	.001	.9
	Urine	.959	.058	1.061	.105	.6	1.	.001	.001	.6
	Sweat	.002		.002						
	Feces	.096		.096						
	Balance	-.140	.162	-.253	.151	.001	.001	.001	.001	.3
Chloride - (meq.)	Diet									
	Urine	144.3	25.5	148.0	19.1	.4	.2	.01	.001	.8
	Sweat	2.2		2.2						
	Feces	0.2		0.2						
	Balance									
Nitrogen - (gm.)	Diet	15.70	2.72	15.92	2.97	.001	.001	.01	.01	.9
	Urine	15.86	0.88	16.51	2.28	.01	.01	.05	.1	.6
	Sweat	0.04		0.04						
	Feces	0.97		0.97						
	Balance	-0.73	1.55	-1.60	1.94	.01	.001	.05	.02	.5

TABLE LV
SUMMARY OF BALANCES
J.L.

		PRE-FLIGHT Mean	PRE-FLIGHT s.d.	INFLIGHT Mean	INFLIGHT s.d.	POST-FLIGHT Mean	POST-FLIGHT s.d.	SIGNIFICANCE OF DIFFERENCE (P<) Pre- vs. In-	Pre- vs. Post-	In- vs. Post-
Calcium - (gm.)	Diet	1.309	.042	1.042	.251	1.284	.110	.01	.7	.1
	Urine	.159	.017	.162	.019	.172	.014	.8	.3	.4
	Sweat	.023		.016		.045				
	Feces	.431		.766		.766				
	Balance	+.461	.068	+.119	.259	+.302	.102	.001	.01	.3
Magnesium - (gm.)	Diet	.417	.017	.198	.040	.395	.035	.001	.2	.01
	Urine	.101	.015	.097	.016	.093	.006	.5	.4	.8
	Sweat	.006		.007		.017				
	Feces	.173		.109		.109				
	Balance	+.137	.015	-.012	.040	+.176	.031	.001	.02	.001
Sodium - (meq.)	Diet	199.9	41.8	145.1	28.4	199.4	49.3	.01	1.	.02
	Urine	143.7	26.3	181.8	22.6	74.5	21.8	.01	.001	.001
	Sweat	25.2		2.9		9.8				
	Feces	4.9		10.3		10.3				
	Balance	+26.2	56.5	-49.2	31.6	+104.8	42.7	.01	.05	.001
Potassium - (meq.)	Diet	129.8	13.7	36.8	8.9	128.5	10.7	.001	.9	.001
	Urine	74.6	7.6	50.9	6.3	63.4	14.1	.001	.2	.05
	Sweat	14.4		1.6		11.4				
	Feces	6.9		7.2		7.2				
	Balance	+34.0	9.8	-22.9	7.9	+46.5	22.5	.001	.3	.001
Phosphate - (gm.)	Diet	2.602	.222	1.362	.161	2.640	.174	.001	.8	.001
	Urine	1.259	.133	1.577	.155	1.296	.042	.001	.7	.01
	Feces	.407		.289		.289				
	Balance	+.937	.249	-.519	.253	+1.055	.182	.001	.5	.001

TABLE LV
SUMAMRY OF BALANCES
J.L.

Continued

		PRE-FLIGHT mean	PRE-FLIGHT s.d.	INFLIGHT mean	INFLIGHT s.d.	POST-FLIGHT mean	POST-FLIGHT s.d.	SIGNIFICANCE OF DIFFERENCE (P<) Pre- vs. In-	Pre- vs. Post-	In- vs. Post-
Sulfate - (gm.)	Diet	2.556	.292	.874	.163	2.579	.160	.001	.9	.001
	Urine	1.077	.433	1.019	.102	1.529	.104	.7	.1	.001
	Sweat	.005		.002		.010				
	Feces	.090		.096		.096				
	Balance	+1.384	.582	-.206	.165	+.944	.103	.001	.2	.001
Chloride - (meq.)	Diet									
	Urine	129.3	23.0	146.4	22.1	65.5	26.8	.2	.01	.001
	Sweat	16.1		2.2		15.3				
	Feces	0.5		0.2		0.2				
	Balance									
Nitrogen - (gm.)	Diet	23.24	1.24	15.81	2.85	22.95	2.08	.001	.8	.001
	Urine	20.36	2.20	16.24	1.86	19.92	2.91	.001	.8	.02
	Sweat	0.36		0.04		0.29				
	Feces	1.22		0.87		0.97				
	Balance	+1.30	.60	-1.24	1.84	+1.78	1.04	.001	.4	.02

TABLE LVI
SUMMARY OF BALANCES
E.W.

		PRE-FLIGHT Mean	s.d.
Calcium - (gm.)	Diet	1.277	.067
	Urine	.164	.018
	Sweat	.025	
	Feces	.641	
	Balance	+.423	.053
Magnesium - (gm.)	Diet	.427	.031
	Urine	.150	.023
	Sweat	.009	
	Feces	.149	
	Balance	+.101	.050
Sodium - (meq.)	Diet	246.4	34.0
	Urine	186.1	31.1
	Sweat	40.1	
	Feces	3.6	
	Balance	+11.0	28.6
Potassium - (meq.)	Diet	132.6	23.8
	Urine	84.0	16.5
	Sweat	12.9	
	Feces	11.2	
	Balance	+25.4	27.6
Phosphate - (gm.)	Diet	2.721	.327
	Urine	1.455	.165
	Feces	.471	
	Balance	+.767	.417
Sulfate - (gm.)	Diet	2.610	.349
	Urine	1.765	.221
	Sweat	.005	
	Feces	.100	
	Balance	+.730	.453
Chloride - (meq.)	Diet		
	Urine	176.6	33.8
	Sweat	33.3	
	Feces	0.2	
	Balance		
Nitrogen - (gm.)	Diet	26.00	2.46
	Urine	18.56	1.79
	Sweat	0.34	
	Feces	1.35	
	Balance	+5.70	2.71

TABLE LVII
SUMMARY OF BALANCES
M.C.

		PRE-FLIGHT Mean	s.d.
Calcium - (gm.)	Diet	1.318	.034
	Urine	.205	.030
	Sweat	.033	
	Feces	.692	
	Balance	+.388	.145
Magnesium - (gm.)	Diet	.445	.039
	Urine	.129	.015
	Sweat	.009	
	Feces	.187	
	Balance	+.120	.092
Sodium - (meq.)	Diet	225.0	48.0
	Urine	146.4	27.1
	Sweat	31.2	
	Feces	1.7	
	Balance	+45.7	58.8
Potassium - (meq.)	Diet	140.3	16.7
	Urine	94.3	15.8
	Sweat	10.5	
	Feces	6.9	
	Balance	+28.6	19.2
Phosphate - (gm.)	Diet	2.872	.283
	Urine	1.508	.145
	Feces	.406	
	Balance	+.959	.358
Sulfate - (gm.)	Diet	2.749	.309
	Urine	1.906	.296
	Sweat	.005	
	Feces	.136	
	Balance	+.702	.500
Chloride - (meq.)	Diet		
	Urine	139.0	25.2
	Sweat	25.9	
	Feces	0.4	
	Balance		
Nitrogen - (gm.)	Diet	27.13	2.16
	Urine	22.28	2.14
	Sweat	0.26	
	Feces	1.49	
	Balance	+3.11	2.77

TABLE LVIII

Significance* of Correlationships to Dietary Intake

	Ca	Mg	PO_4	SO_4	N	Na	K
Ca - Diet	---	.01	.001	.001	.001	.001	.001
Ca - Urine	.9	.9	.9	.9	.9	.7	.9
Ca - Balance	.01	.01	.01	.01	.01	.02	.01
Mg - Diet	.01	---	.001	.001	.001	.001	.001
Mg - Urine	.9	.9	.9	.9	.6	.6	.9
Mg - Balance	.001	.001	.001	.001	.01	.01	.001
PO_4 - Diet	.001	.001	---	.001	.001	.001	.001
PO_4 - Urine	.05	.1	.1	.05	.2	.3	.05
PO_4 - Balance	.001	.001	.001	.001	.001	.001	.001
SO_4 - Diet	.001	.001	.001	---	.001	.001	.001
SO_4 - Urine	.2	.2	.1	.2	.1	.05	.9
SO_4 - Balance	.001	.01	.01	.01	.02	.05	.01
N - Diet	.001	.001	.001	.001	---	.001	.001
N - Urine	.02	.05	.05	.05	.1	.05	.05
N - Balance	.2	.1	.1	.1	.05	.2	.1
Na - Diet	.001	.001	.001	.001	.001	---	.001
Na - Urine	.2	.3	.2	.3	.4	.6	.2
Na - Balance	.01	.01	.01	.01	.05	.05	.01
K - Diet	.001	.001	.001	.001	.001	.001	---
K - Urine	.4	.3	.3	.4	.2	.2	.3
K - Balance	.001	.01	.001	.01	.01	.02	.001

* - Values expressed as "P<" for the correlation coefficient.

Data used for calculations were the mean values for each subject for each phase (N=8).

TABLE LIX A

Significance* of Correlationships of Urinary Excretions

	Ca	Mg	PO_4	SO_4	N	Na	K
Ca	---	.8	.3	.6	.1	.9	.1
Mg	.8	---	.6	.2	.5	.2	.2
PO_4	.3	.6	---	.9	.5	.2	.8
SO_4	.6	.2	.9	---	.3	.7	.3
N	.1	.5	.5	.3	---	.2	.2
Na	.9	.2	.2	.7	.2	---	.7
K	.1	.2	.8	.3	.2	.7	---

* - Values expressed as "P<" for the correlation coefficient.

Data used for calculations were the mean values for each subject for each phase (N=8).

TABLE LIX B

Significance* of Correlationships of Balances

	Ca	Mg	PO_4	SO_4	N	Na	K
Ca	---	.02	.01	.01	.01	.1	.01
Mg	.02	---	.001	.01	.3	.001	.001
PO_4	.01	.001	---	.001	.1	.01	.001
SO_4	.01	.01	.001	---	.2	.05	.01
N	.01	.3	.1	.2	---	.4	.1
Na	.1	.001	.01	.05	.4	---	.01
K	.01	.001	.001	.01	.1	.01	---

* - Values expressed as "P<" for the correlation coefficient.

Data used for calculations were the mean values for each subject for each phase (N=8).

TABLE LX
Significant Interrelationships
Slopes of Regression Lines

"y"	"x"	Slope	P<
Ca - Bal.	Ca - Diet	1.198	.01
	Mg - Diet	1.516	.01
	P - Diet	.252	.01
	S - Diet	.202	.01
	N - Diet	.036	.01
	Na - Diet	.0037	.02
	K - Diet	.0036	.01
Ca - Bal.	Mg - Bal.	1.720	.02
	P - Bal.	.239	.01
	S - Bal.	.247	.01
	N - Bal.	.048	.01
	Na - Bal.	.0020	.1
	K - Bal.	.0044	.01
Mg - Bal.	Ca - Diet	.576	.001
	Mg - Diet	.709	.001
	P - Diet	.915	.001
	S - Diet	.097	.001
	N - Diet	.015	.01
	Na - Diet	.0018	.01
	K - Diet	.0017	.001
Mg - Bal.	Ca - Bal.	.362	.02
	P - Bal.	.112	.001
	S - Bal.	.114	.01
	Na - Bal.	.0014	.001
	K - Bal.	.0022	.001

"y"	"x"	Slope	P<
P - Bal.	Ca - Diet	5.063	.001
	Mg - Diet	6.322	.001
	P - Diet	.057	.001
	S - Diet	.847	.001
	N - Diet	.145	.001
	Na - Diet	.015	.001
	K - Diet	.015	.001
P - Bal.	Ca - Bal.	3.494	.01
	Mg - Bal.	7.791	.001
	S - Bal.	1.014	.001
	N - Bal.	.151	.1
	Na - Bal.	.866	.01
	K - Bal.	.019	.001
S - Bal.	Ca - Diet	4.487	.001
	Mg - Diet	5.543	.01
	P - Diet	.915	.01
	S - Diet	.737	.01
	N - Diet	.120	.02
	Na - Diet	.012	.05
	K - Diet	.013	.01
S - Bal.	Ca - Bal.	3.108	.01
	Mg - Bal.	6.817	.01
	P - Bal.	.873	.001
	Na - Bal.	.009	.05
	K - Bal.	.016	.01

"y"	"x"	Slope	P<
N - Bal.	Mg - Diet	18.271	.1
	P - Diet	3.129	.1
	S - Diet	2.51	.1
	N - Diet	.506	.05
	K - Diet	.044	.1
N - Bal.	Ca - Bal.	14.317	.01
	P - Bal.	3.044	.1
	K - Bal.	.057	.1
Na - Bal.	Ca - Diet	365.4	.01
	Mg - Diet	443.1	.01
	P - Diet	77.0	.01
	S - Diet	60.8	.01
	N - Diet	9.524	.05
	Na - Diet	1.068	.05
	K - Diet	1.097	.01
Na - Bal.	Ca - Bal.	201.6	.1
	Mg - Bal.	668.4	.001
	P - Bal.	72.3	.01
	S - Bal.	69.5	.05
	K - Bal.	1.44	.01

TABLE LX
Significant Interrelationships
Slopes of Regression Lines

Continued

"y"	"x"	Slope	P<
K - Bal.	Ca - Diet	245.4	.001
	Mg - Diet	303.1	.01
	P - Diet	51.6	.001
	S - Diet	41.1	.01
	N - Diet	6.842	.01
	Na - Diet	.716	.02
	K - Diet	.742	.001
K - Bal.	Ca - Bal.	172.9	.01
	Mg - Bal.	409.2	.001
	P - Bal.	49.8	.001
	S - Bal.	51.1	.01
	N - Bal.	7.62	.1
	Na - Bal.	.55	.01
Ca - Ur.	N - Ur.	.0094	.1
	K - Ur.	.0017	.1
P - Ur.	Ca - Diet	-.853	.05
	Mg - Diet	-1.016	.1
	P - Diet	-.170	.1
	S - Diet	-.142	.05
	K - Diet	-.0025	.05
S - Ur.	P - Diet	.317	.1
	N - Diet	.049	.1
	Na - Diet	.006	.05
N - Ur.	Ca - Diet	16.572	.02
	Mg - Diet	20.693	.05
	P - Diet	3.475	.05
	S - Diet	2.636	.05
	N - Diet	.439	.1
	Na - Diet	.052	.05
	K - Diet	.049	.05
N - Ur.	Ca - Ur.	41.23	.1
K - Ur.	Ca - Ur.	226.5	.1

TABLE LXI

Tritium Measurements, Raw Data

Subject	S/N7-	C_{u+s}	C_u	B	Subject	S/N7-	C_{u+s}	C_u	B
B	1	52504.6	3446.9	31.3	B	62	58101.0	2144.0	30.3
B	2	46986.5	1975.0	31.3	B	65	52165.7	2155.8	30.1
B	4	45219.0	2276.8	29.2	B	66	48770.8	1911.6	30.1
B	5	50753.7	2572.3	31.3	L	67	38385.8	2541.5	27.4
?	6	46805.9	3723.3	31.3	B	68	47380.6	3056.2	30.1
?	7	44545.7	3067.9	31.3	L	69	42298.7	2166.9	30.1
B	8	51038.4	2476.9	31.3	L	70	44233.7	2226.2	27.4
B	9	41194.4	2747.5	29.1	L	71	54540.6	10846.5	30.7
B	10	56373.7	2460.8	29.1	L	75	54814.0	5442.6	27.4
B	11	52995.2	2256.7	29.1	B	76	55628.7	2131.0	30.7
B	12	52873.9	2605.8	29.1	L	77	45754.8	3258.3	28.4
B	13	48285.0	1942.9	29.2	L	78	50786.8	2629.0	30.3
B	14	51535.4	1053.5	27.2	L	79	44110.2	2621.3	27.4
B	15	43002.8	1740.3	29.1	B	80	60687.6	2405.7	30.3
B	16	49737.9	1471.4	29.1	L	81	51514.8	2290.7	30.1
B	17	50792.1	1177.5	27.2	L	83	50436.9	3457.7	28.4
L	18	41515.0	1463.4	29.1	B	84	52837.6	2476.0	30.0
L	21	42912.3	3131.2	29.2	B	85	56985.1	2396.7	30.3
L	22	40669.3	5267.4	29.2	L	86	50132.5	2302.0	30.7
B	24	45768.5	2637.5	29.2	L	87	51880.9	13565.2	28.8
L	25	41094.2	2500.6	30.3	B	88	43260.3	2109.2	30.3
L	26	43175.7	2812.9	30.3	L	90	43882.1	2001.5	30.0
?	27	46258.3	4531.2	24.6	B	91	51663.1	1418.0	30.0
B	29	58607.1	2590.2	30.7	L	92	44396.4	2311.1	27.4
L	31	43841.2	1706.5	22.8	L	93	48416.0	2517.2	30.3
B	32	53038.8	2413.5	30.3	B	95	51452.7	2481.1	28.8
B	33	51850.5	1540.6	24.6	B	96	62081.8	2596.6	30.7
?	34	46317.9	2491.2	24.6	L	97	43367.4	1978.0	24.6
L	35	51840.8	4295.6	30.3	L	98	49112.2	2238.0	27.2
L	36	50966.6	2749.7	30.3	L	100	55330.9	2532.6	30.7
L	37	48668.9	3355.6	30.3	L	101	56978.8	4968.5	30.7
L	39	50172.5	2417.6	24.4	B	102	52147.4	1582.8	28.8
L	41	48744.9	2053.6	24.4	L	103	44866.4	3361.9	28.8
L	42	50340.6	2300.8	24.6	B	104	67493.1	9837.5	27.2
L	45	53227.6	7609.3	27.4	B	105	47724.9	2018.8	30.7
L	47	49318.1	3199.9	24.4	B	106	52941.1	1993.4	28.8
B	48	56769.5	2584.1	30.3	B	108	53281.7	2082.1	30.7
L	49	45304.3	2336.9	30.1	B	109	57156.4	1874.4	30.7
B	51	58947.7	1368.3	30.3	B	111	55454.1	2857.4	30.7
B	52	62646.9	2277.6	30.3	L	112	42353.6	1931.0	28.8
L	53	41965.4	1951.7	30.3	B	113	57134.9	1970.7	24.4
L	54	49104.1	3177.6	30.3	B	114	49768.6	1939.3	28.8
B	55	58695.9	1707.1	30.7	L	116	49924.7	3715.8	27.2
L	56	45525.5	3136.9	27.4	B	117	57168.0	3911.6	27.2
B	60	47126.9	1815.6	27.4	B	118	49686.4	3069.7	27.2
B	61	46287.5	2722.9	28.4					

TABLE LXII

Inflight Urine Volumes

(A) F.B.

S/N7-	G.E.T.	Vol.(T)*	Vol.(M)+
11	04:54	363.5	441.9
102	14:00	519.2	598.
95	21:33	318.7	371.3
61	32:24	258.0	172.9
88	48:21	315.9	86.9
68	56:25	233.8	65.9
76	68:25	406.5	480.1
105	77:45	366.9	122.7
9	89:06	225.7	325.5
15	94:42	384.8	343.2
108	99:24	398.3	380.1
12	102:14	311.3	357.1
109	112:10	478.5	-----
17	117:45	688.4	42.0
33	123:14	539.6	51.1
?	128:07	?	?
60	136:00	404.4	308.3
2	143:39	369.6	341.7
13	149:13	386.5	352.1
55	159:46	542.5	482.7
66	165:30	397.5	426.6
106	170:00	413.9	276.7
08	173:42	316.9	318.4
04	185:00	304.9	293.5
24	192:51	276.1	333.4
65	195:12	375.4	389.6
85	207:40	368.1	426.3
14	212:31	314.0	426.6
117	215:13	218.8	285.5
104	220:31	37.5	215.8
62	223:50	422.5	229.1
96	233:24	370.0	114.7
51	237:35	686.8	675.4
5	237:49	302.7	198.1
29	240:45	349.3	189.2
32	247:58	339.0	395.8
111	257:00	296.9	275.5
91	267:11	577.6	450.8
113	268:40	452.3	153.4
16	282:52	534.1	601.3
80	286:32	391.6	398.5
48	290:40	338.6	261.0
1	297:48	227.0	-----
114	308:17	399.5	289.1
10	311:30	353.8	95.2
84	315:25	328.6	-----
118	322:50	244.5	-----
52	326:32	428.7	-----

(B) J.L.

S/N7-	G.E.T.	Vol.(T)*	Vol.(M)+
45	04:38	90.7	-----
18	11:50	420.8	-----
31	21:33	377.1	368.6
77	32:25	198.3	172.9
47	46:00	218.8	-----
71	48:20	121.8	43.7
?	52:06	-----	192.1
?	56:30	-----	217.3
?	68:50	-----	29.9
22	77:46	109.8	344.7
87	80:41	42.7	-----
103	89:00	187.5	243.0
49	94:40	280.7	493.7
92	102:13	277.7	371.0
25	118:00	235.4	326.6
112	121:08	320.2	377.5
67	127:30	214.8	-----
41	140:10	346.7	428.3
26	146:37	218.6	203.7
56	159:02	205.4	223.8
78	165.51	279.2	356.2
79	171:47	241.0	289.4
53	185:17	313.8	391.7
90	192:50	320.1	276.4
69	197:28	283.0	290.0
97	209:09	319.3	277.6
70	215:25	287.9	283.2
21	220:33	193.2	319.2
36	231:52	267.2	189.5
93	237:35	378.1	275.5
98	244:00	326.3	253.0
37	254:21	205.3	227.6
86	266:20	317.3	-----
100	272:10	318.0	110.6
39	282:39	300.7	298.6
81	286:00	328.1	121.8
54	290:44	219.8	143.1
101	302:19	158.7	261.0
42	308:21	317.9	230.9
75	313:50	137.4	184.2
116	317:35	188.8	-----
83	322:50	206.4	-----
35	326:44	168.0	-----

* - Volume calculated from tritiated water dilution (Table LXI).

+ - Volume calculated from on-board flow meter.

Figure 1A

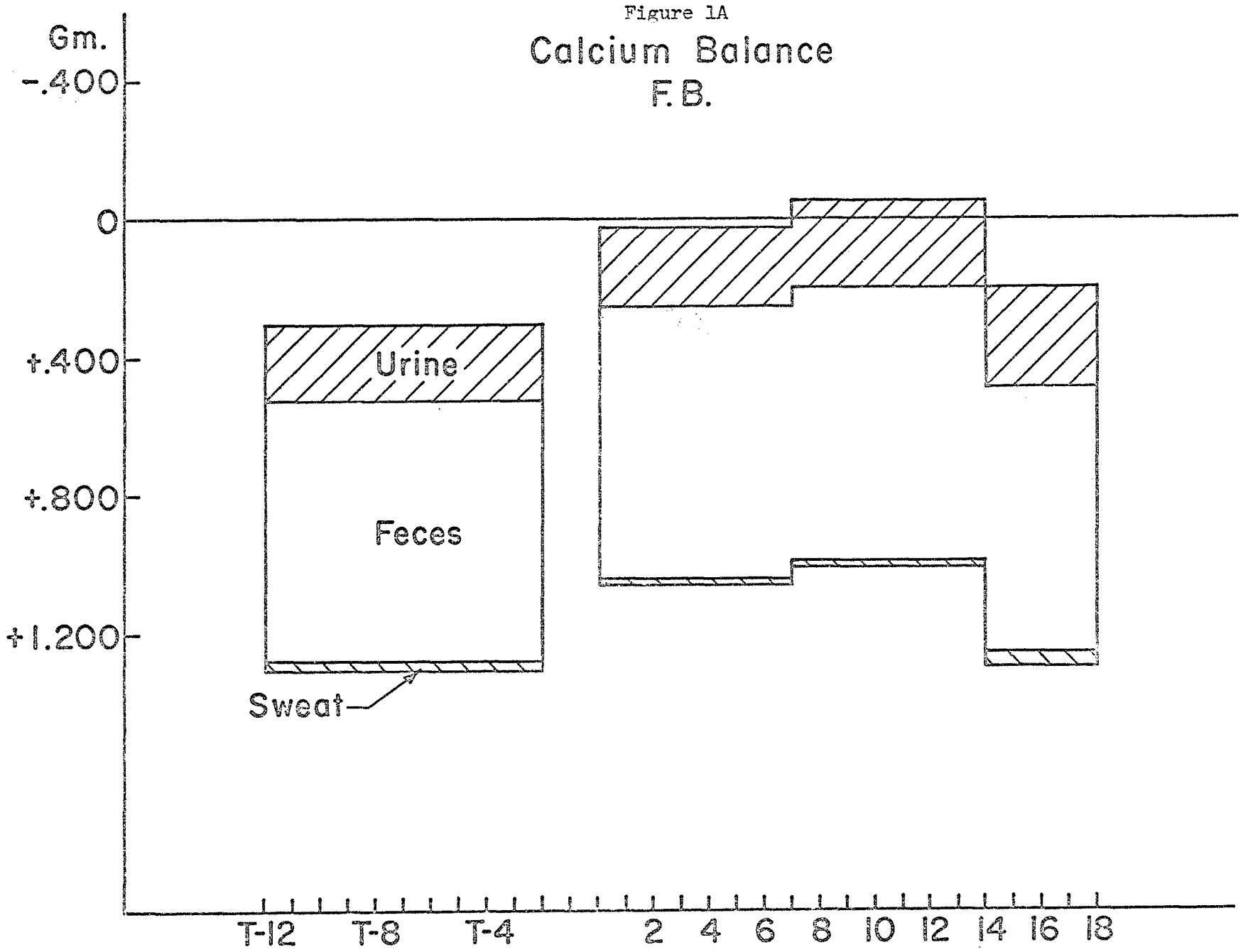

Calcium Balance
F.B.
Gm.
-.400
0
+.400
+.800
+1.200
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 1B

Calcium Balance

J. L.

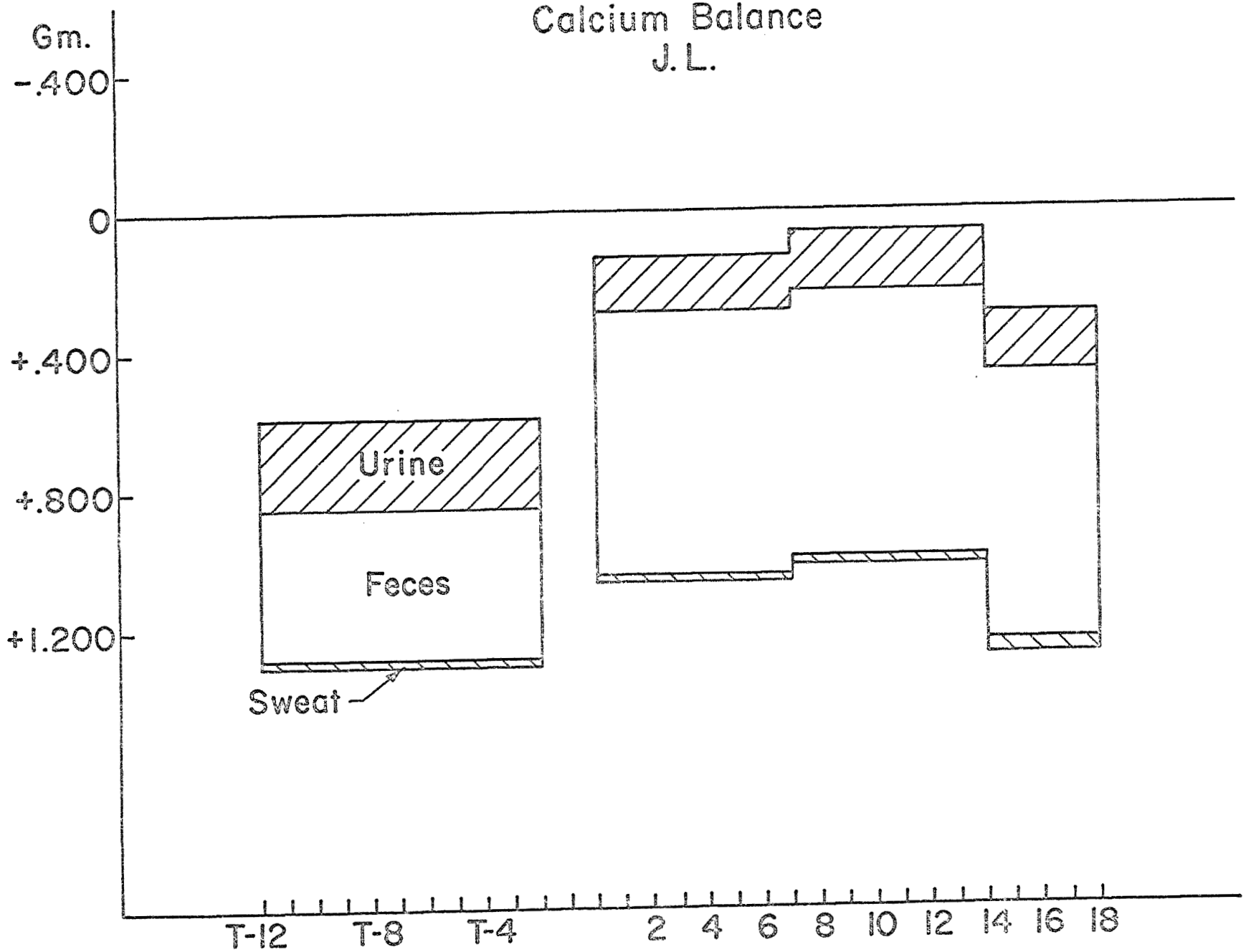


Figure 1C

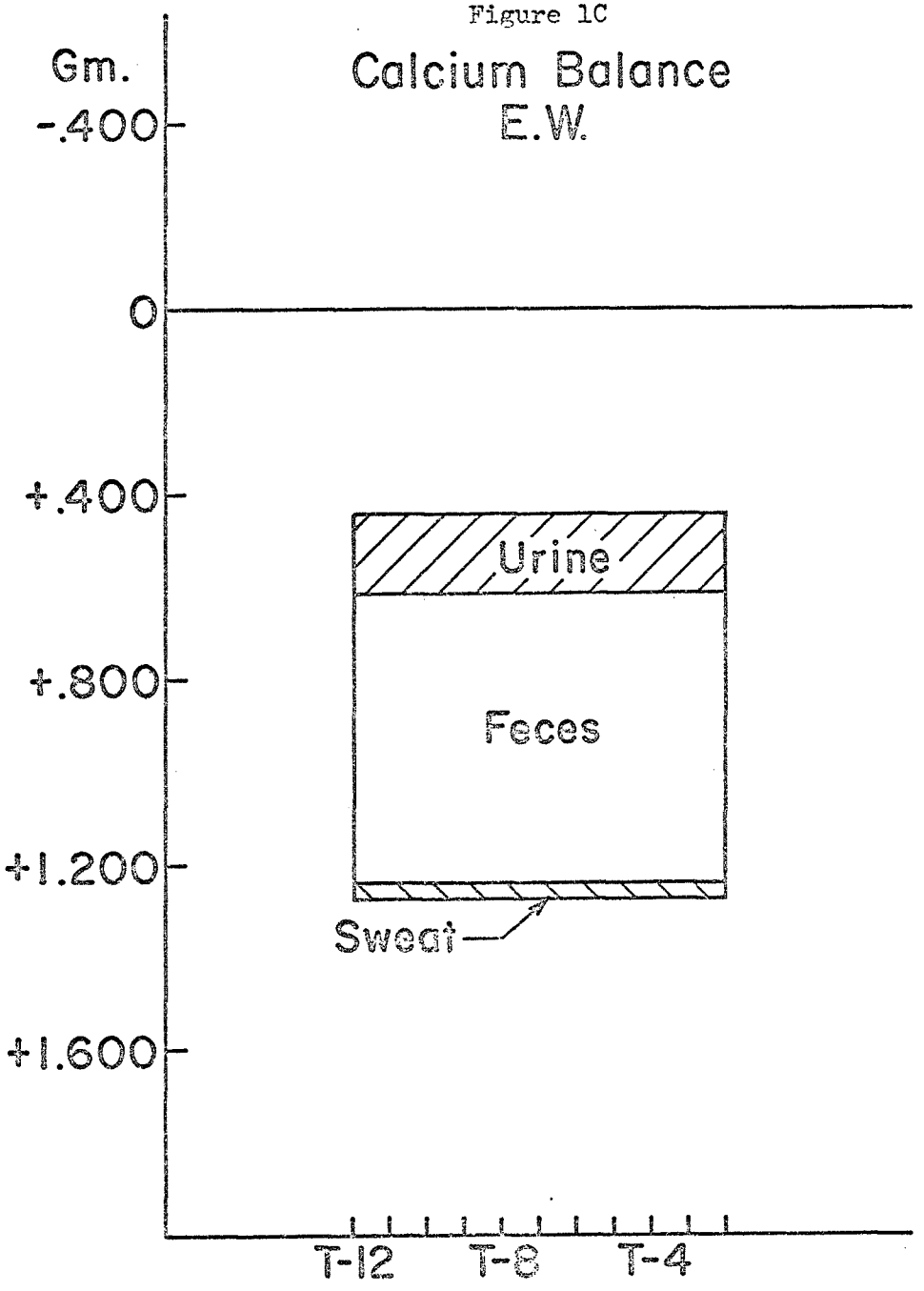

Gm.
Calcium Balance
E.W.
-.400
0
+.400
+.800
+1.200
+1.600
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 1D

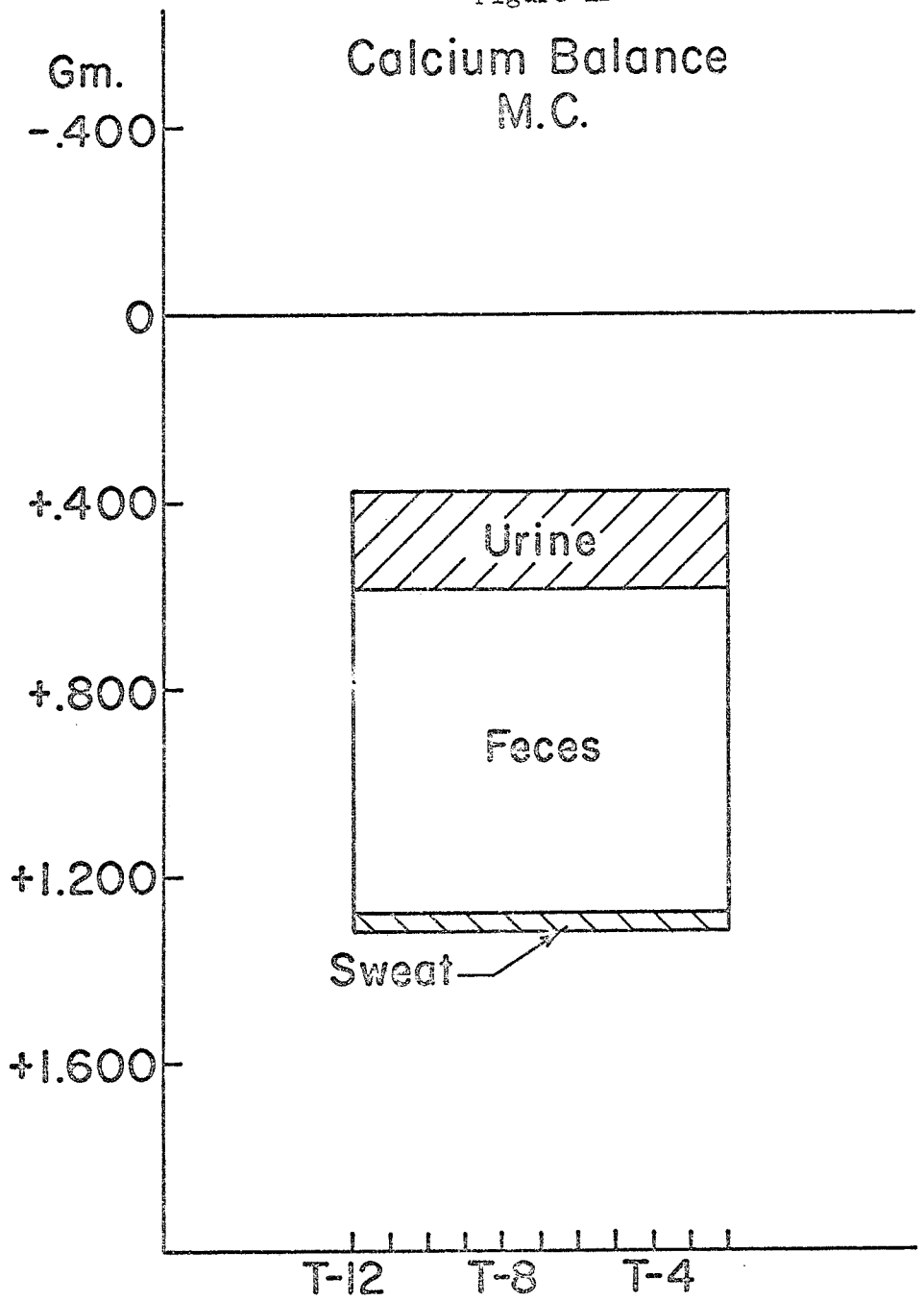

Calcium Balance
M.C.
Gm.
-.400
0
+.400
+.800
+1.200
+1.600
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 2A

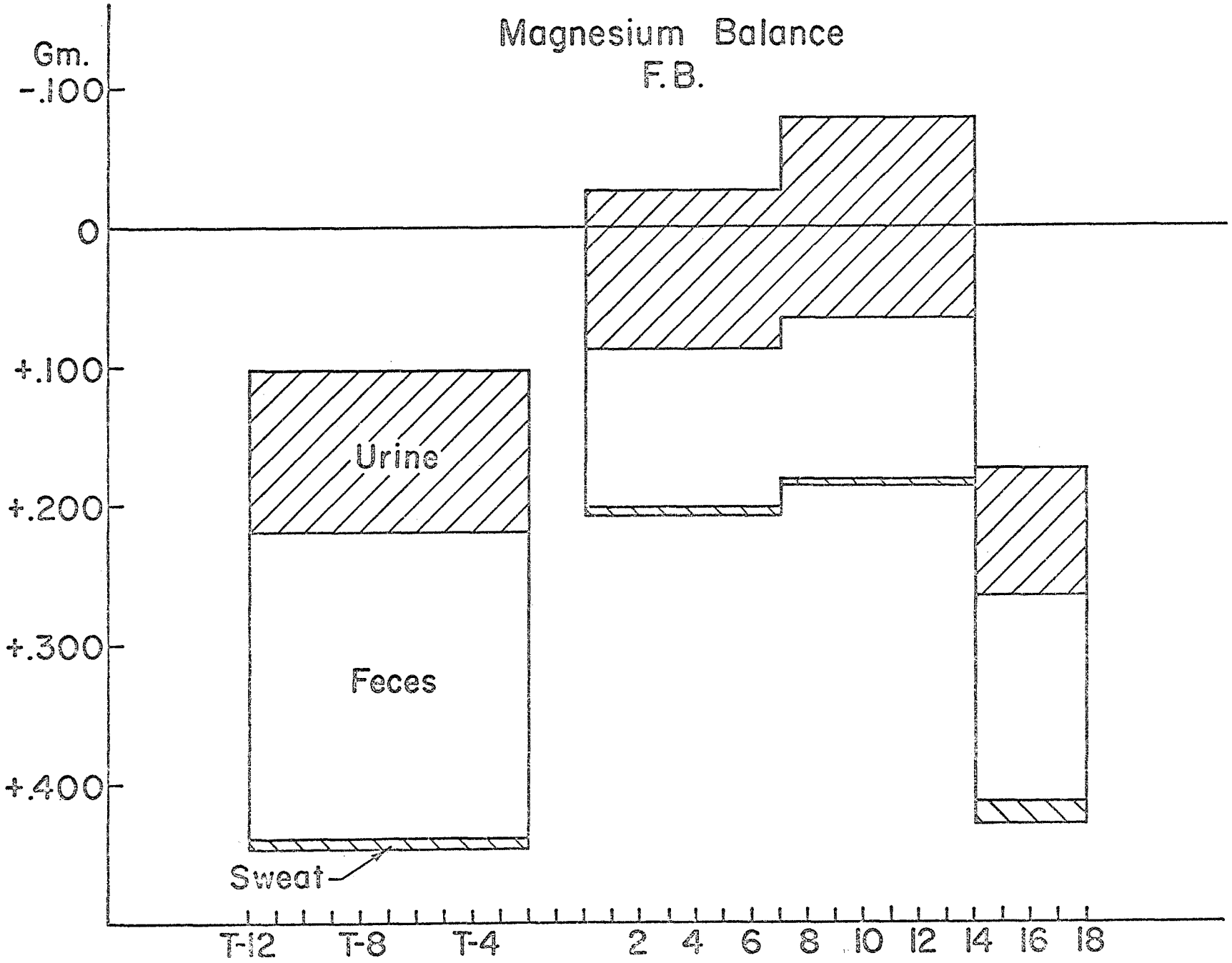

Magnesium Balance
F.B.
Gm.
-.100
0
+.100
+.200
+.300
+.400
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 2B

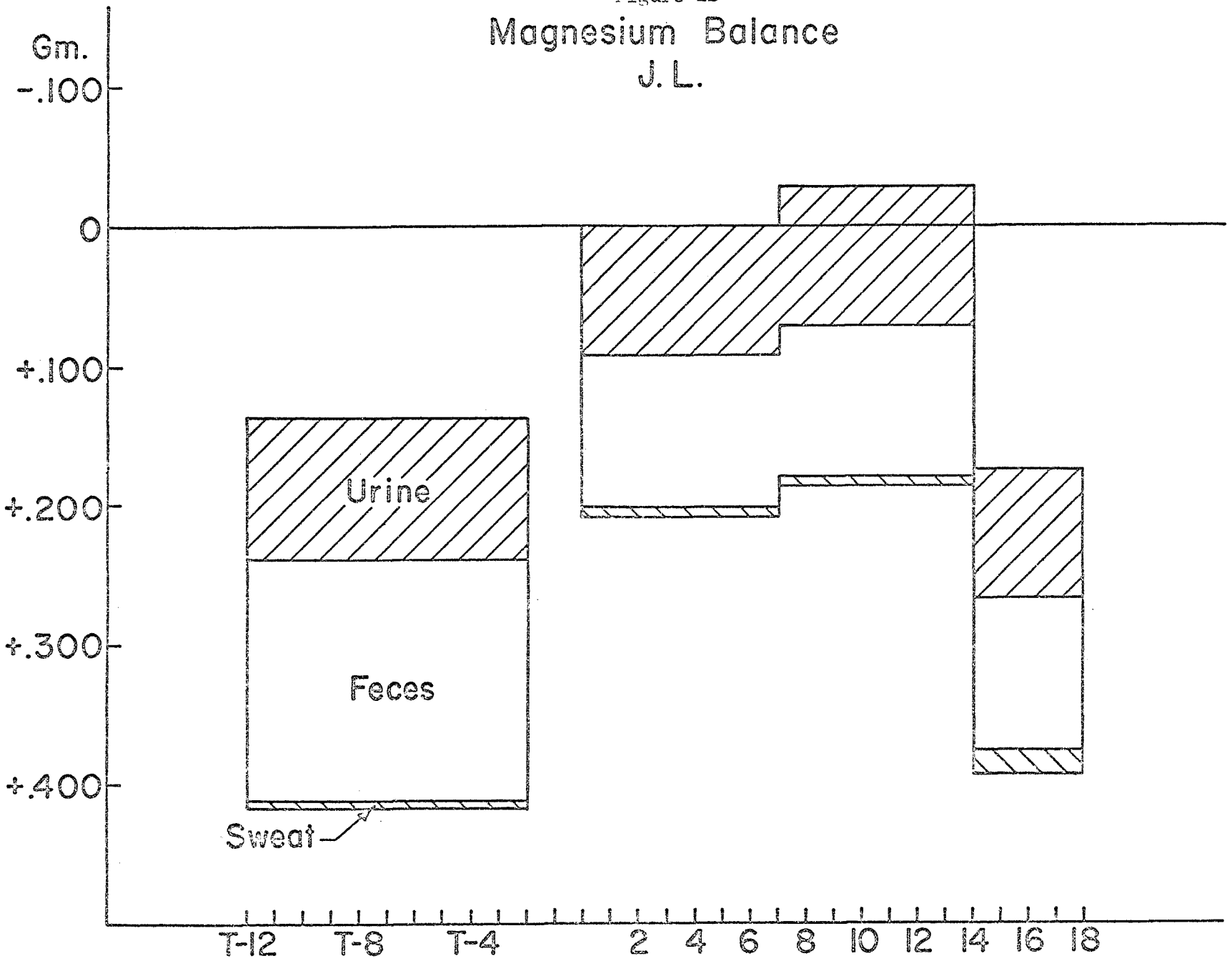

Magnesium Balance
J. L.
Gm.
-.100
0
+.100
+.200
+.300
+.400
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 2C

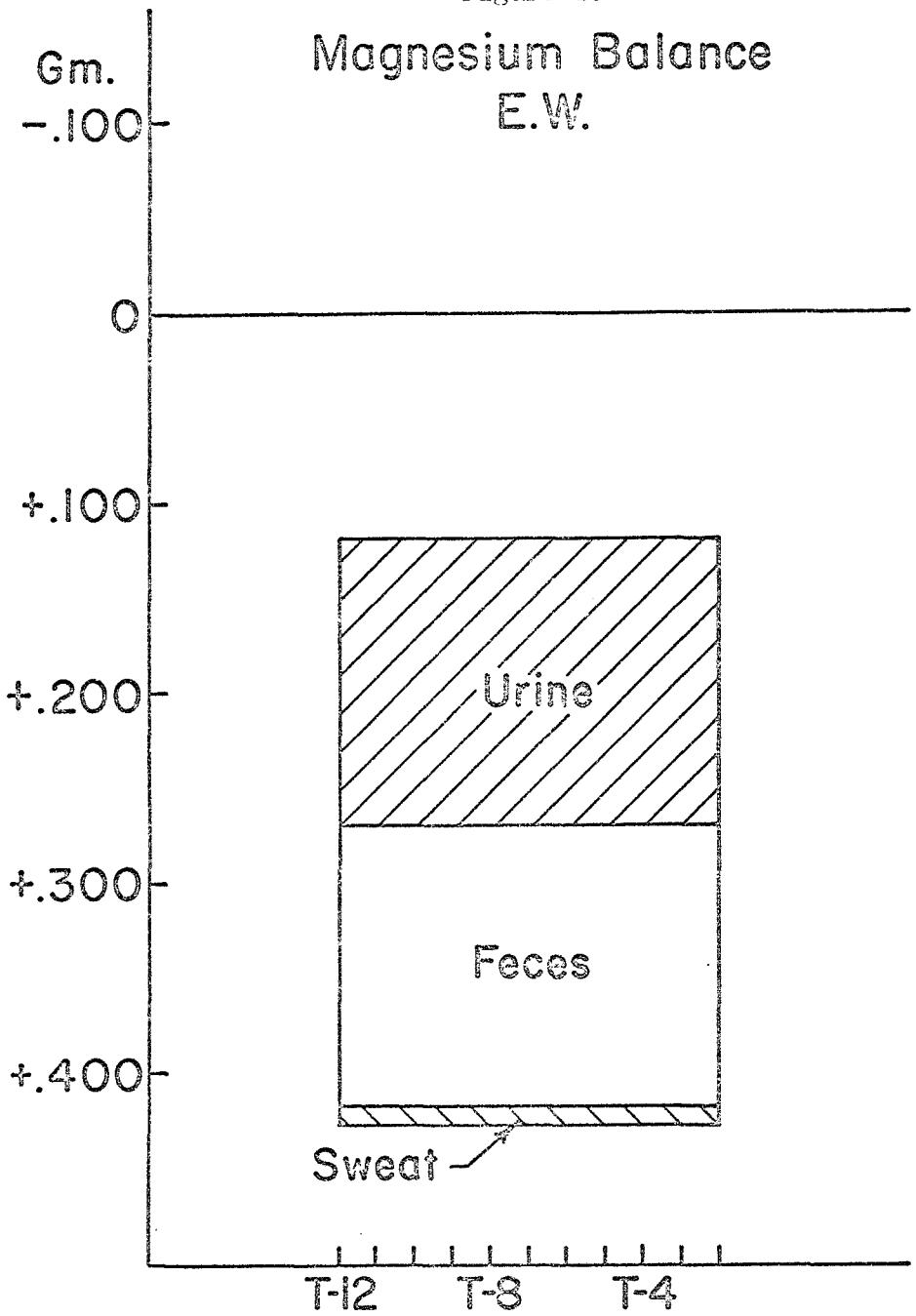

Magnesium Balance
E.W.
Gm.
-.100
0
+.100
+.200
+.300
+.400
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 2D

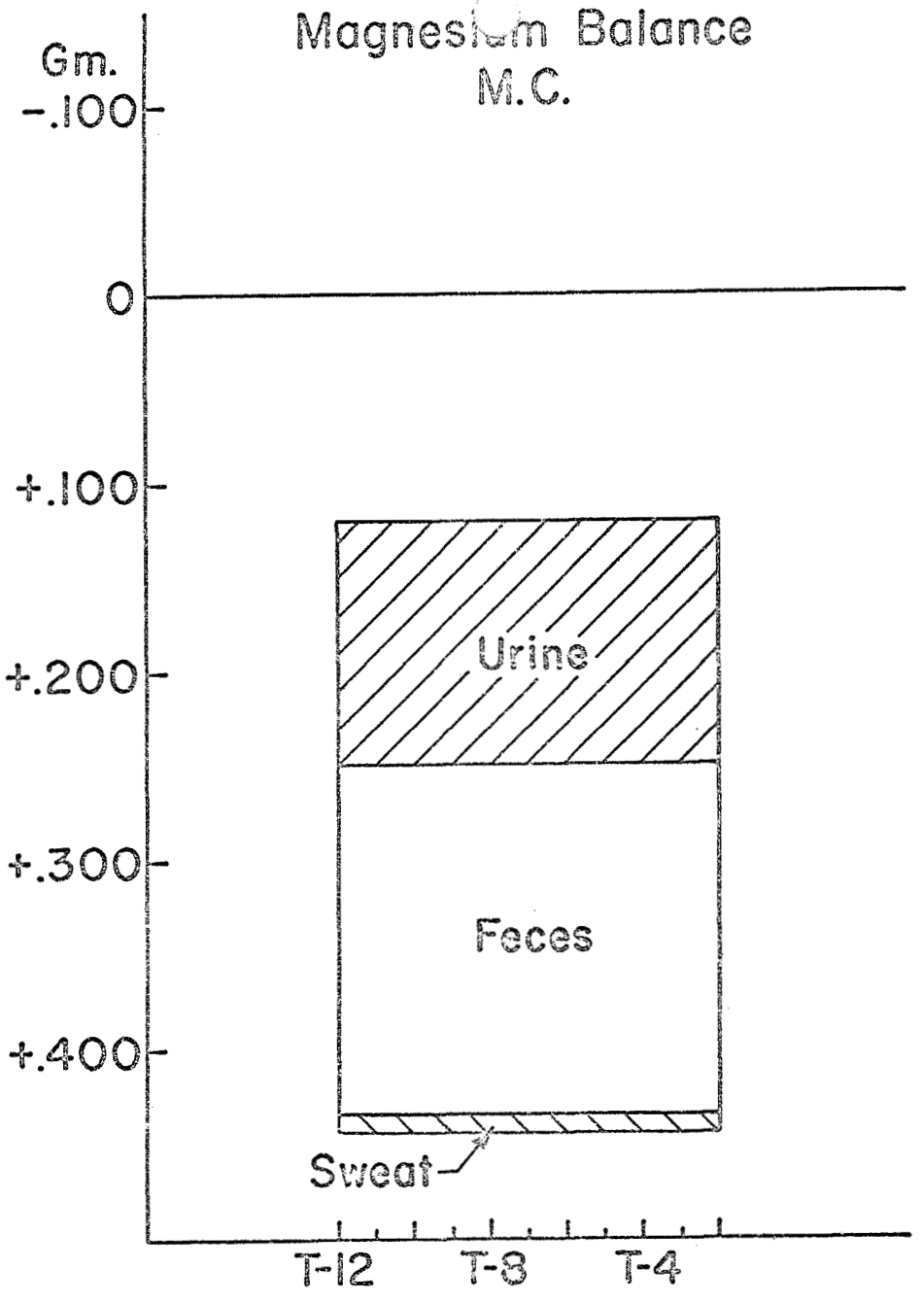

Magnesium Balance
M.C.
Gm.
-.100
0
+.100
+.200
+.300
+.400
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 3A

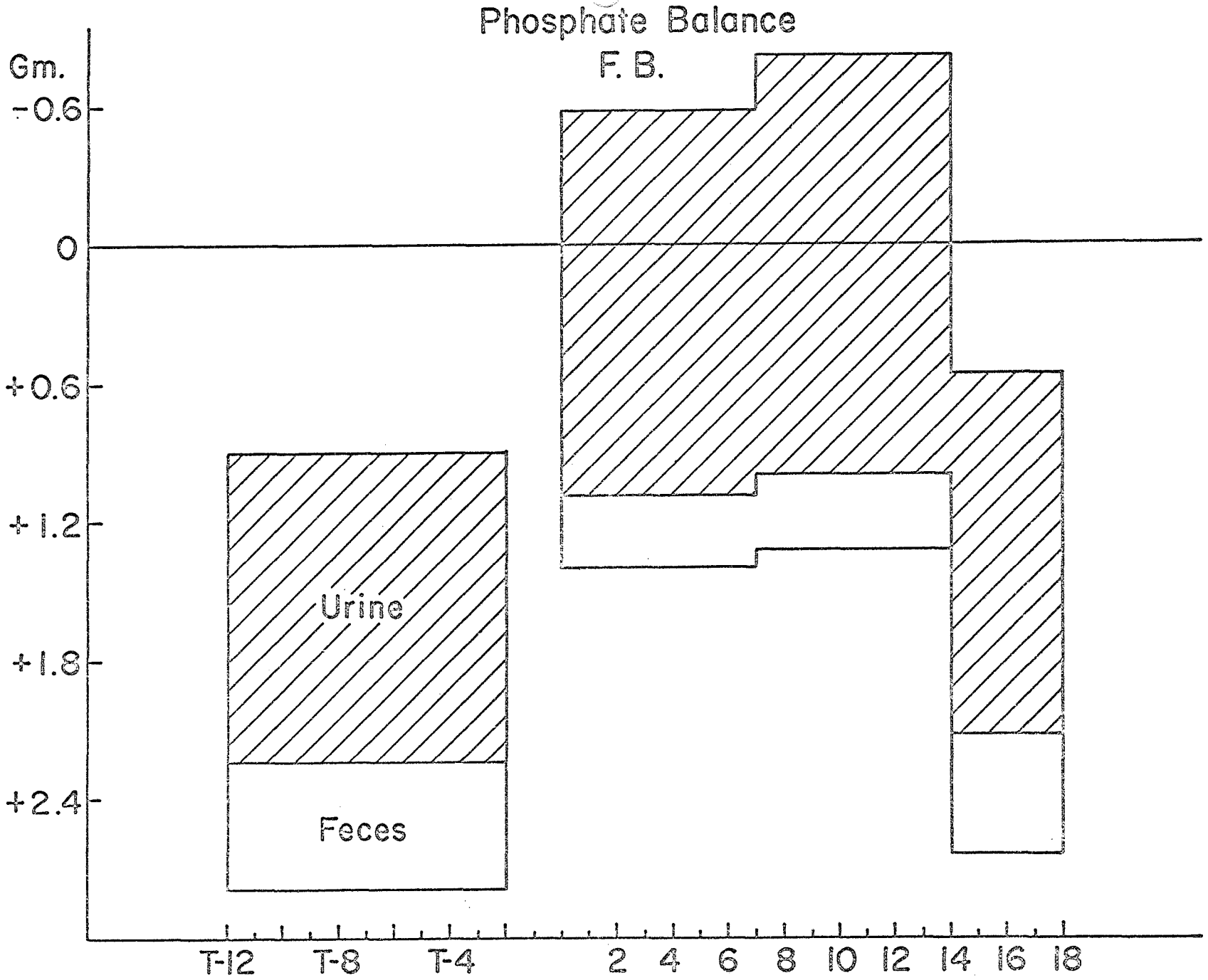

Phosphate Balance
F. B.
Gm.
-0.6
0
+0.6
+1.2
+1.8
+2.4
Urine
Feces
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 3B

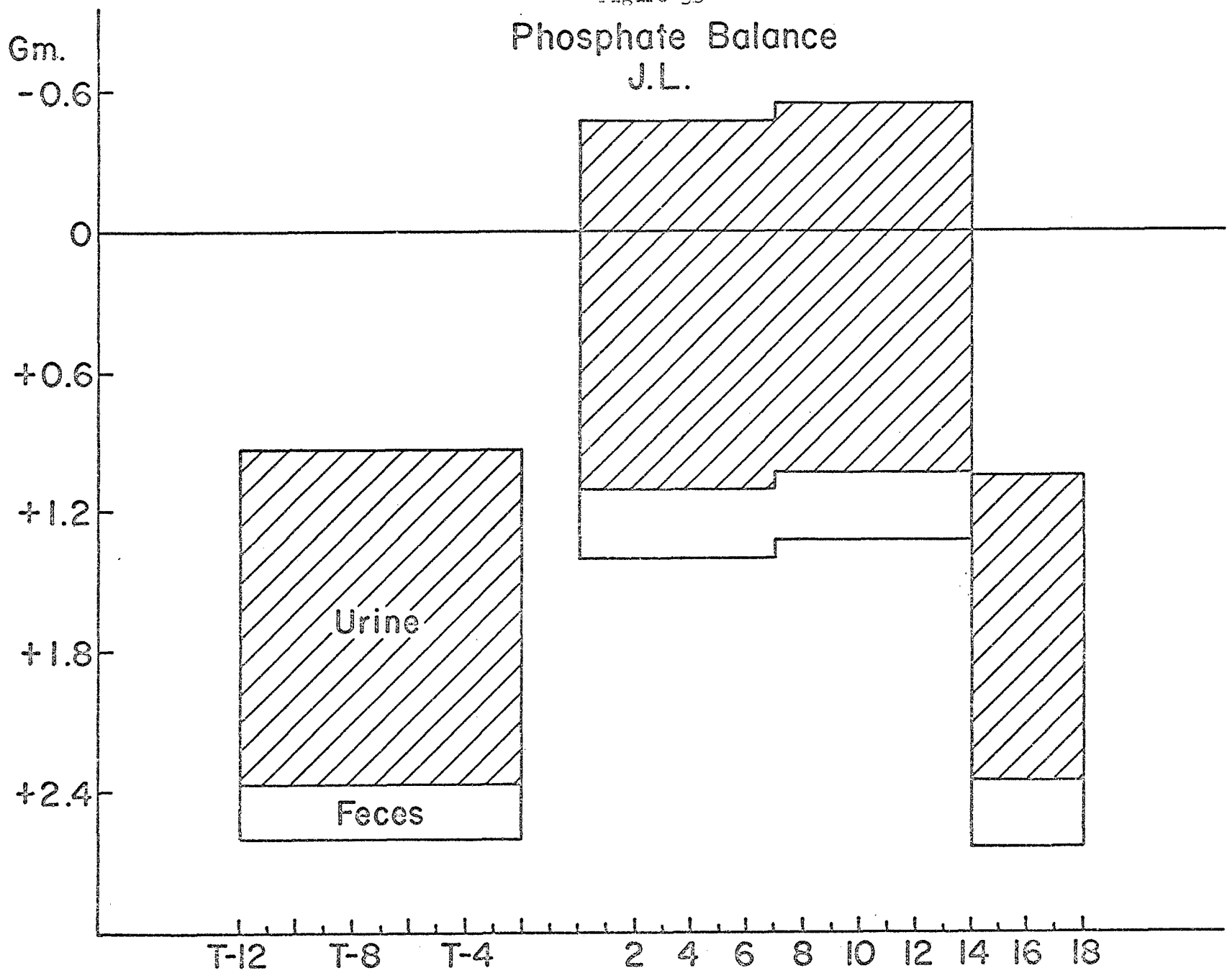

Phosphate Balance
J.L.
Gm.
-0.6
0
+0.6
+1.2
+1.8
+2.4
Urine
Feces
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 3C

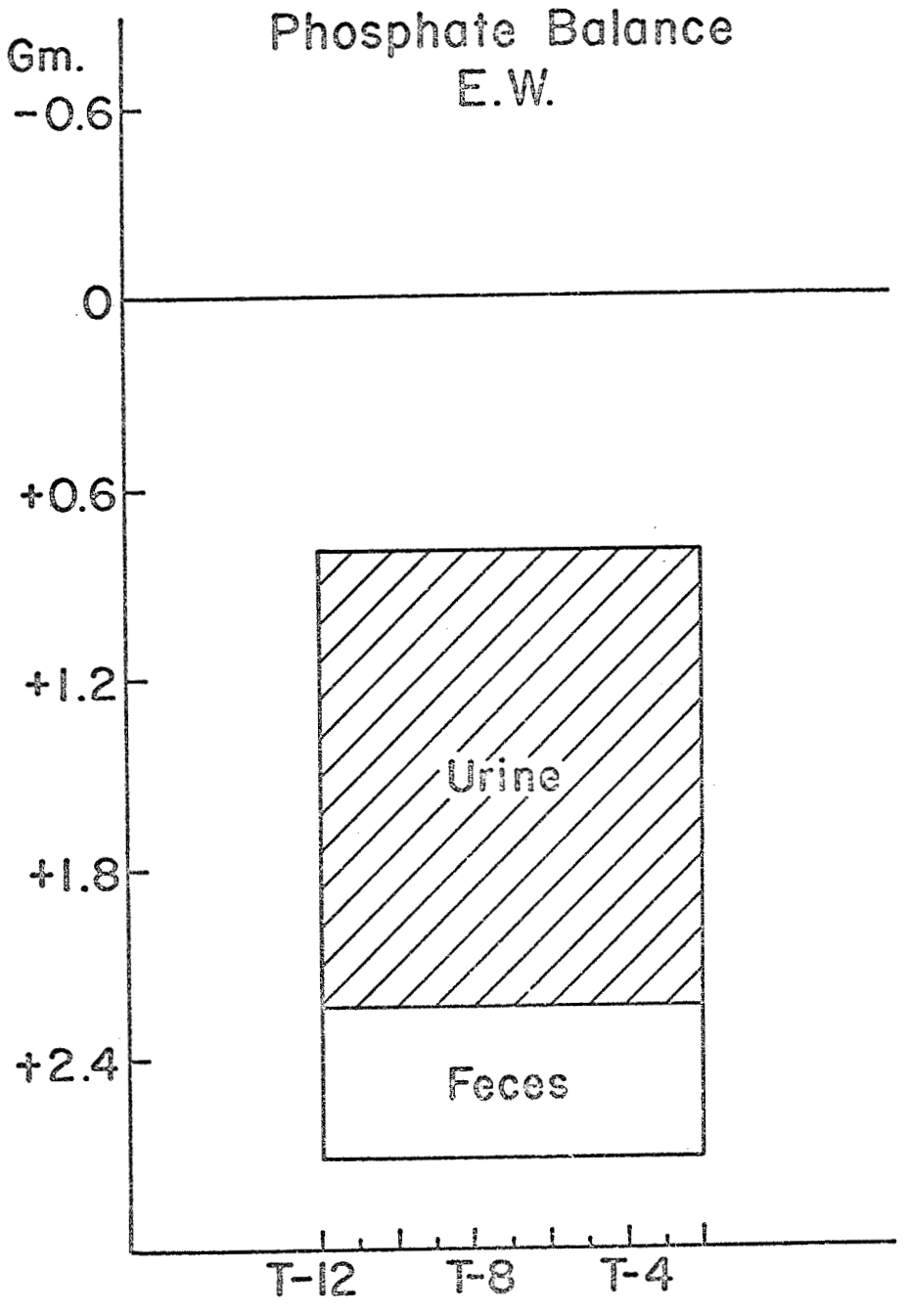


Figure 3D

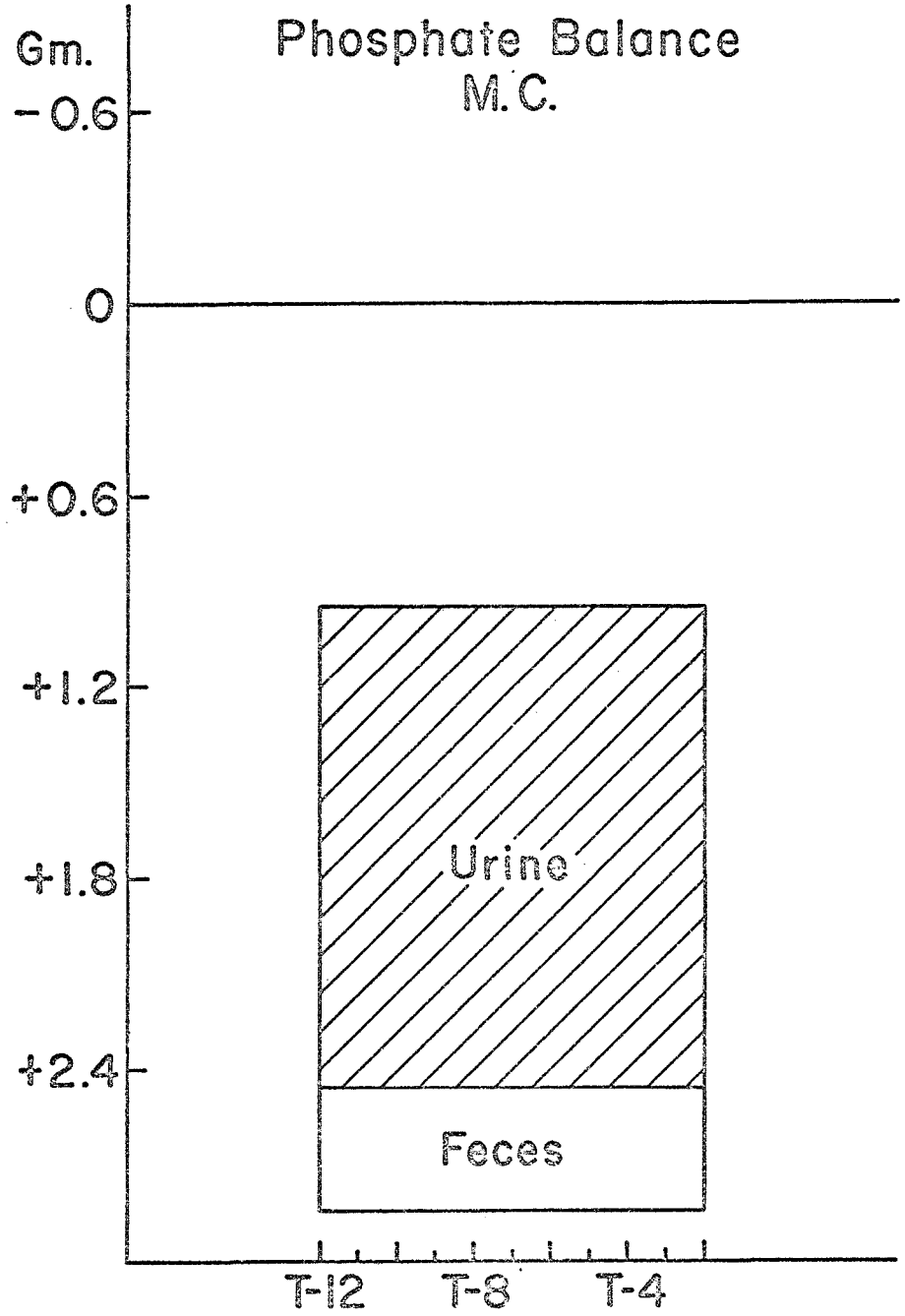


Figure 4A

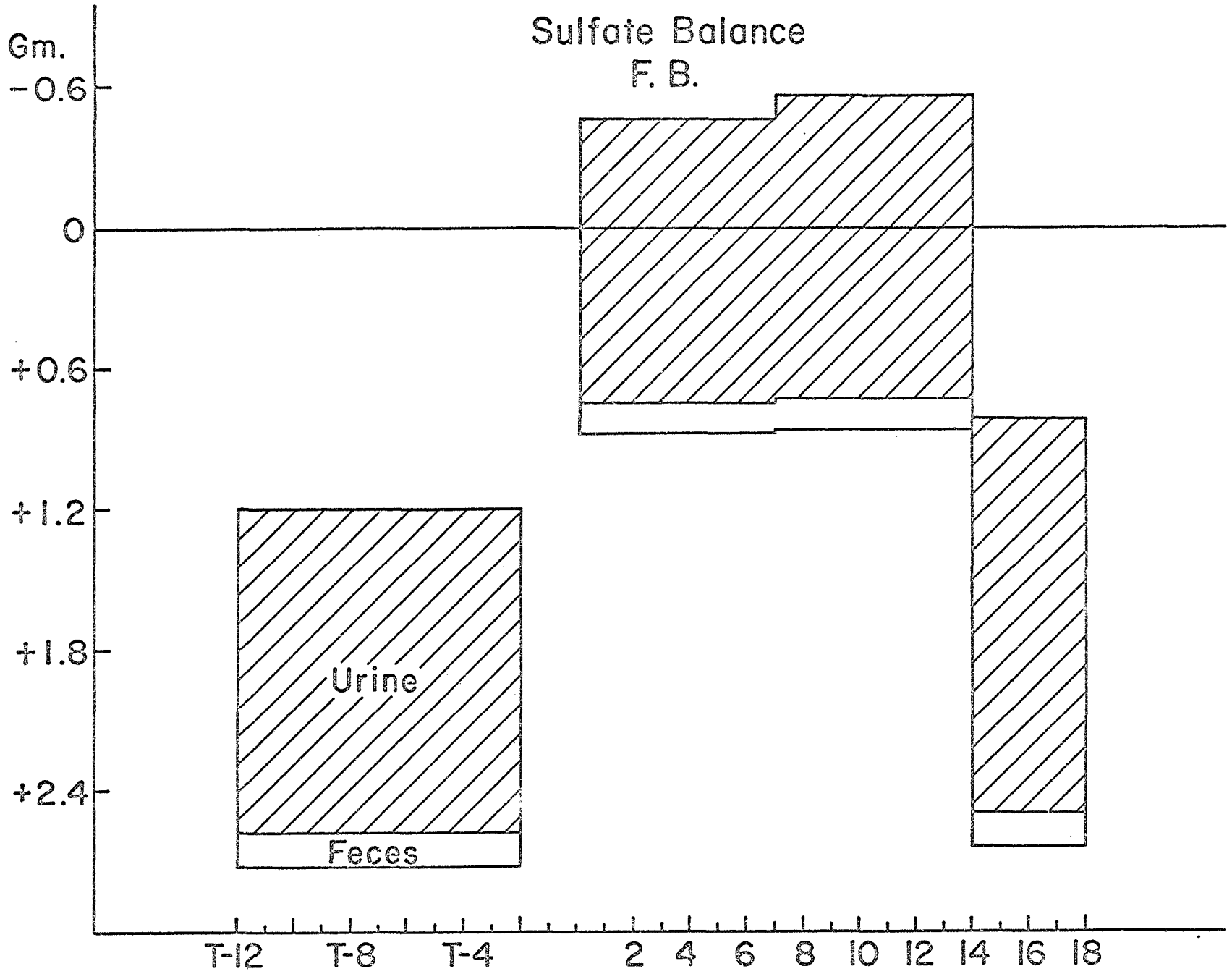

Sulfate Balance
F. B.
Gm.
-0.6
0
+0.6
+1.2
+1.8
+2.4
Urine
Feces
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 4B

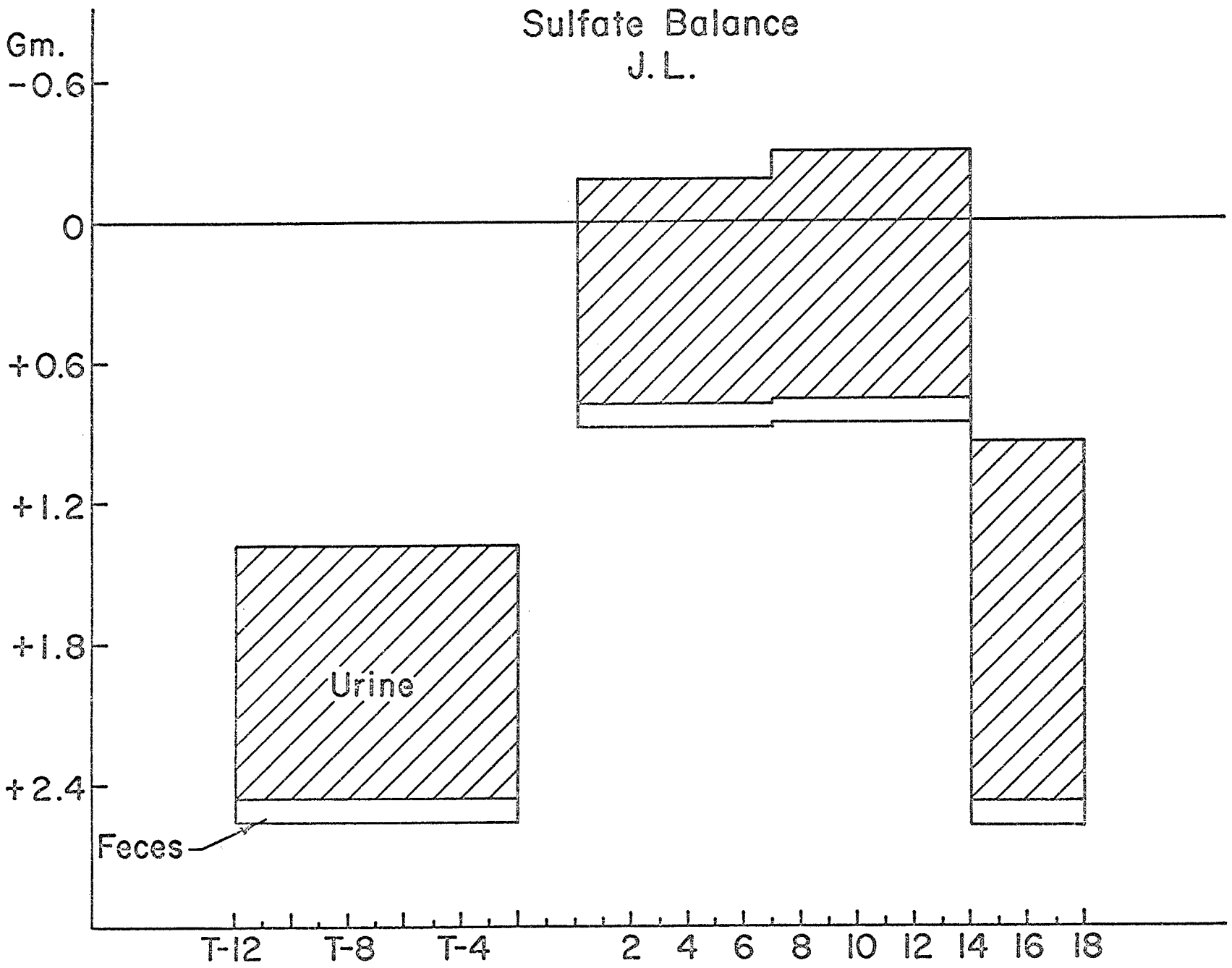

Sulfate Balance
J. L.
Gm.
-0.6
0
+0.6
+1.2
+1.8
+2.4
Urine
Feces
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 4C

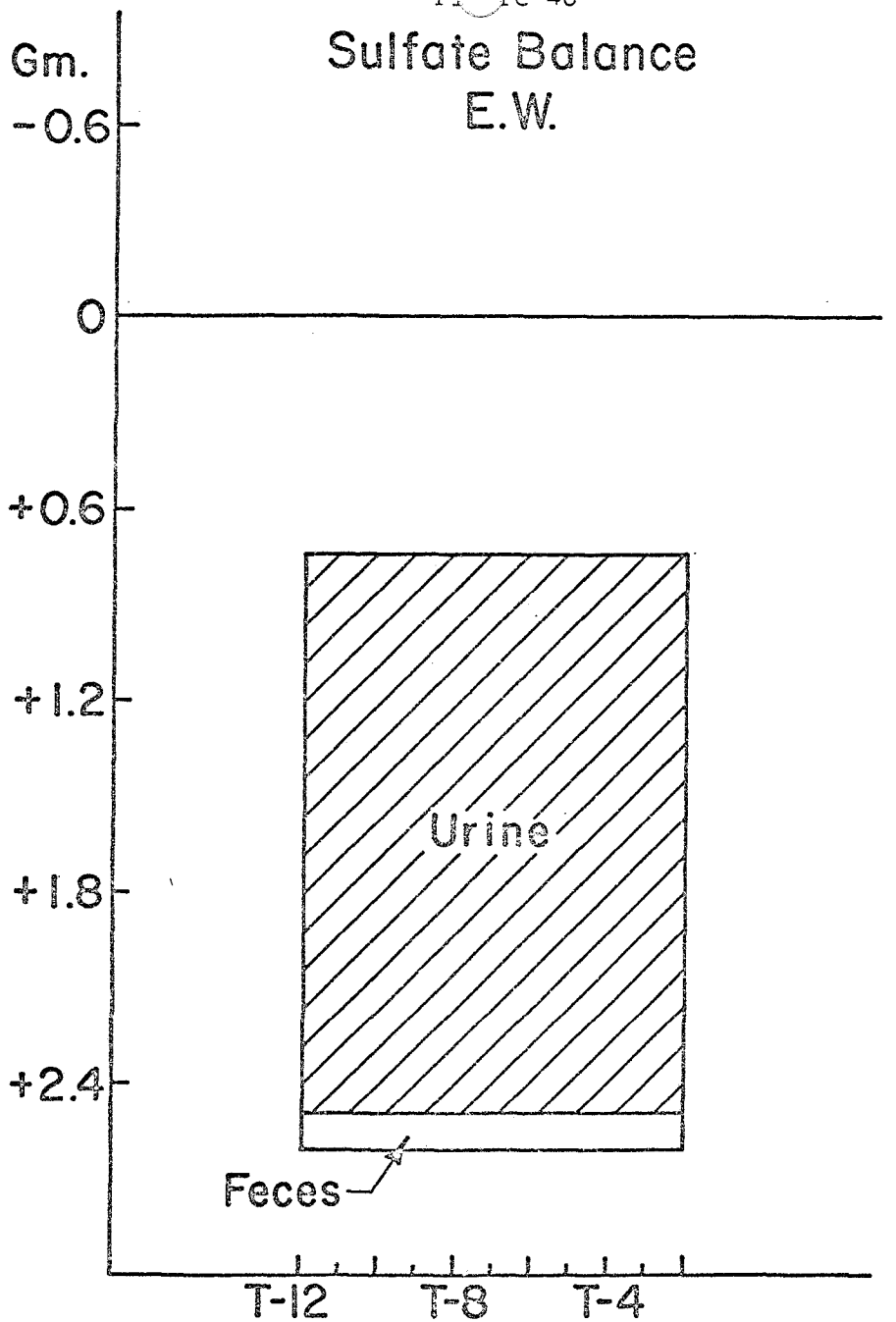
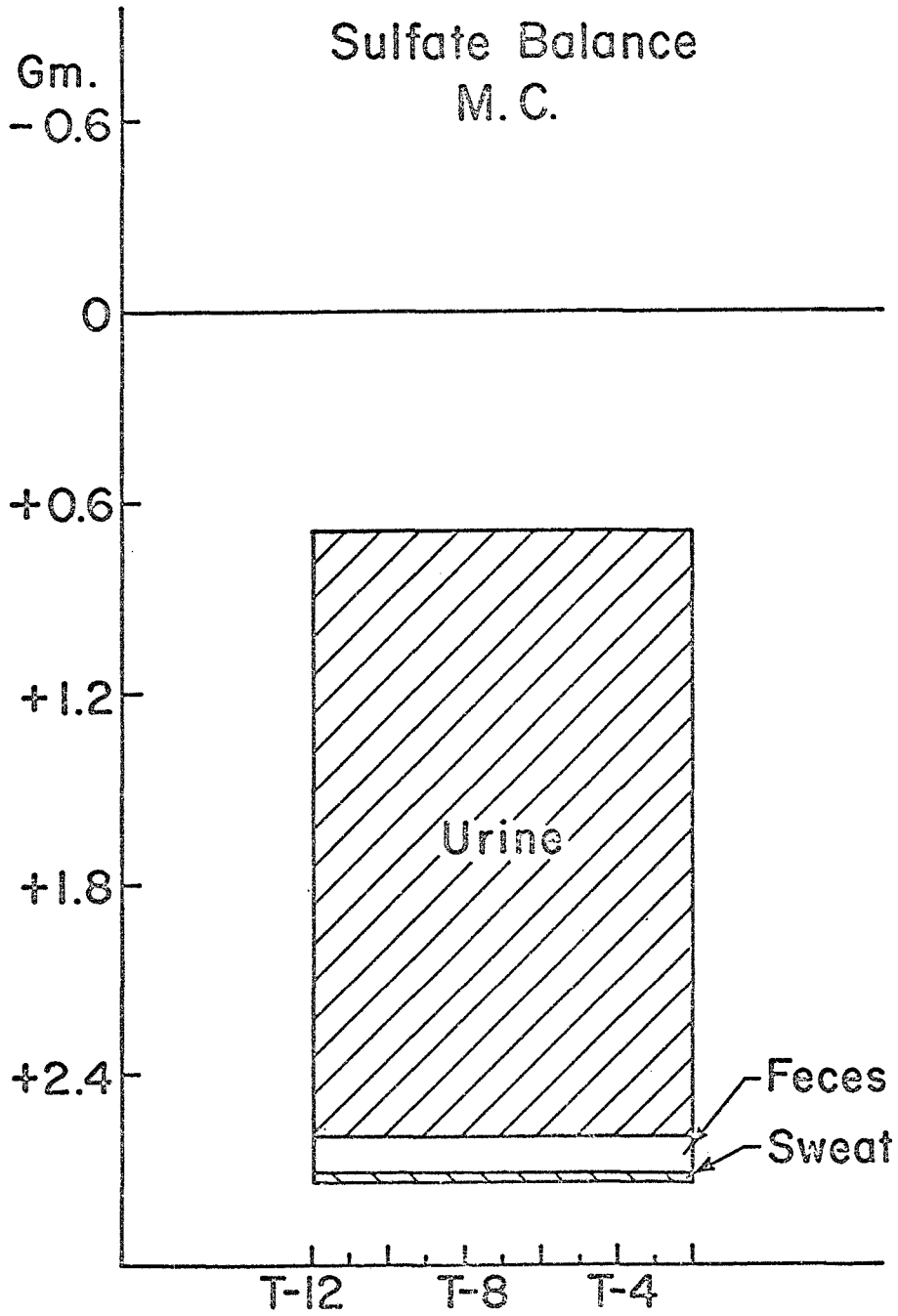


Figure 4D


Sulfate Balance
M. C.
Gm.
-0.6
0
+0.6
+1.2
+1.8
+2.4
Urine
Feces
Sweat
T-12
T-8
T-4

gure 5A

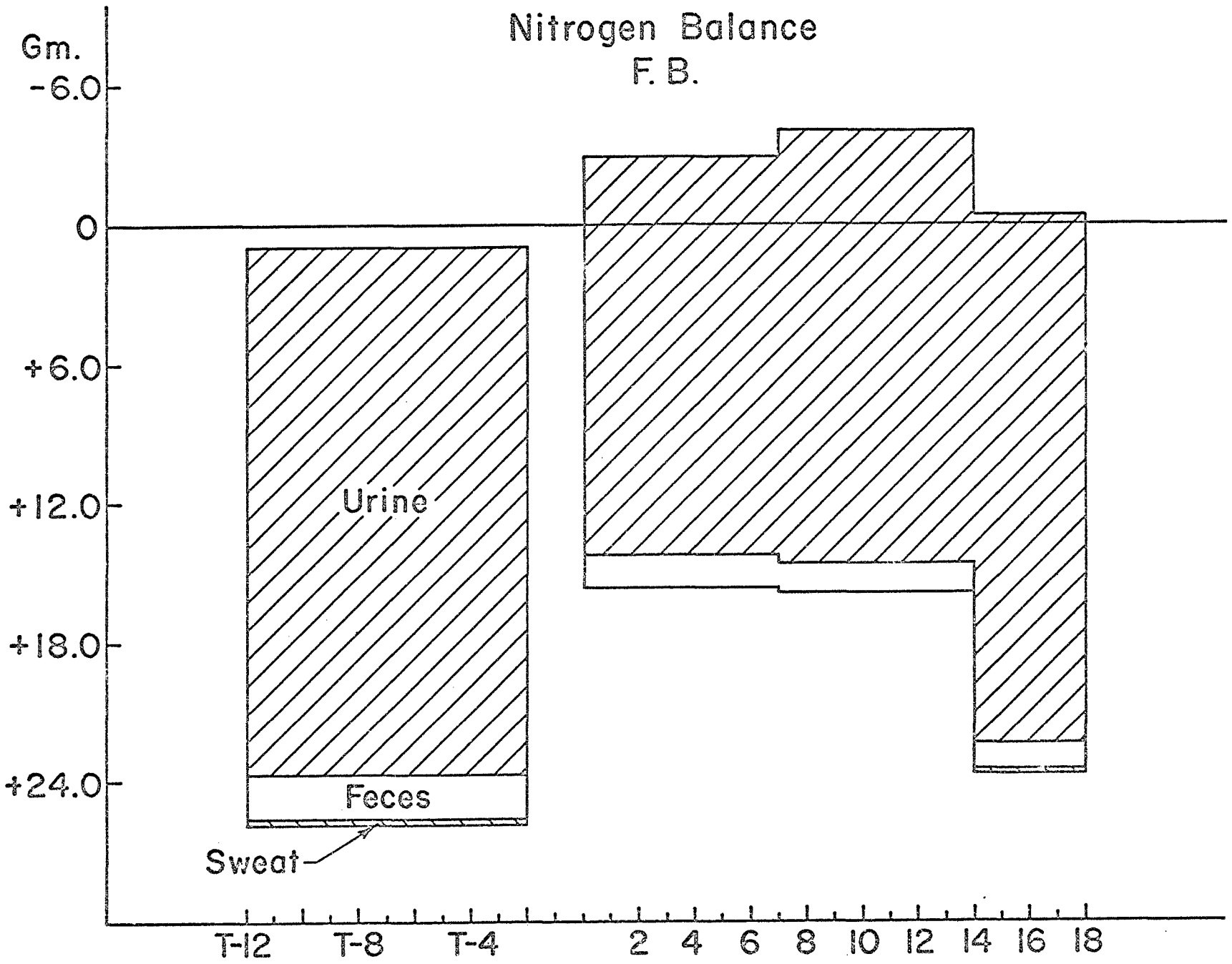

Nitrogen Balance
F. B.
Gm.
-6.0
0
+6.0
+12.0
+18.0
+24.0
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 5B

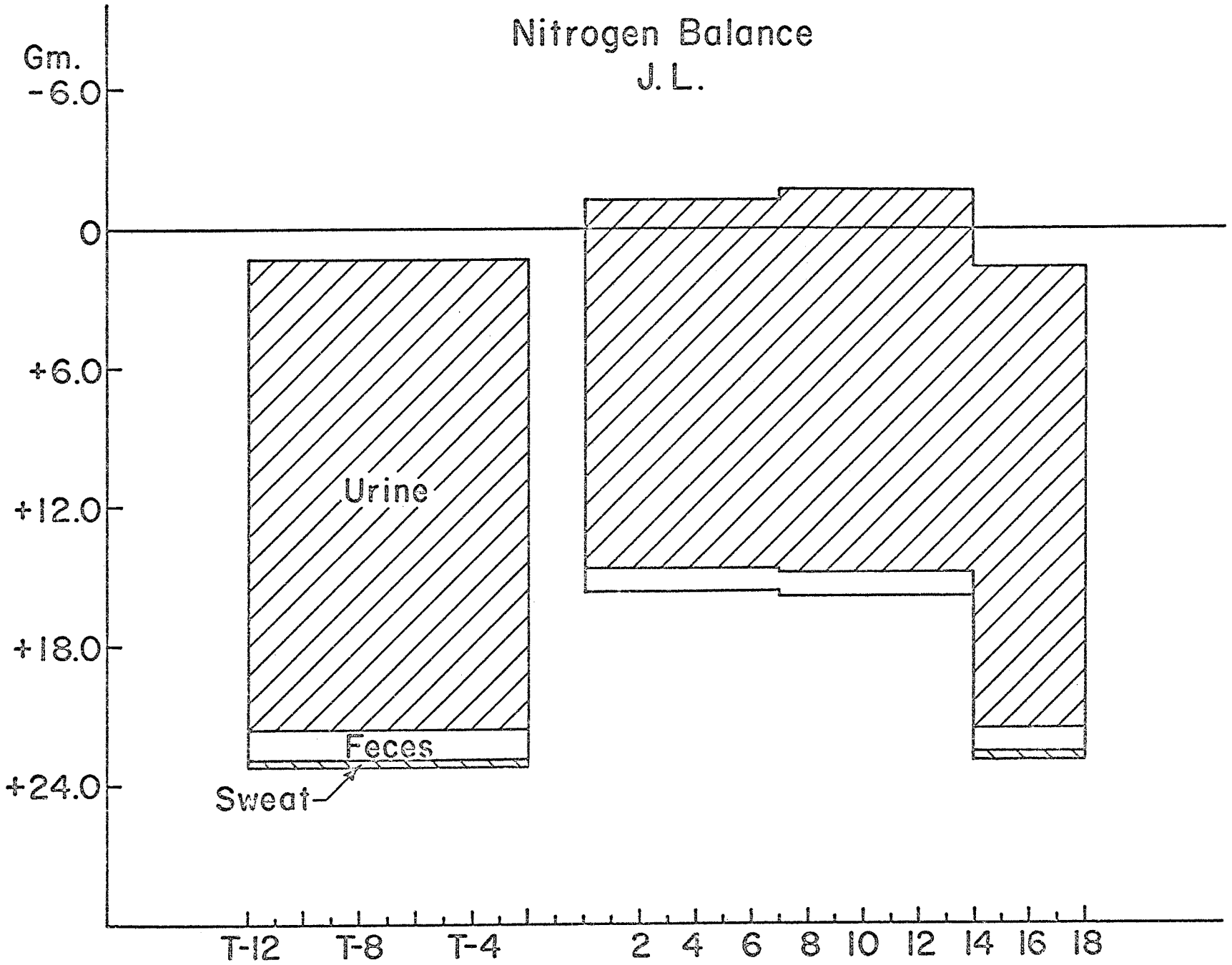

Nitrogen Balance
J. L.
Gm.
-6.0
0
+6.0
+12.0
+18.0
+24.0
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 5C

Nitrogen Balance
E.W.

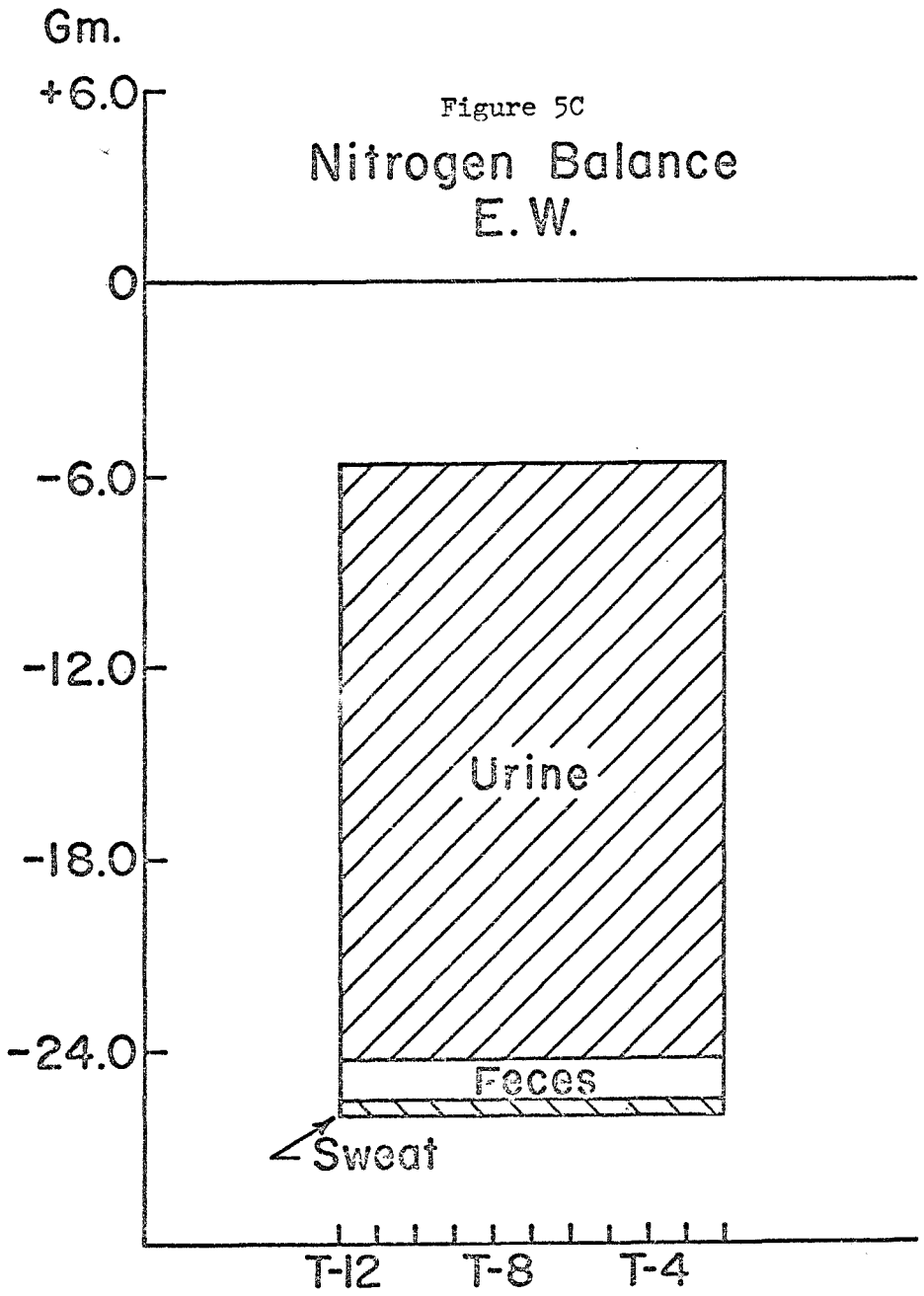


Figure 5D

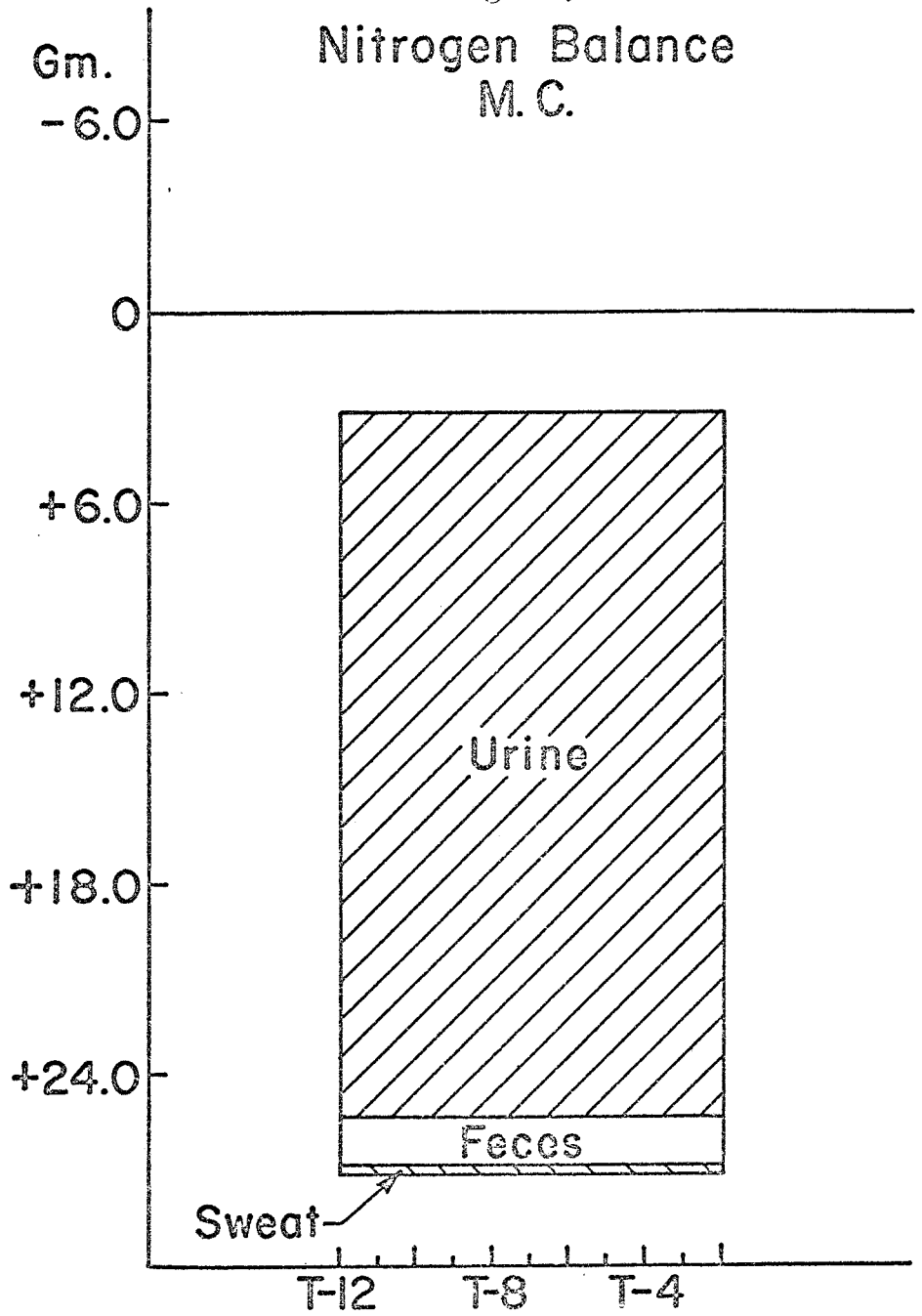

Nitrogen Balance
M. C.
Gm.
-6.0
0
+6.0
+12.0
+18.0
+24.0
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 6A

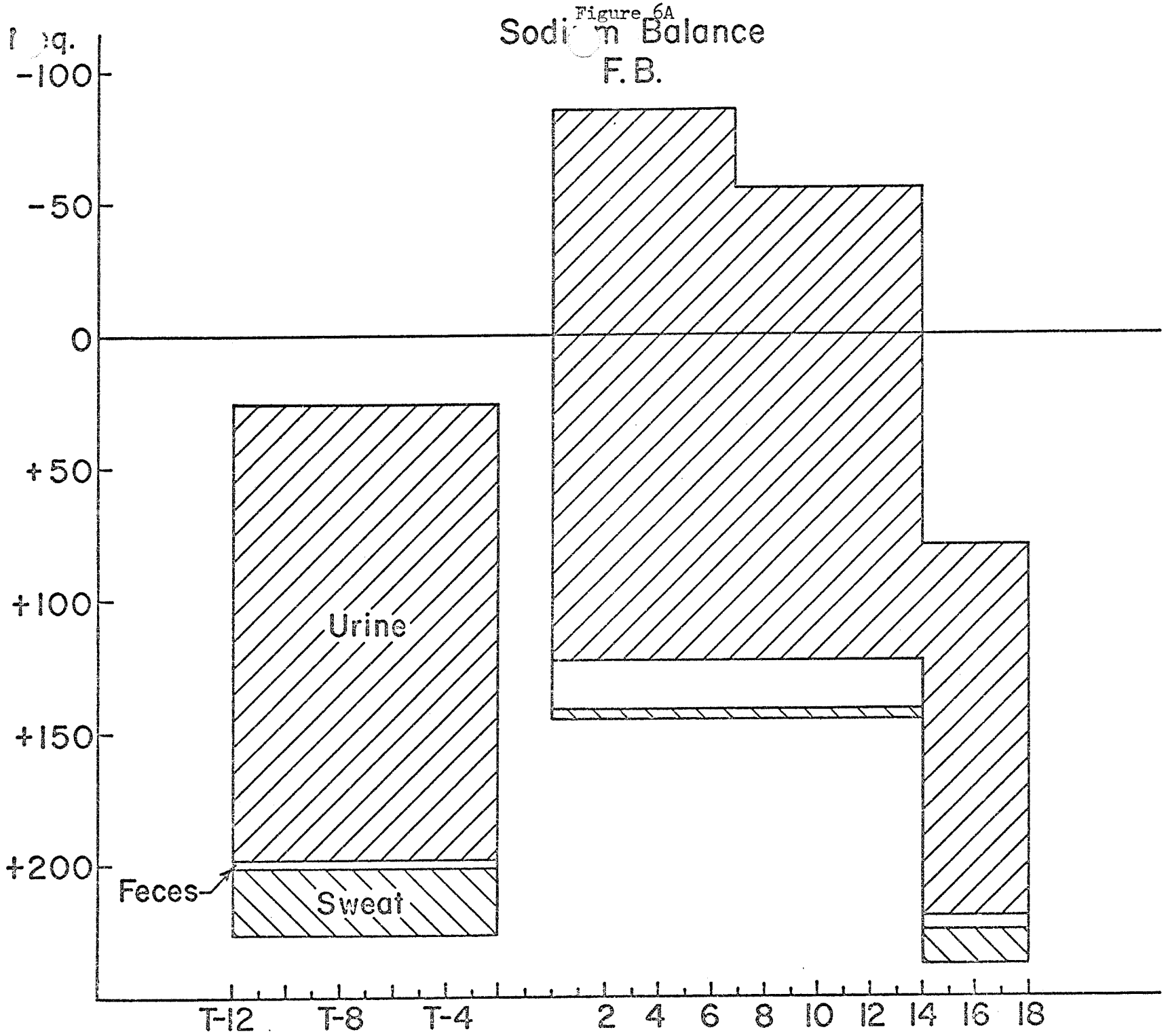

Sodium Balance
F.B.
Meq.
-100
-50
0
+50
+100
+150
+200
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 6B

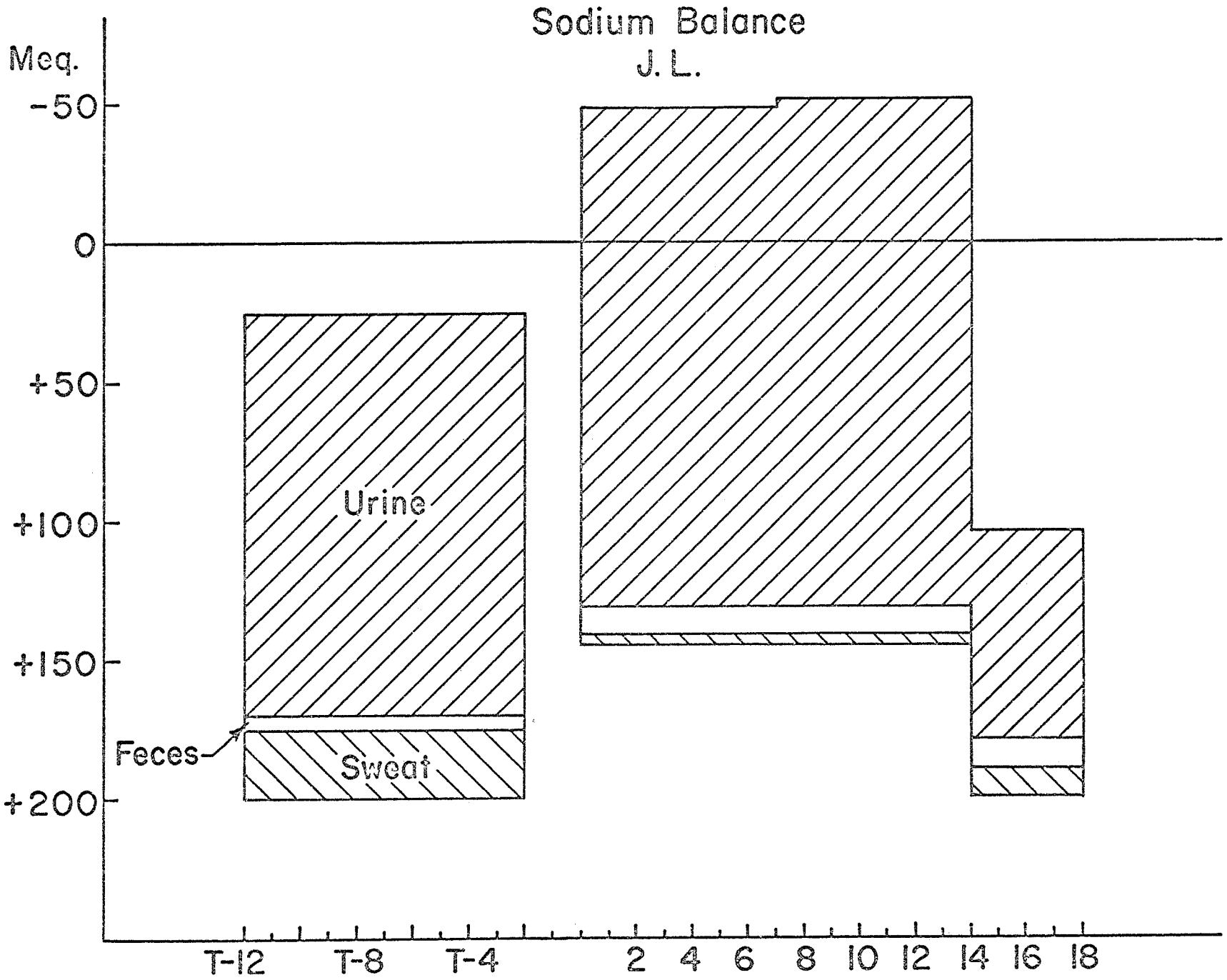

Sodium Balance
J. L.
Meq.
-50
0
+50
+100
+150
+200
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 6C

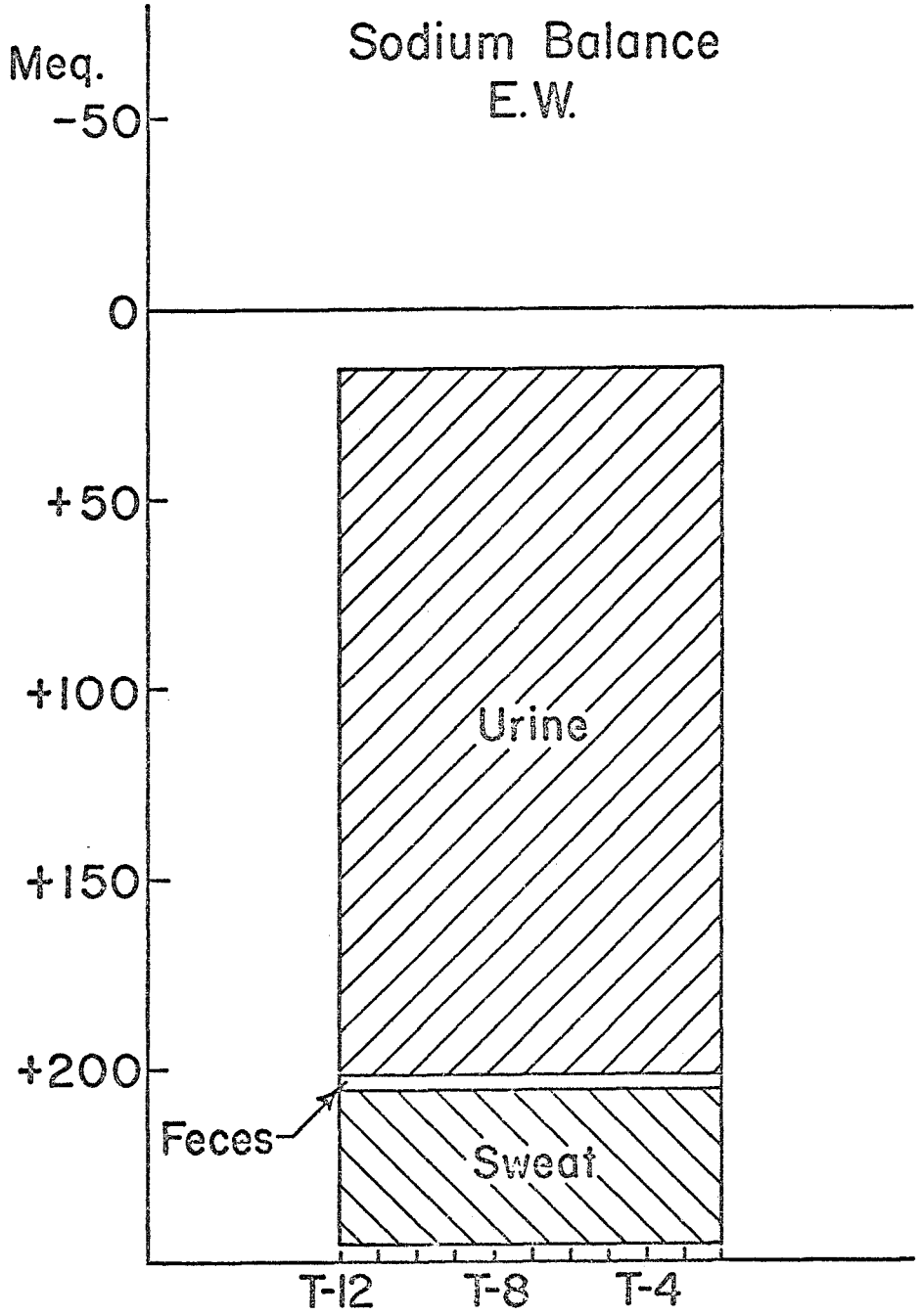

Sodium Balance
E.W.
Meq.
-50
0
+50
+100
+150
+200
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 6D

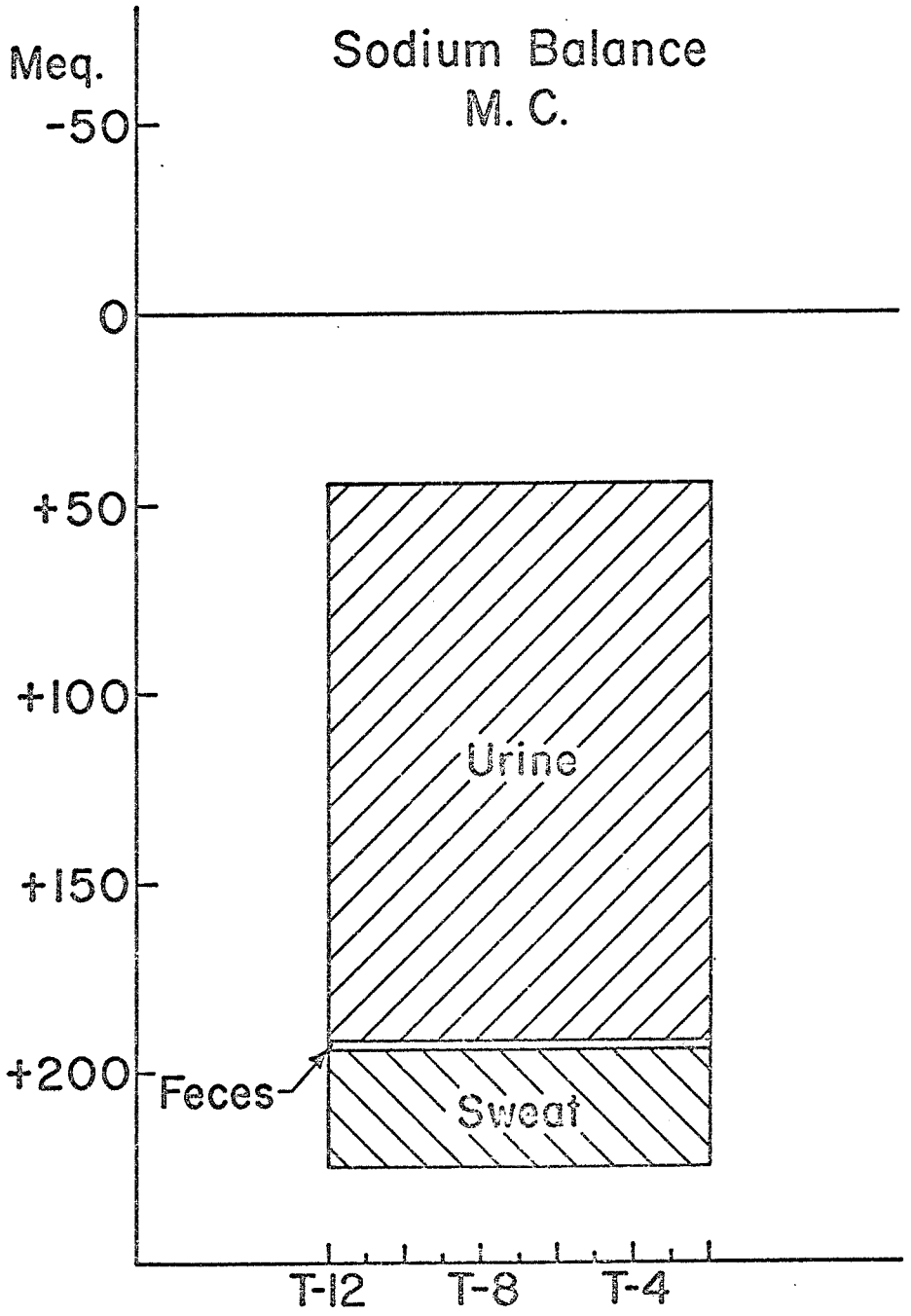

Sodium Balance
M. C.
Meq.
-50
0
+50
+100
+150
+200
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 7A

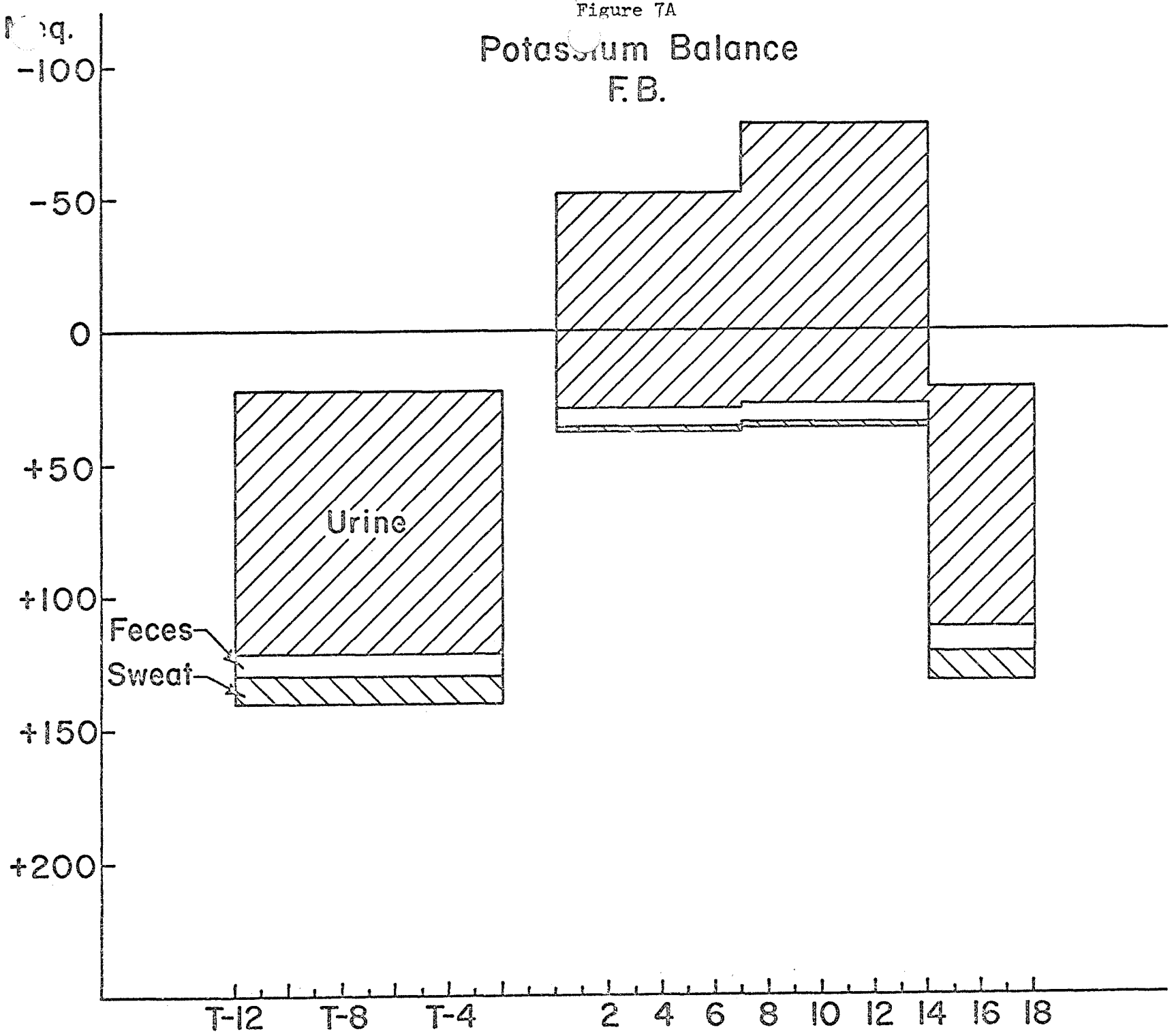

Potassium Balance
F.B.
Meq.
-100
-50
0
+50
+100
+150
+200
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 7B

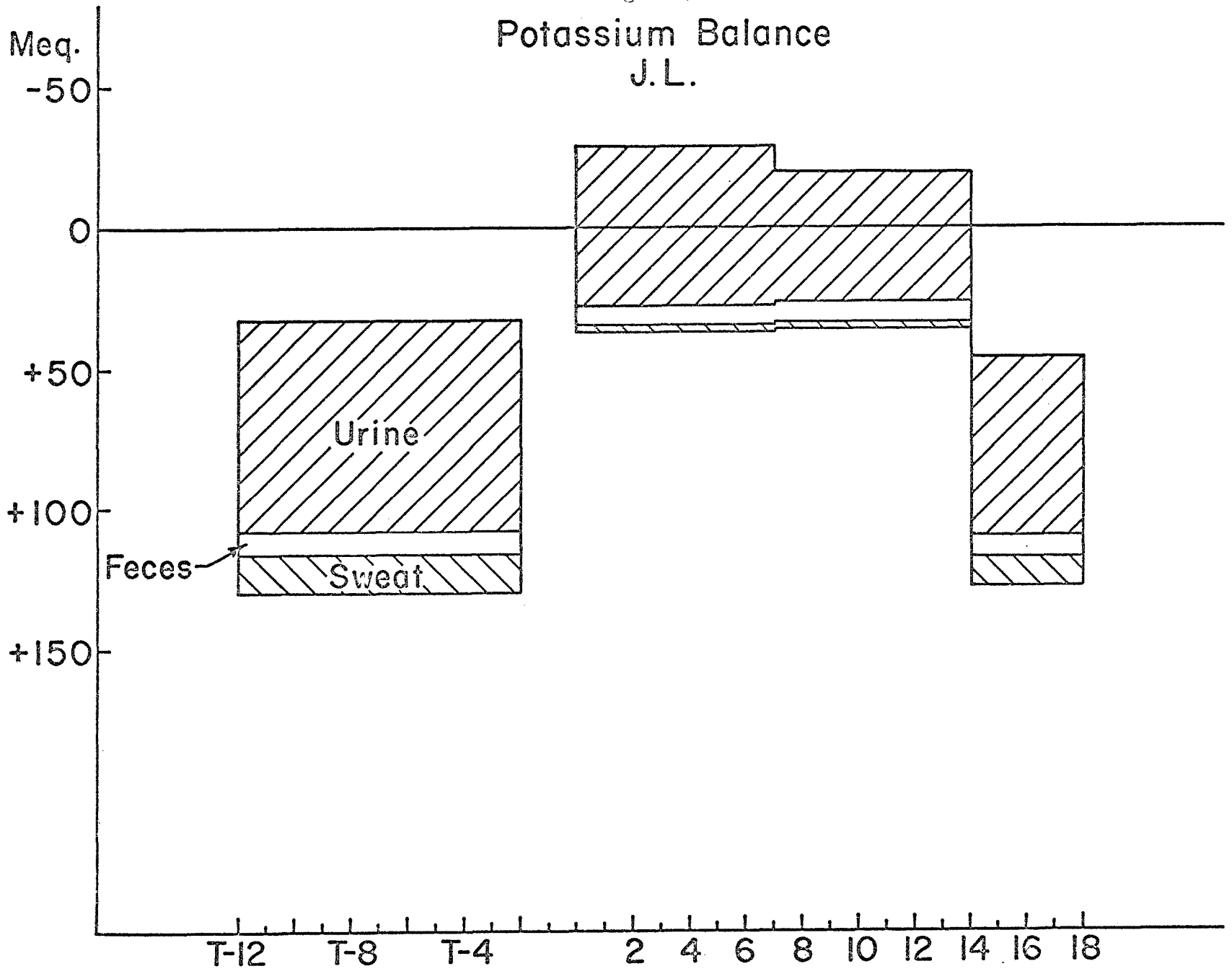

Potassium Balance
J.L.
Meq.
-50
0
+50
+100
+150
Urine
Feces
Sweat
T-12
T-8
T-4
2
4
6
8
10
12
14
16
18

Figure 7C

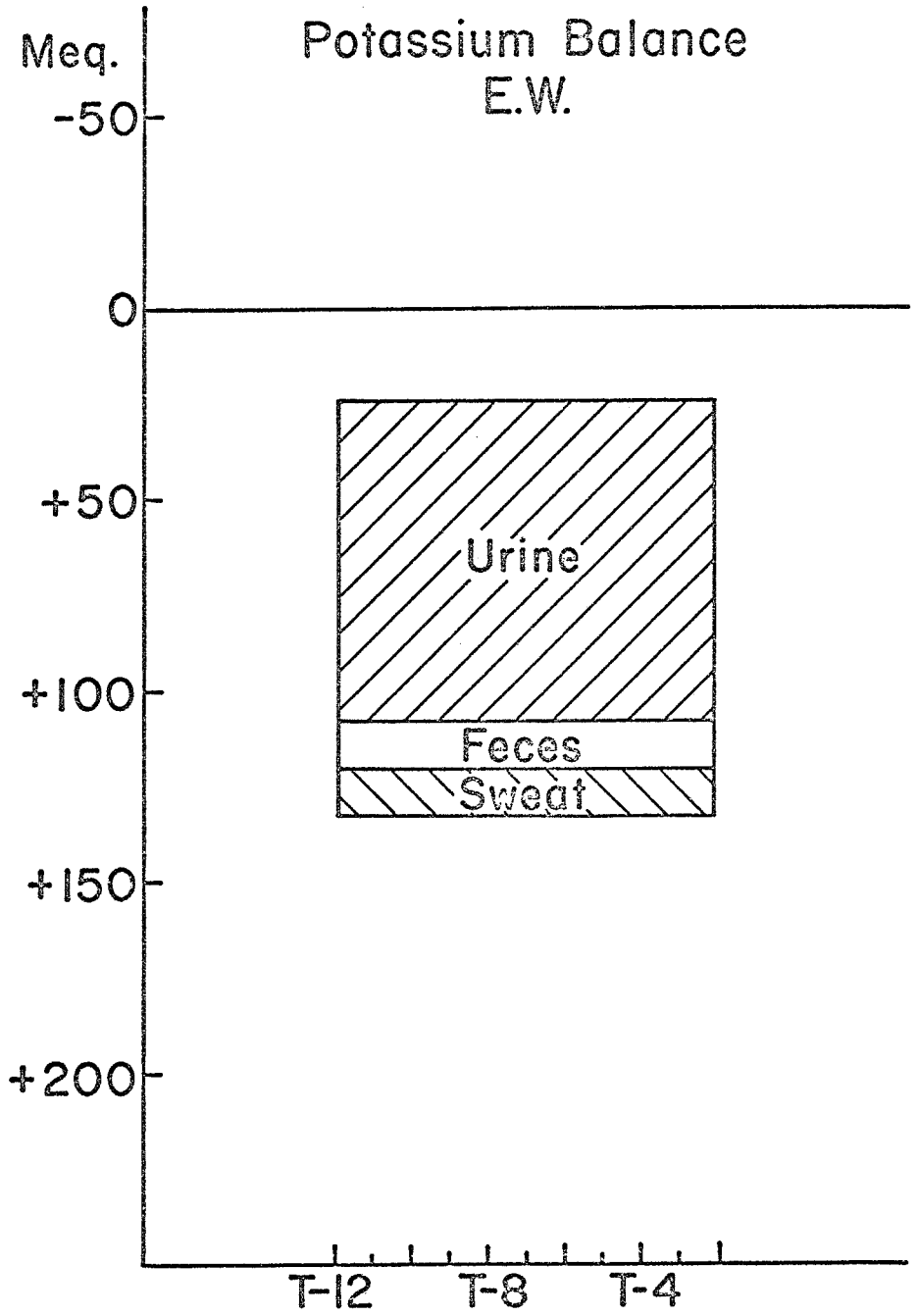

Potassium Balance
E.W.
Meq.
-50
0
+50
+100
+150
+200
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 7D

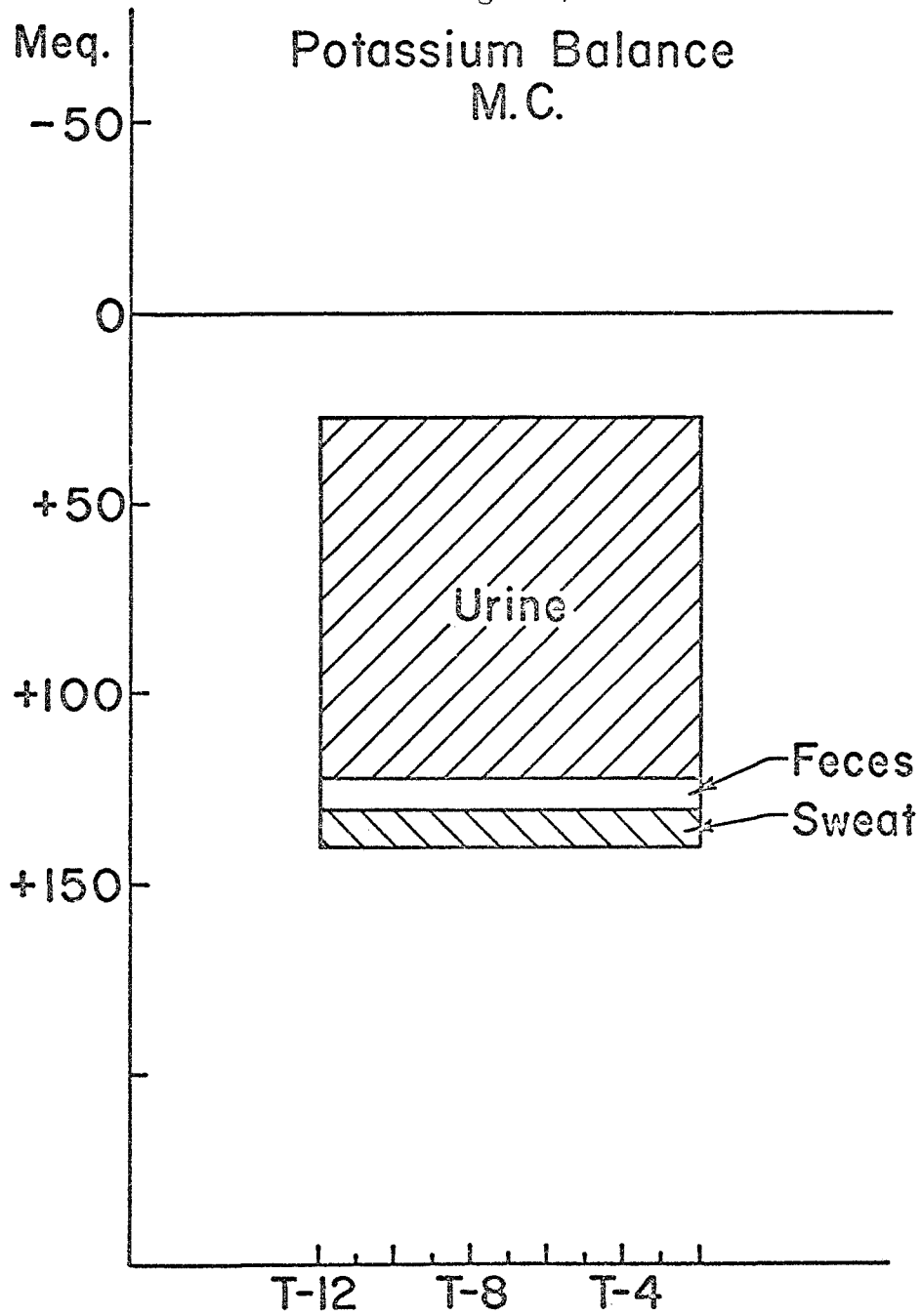

Meq.
Potassium Balance
M.C.
-50
0
+50
+100
+150
Urine
Feces
Sweat
T-12
T-8
T-4

Figure 8A

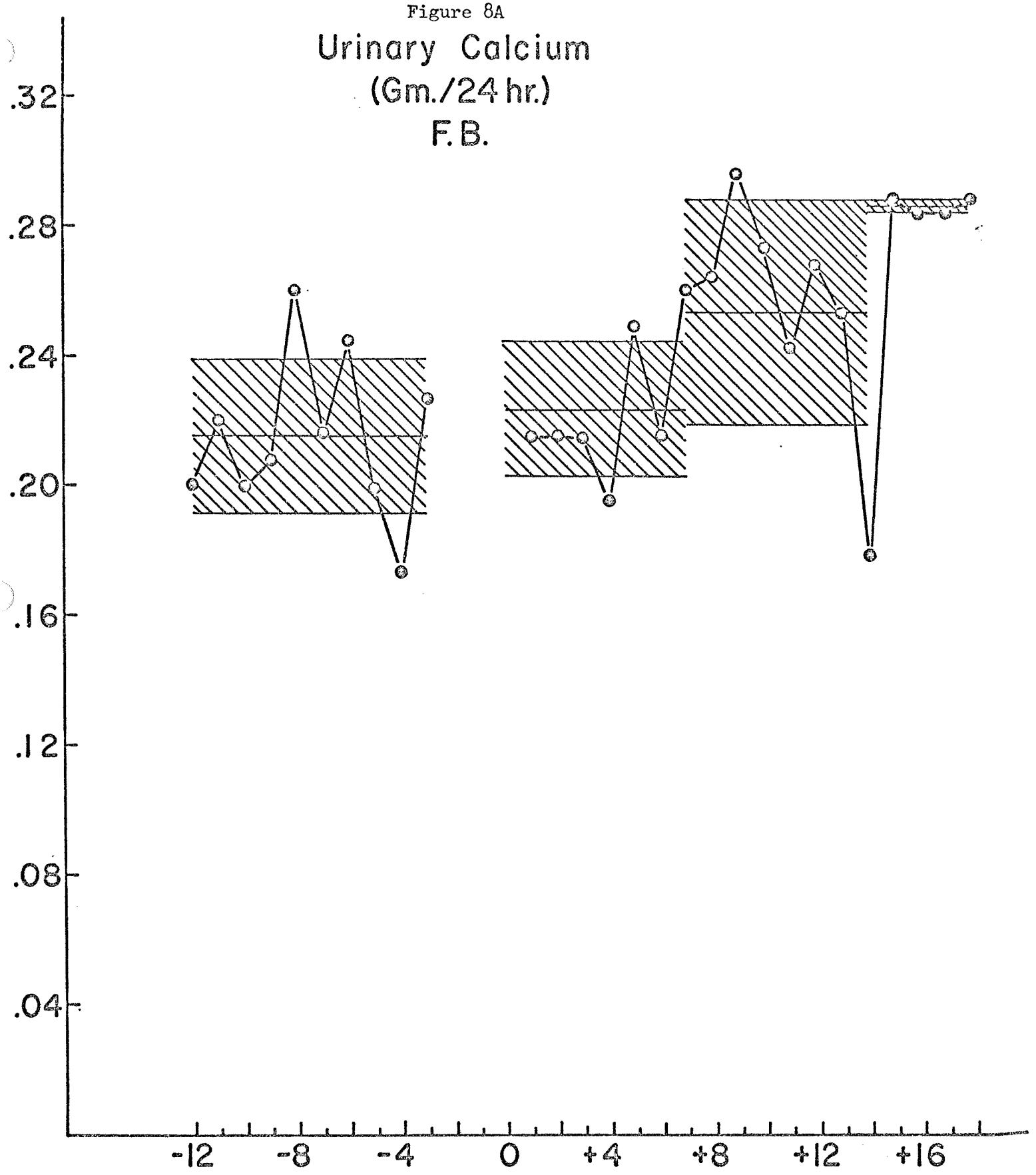


Figure 8B

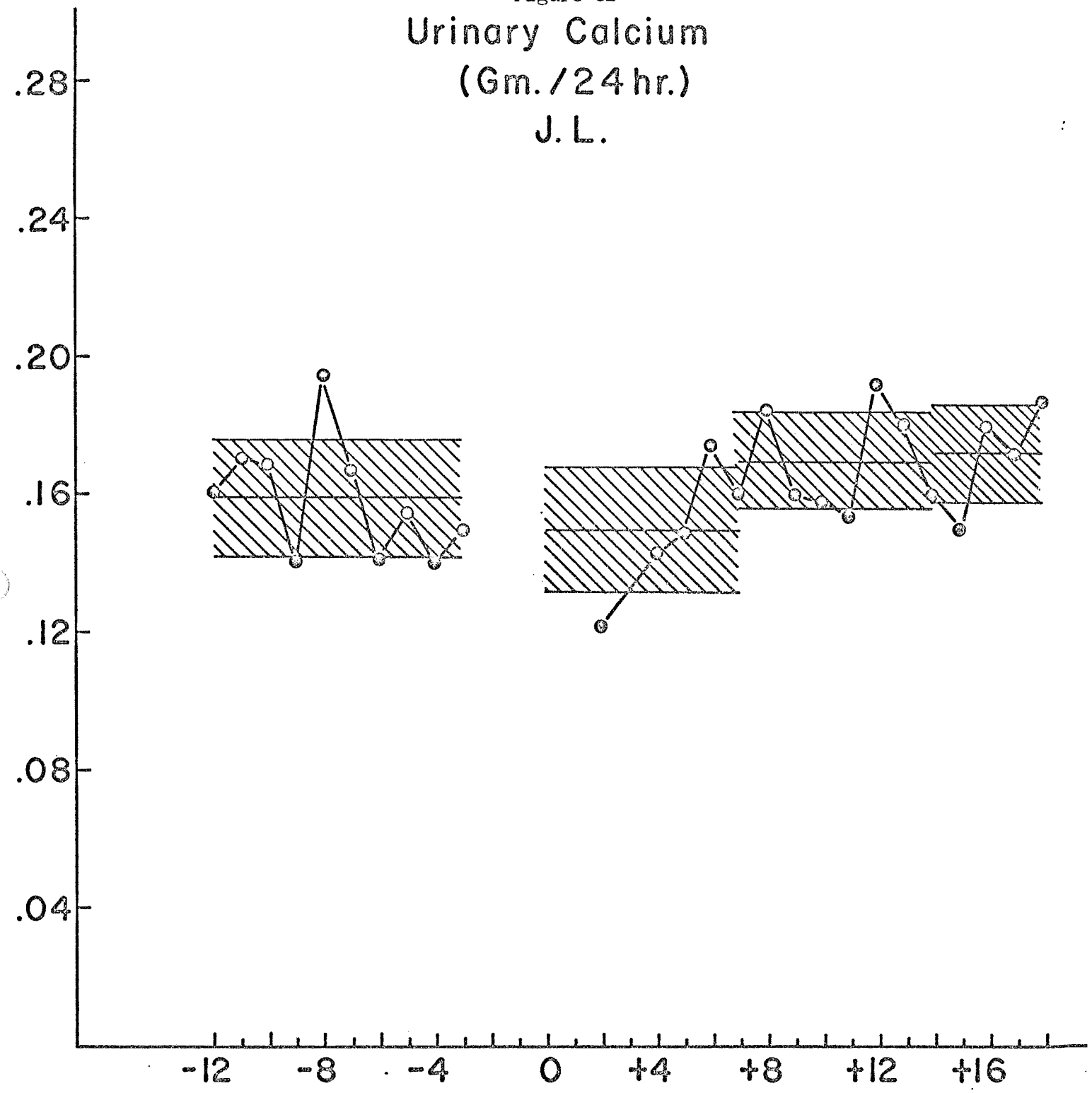


Figure 9A

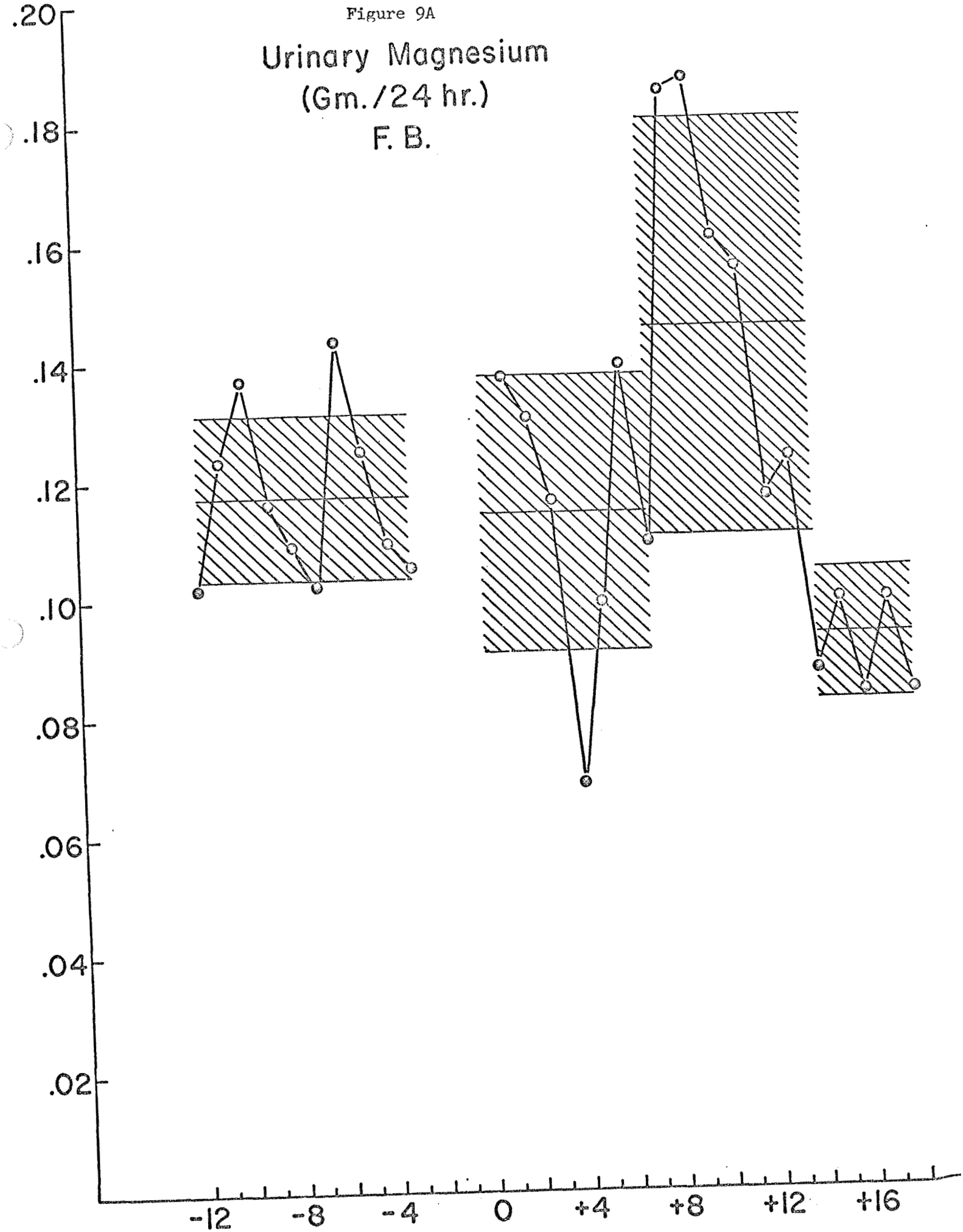

Urinary Magnesium
(Gm./24 hr.)
F. B.
.20
.18
.16
.14
.12
.10
.08
.06
.04
.02
-12
-8
-4
0
+4
+8
+12
+16

Figure 9B

Urinary Magnesium
(Gm./24 hr.)
J.L.

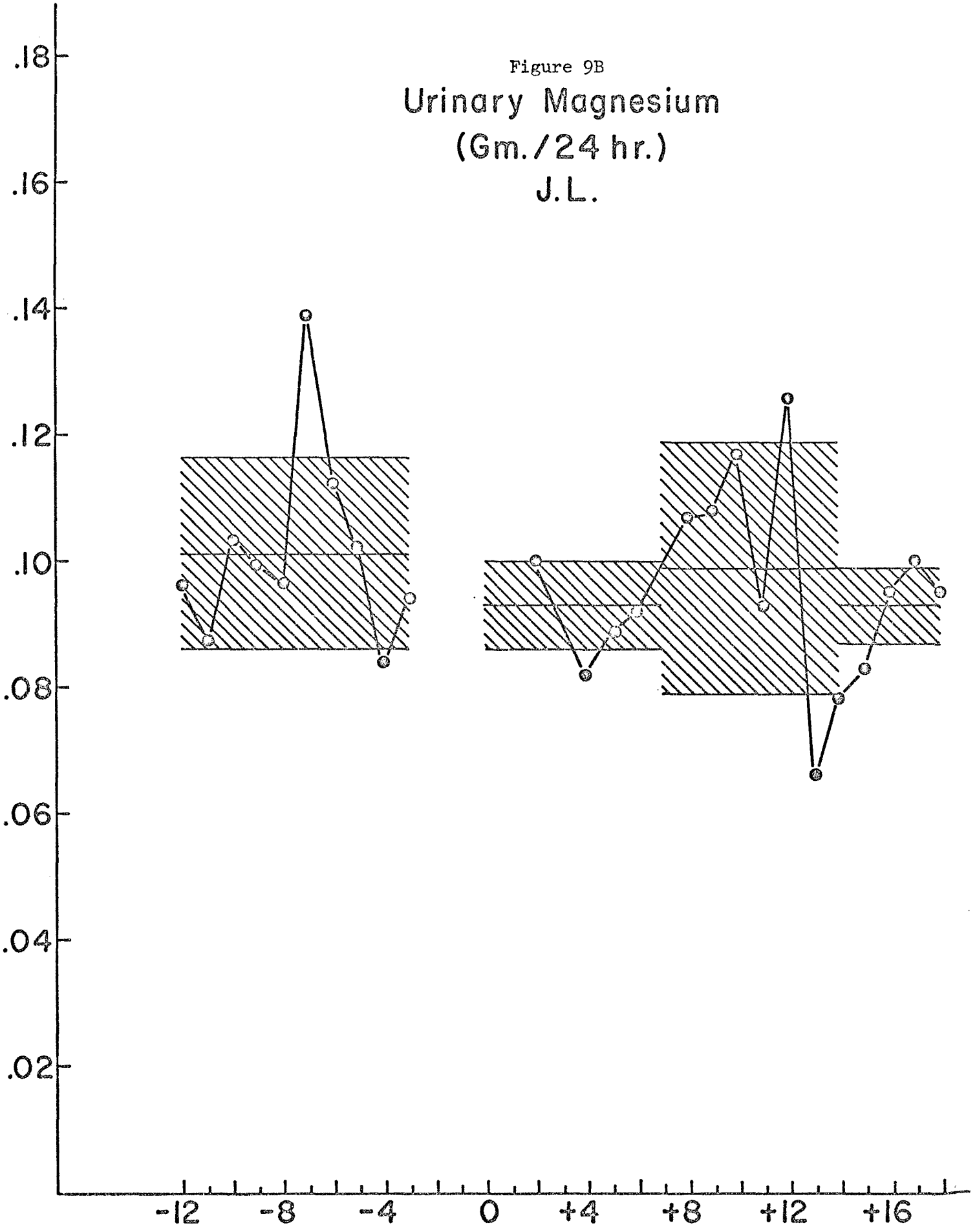


Figure 10A

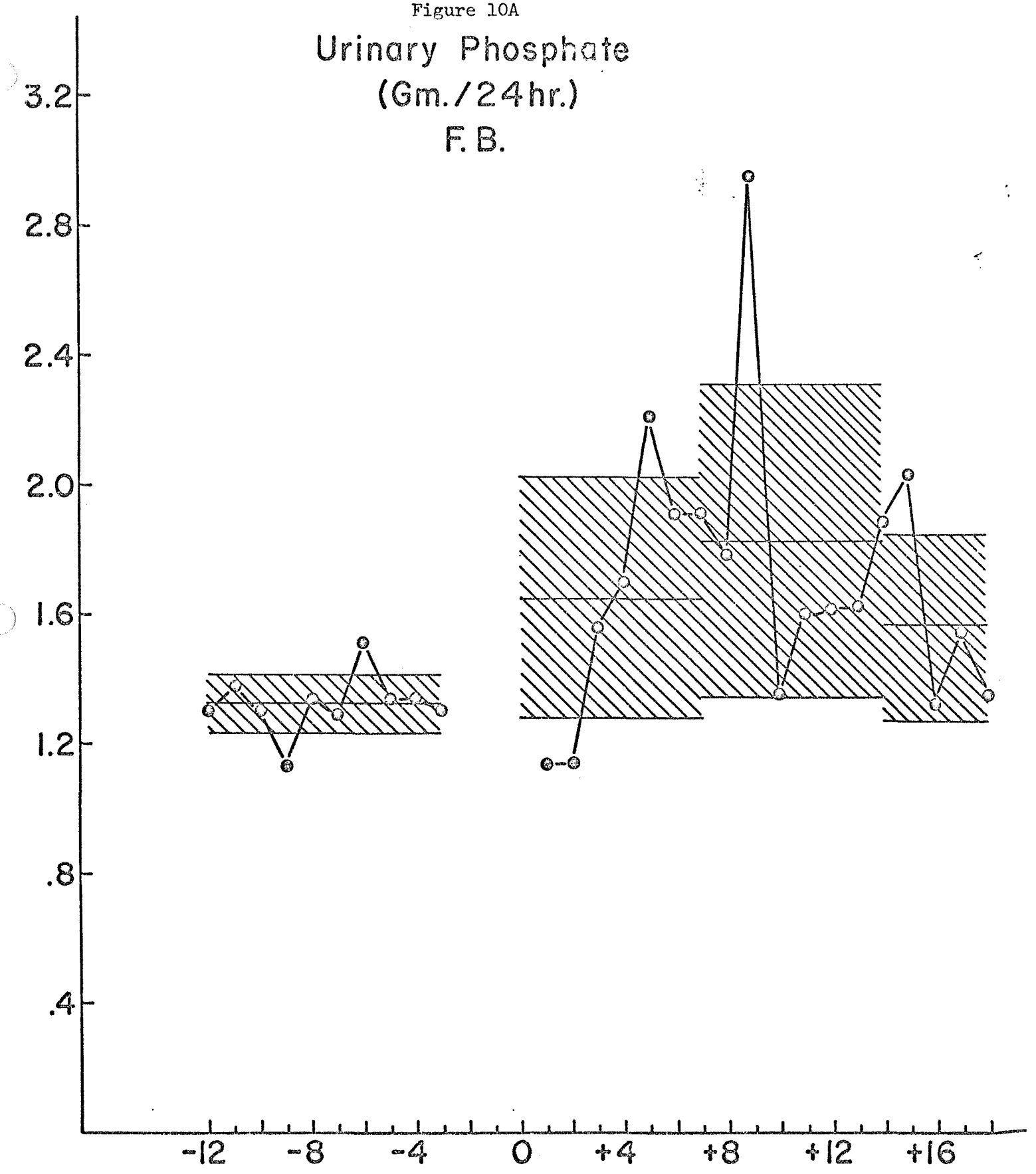


Figure 10B

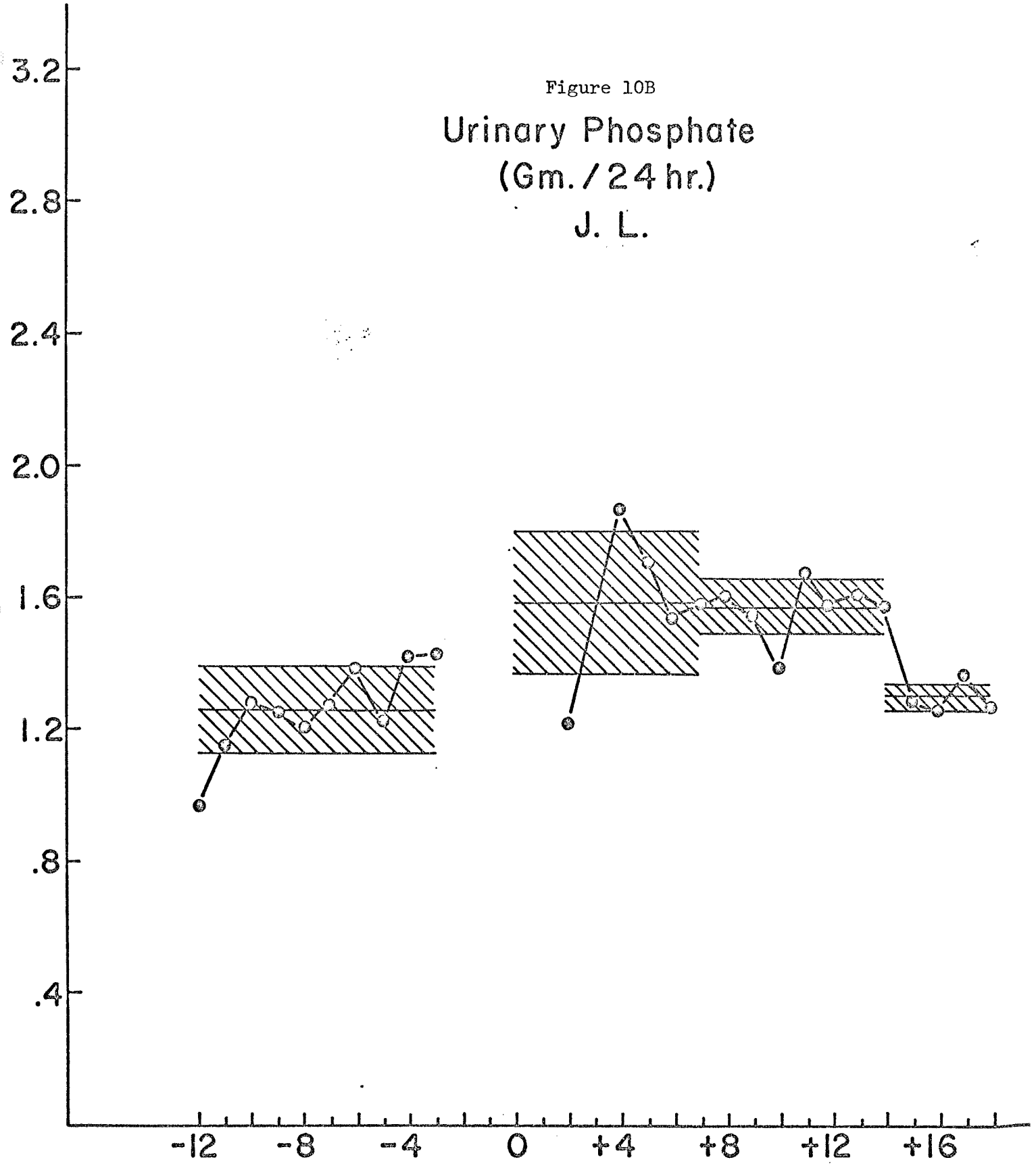
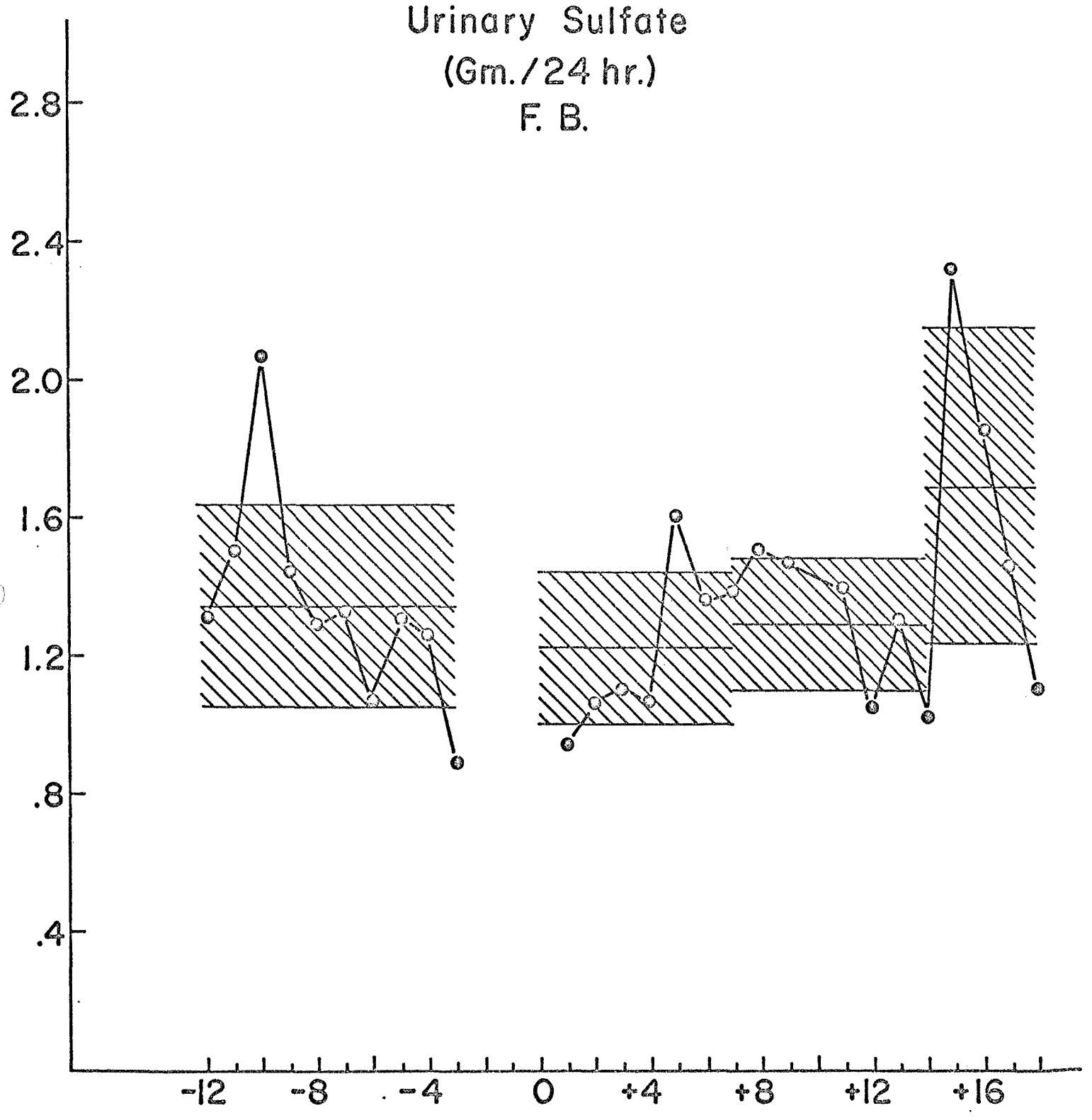


Figure 11A



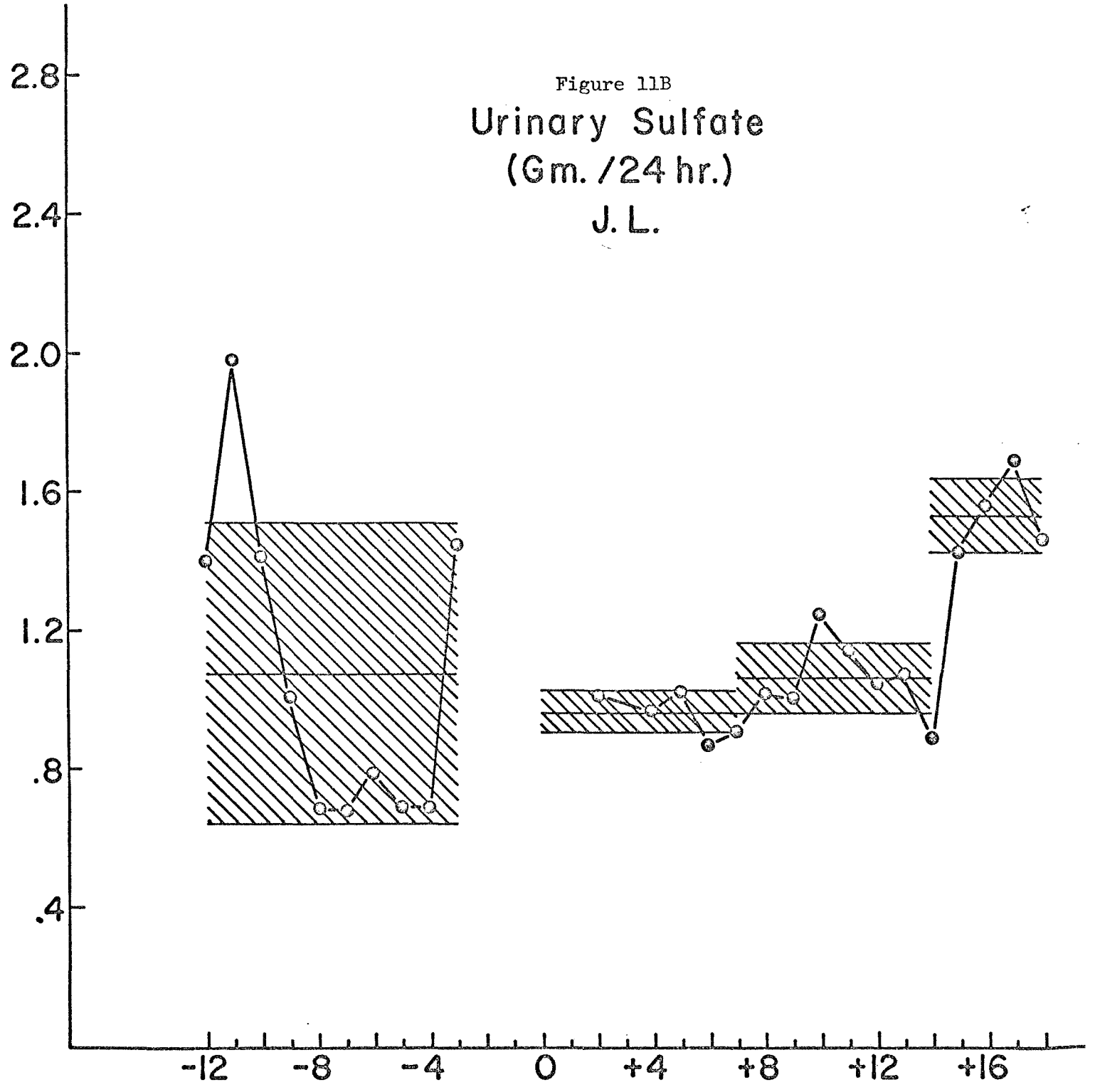


Figure 11B

Figure 12A

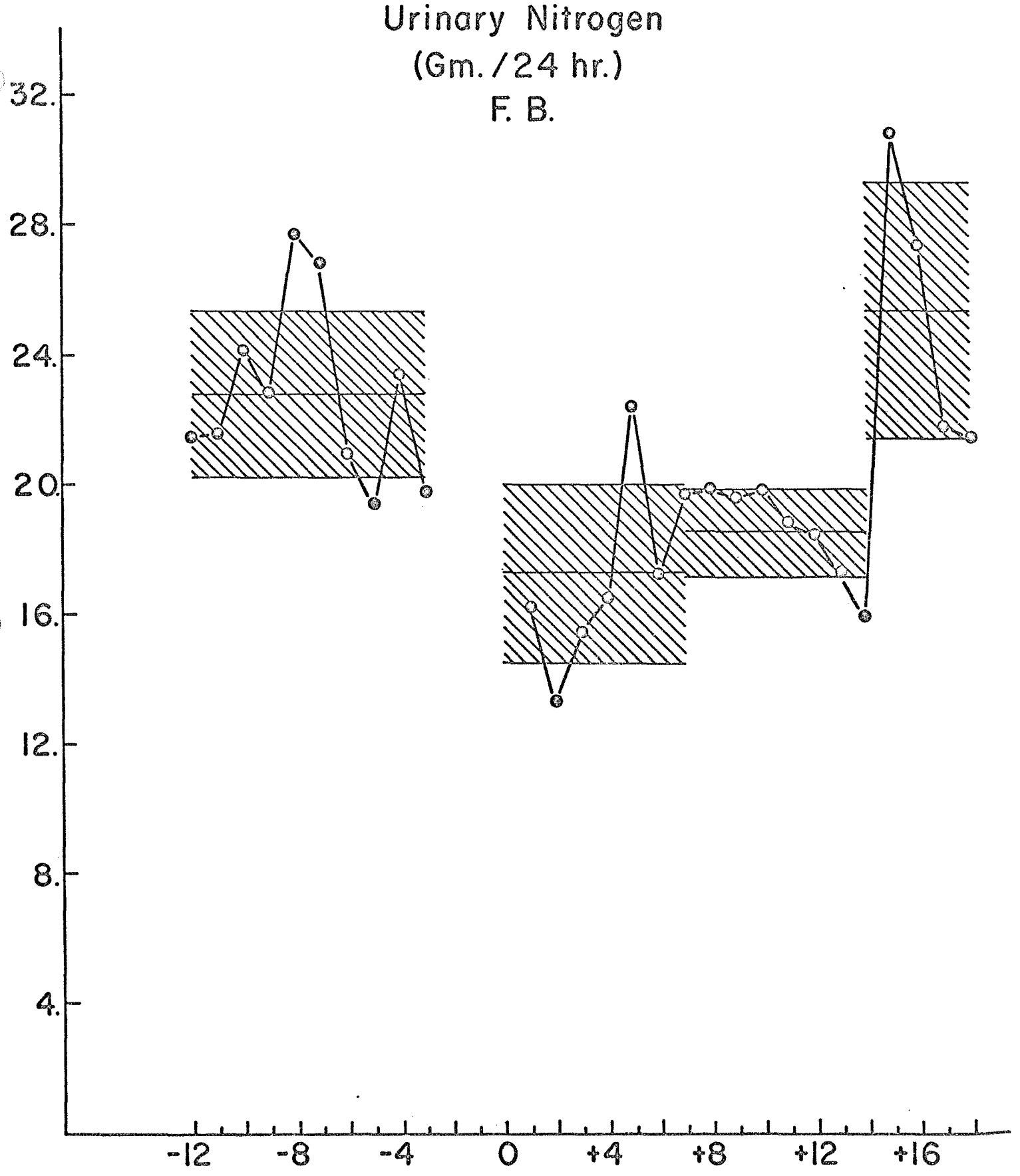


Figure 12B

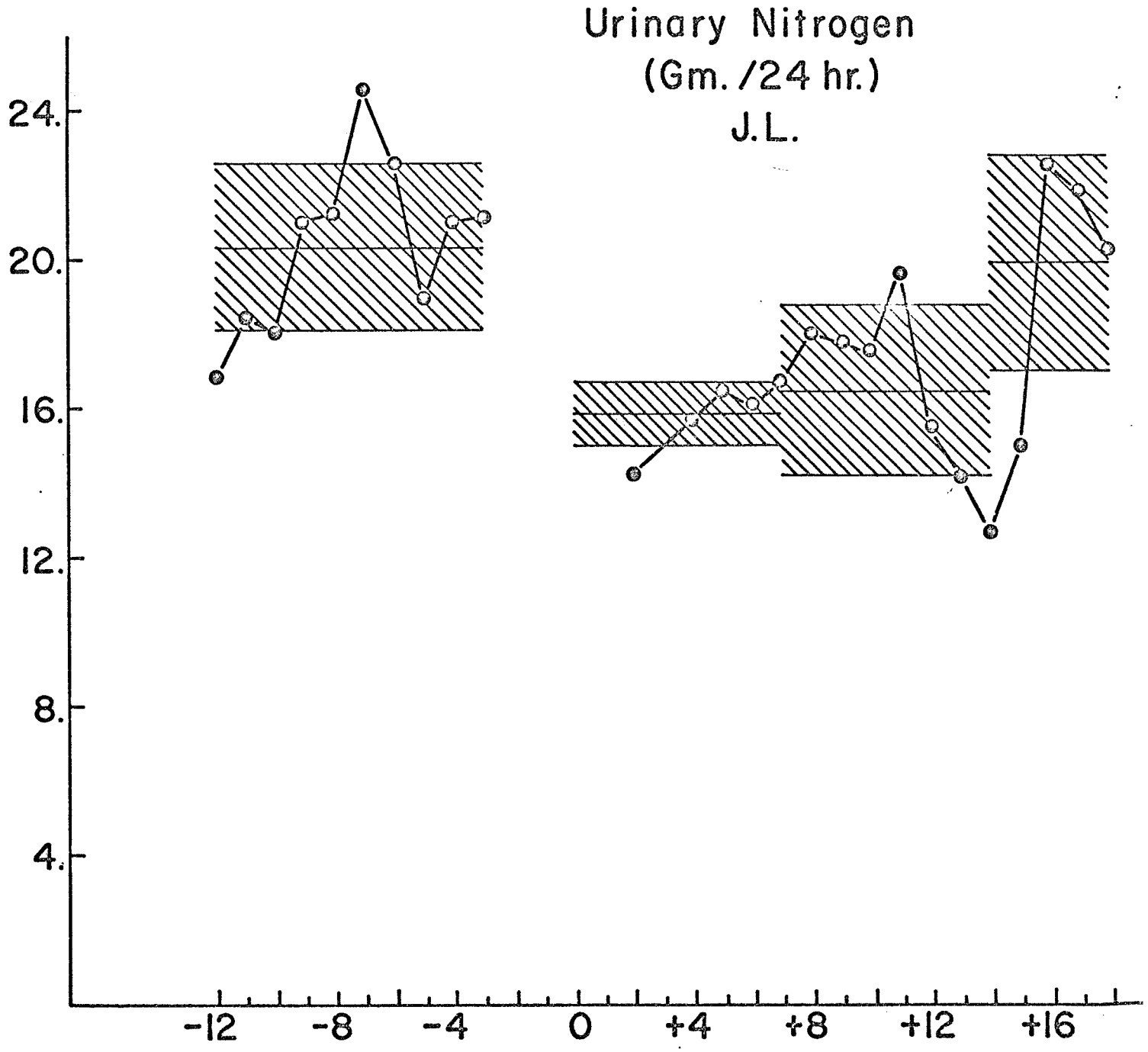


Figure 13A

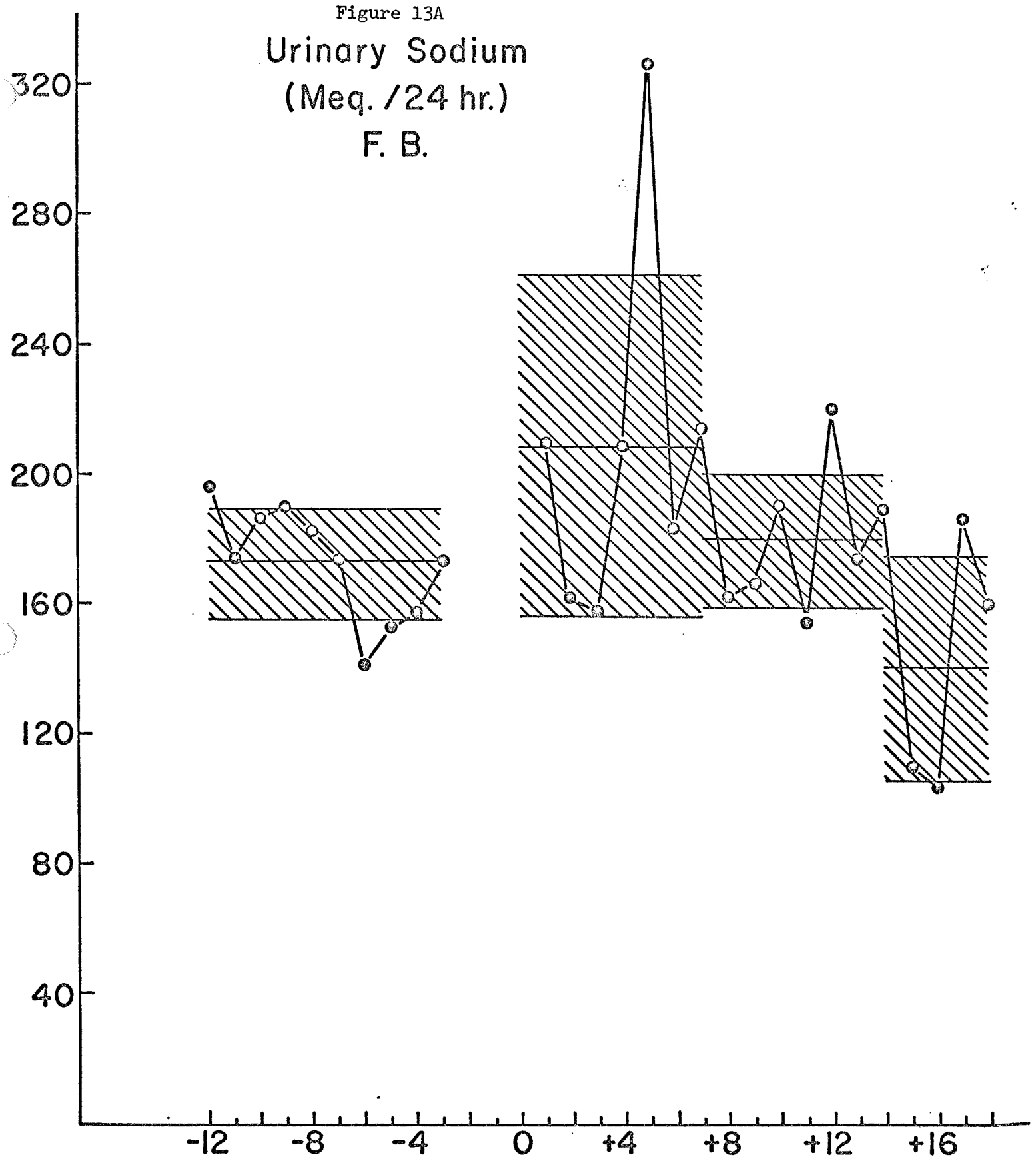

Urinary Sodium
(Meq. /24 hr.)
F. B.
320
280
240
200
160
120
80
40
-12
-8
-4
0
+4
+8
+12
+16

Figure 13B

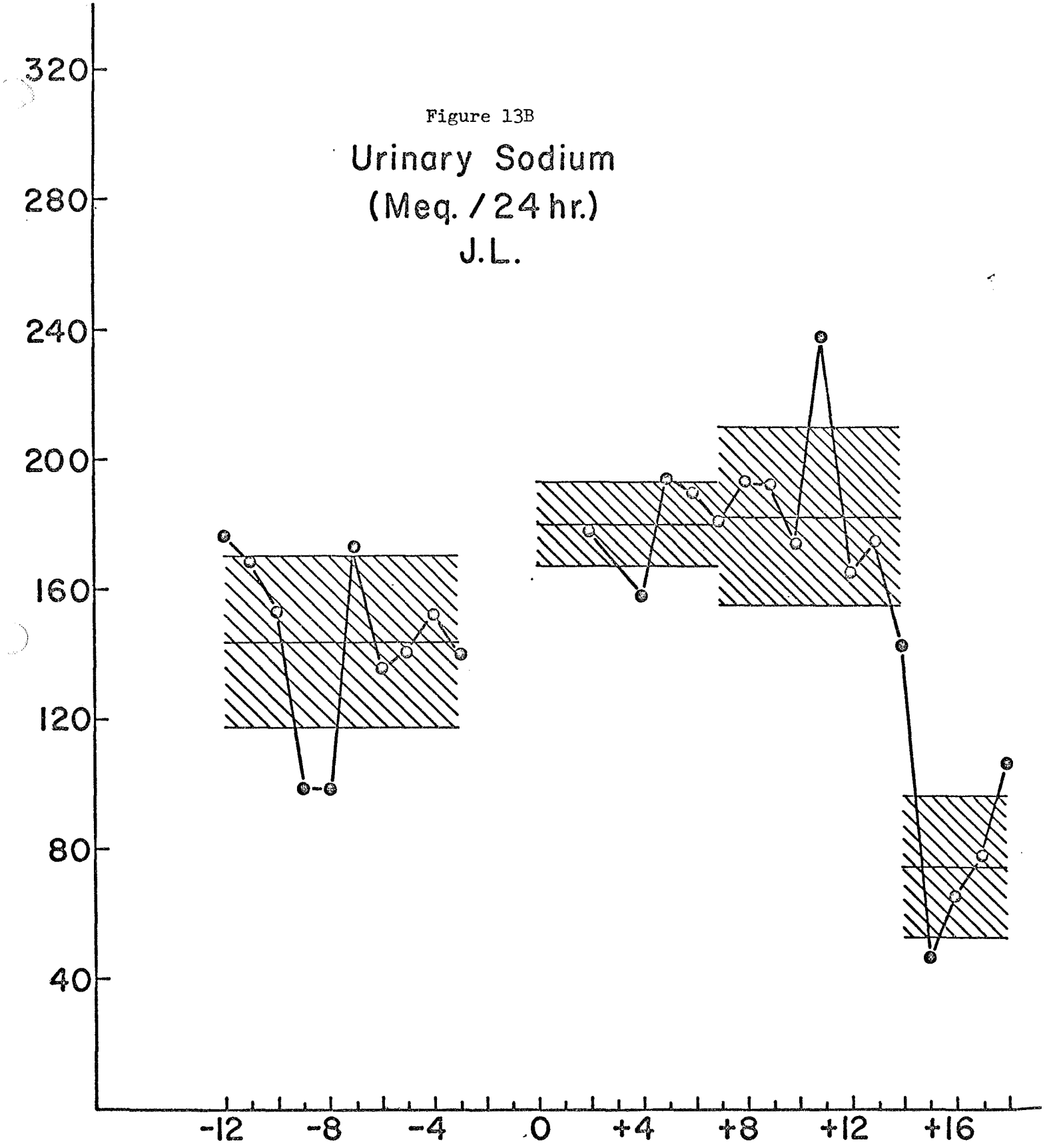

Urinary Sodium
(Meq. / 24 hr.)
J.L.
320
280
240
200
160
120
80
40
-12
-8
-4
0
+4
+8
+12
+16

Figure 14A

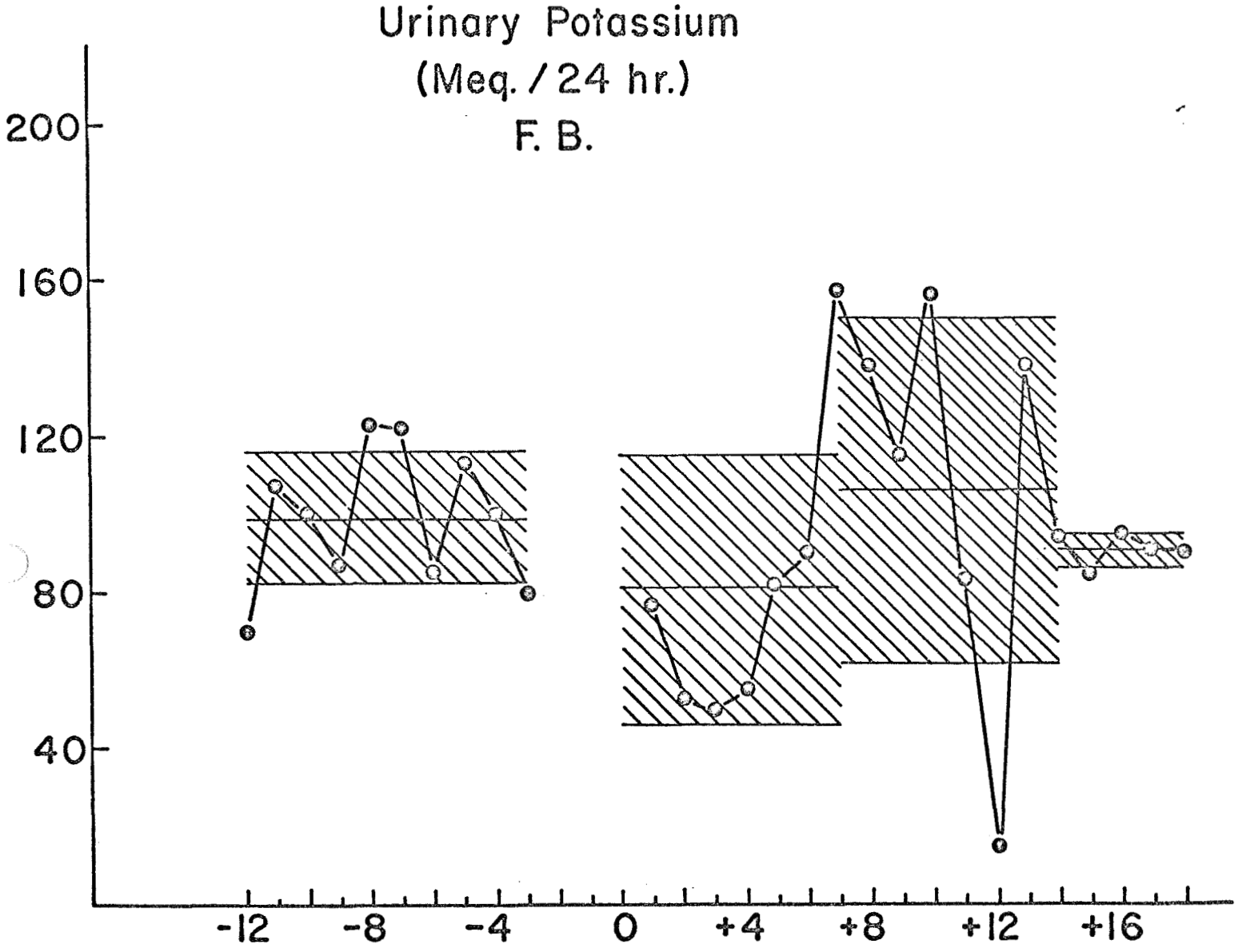
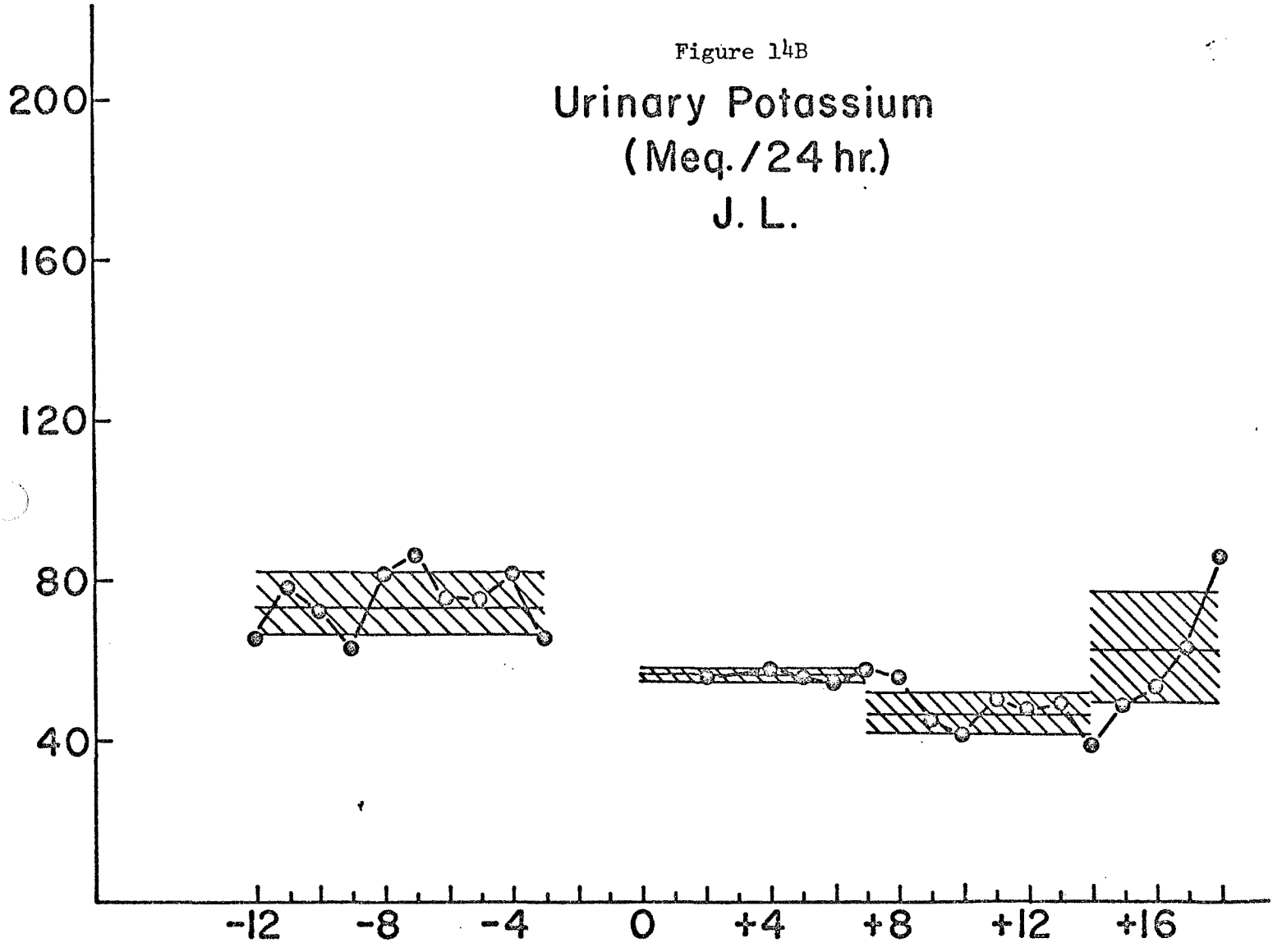


Figure 14B



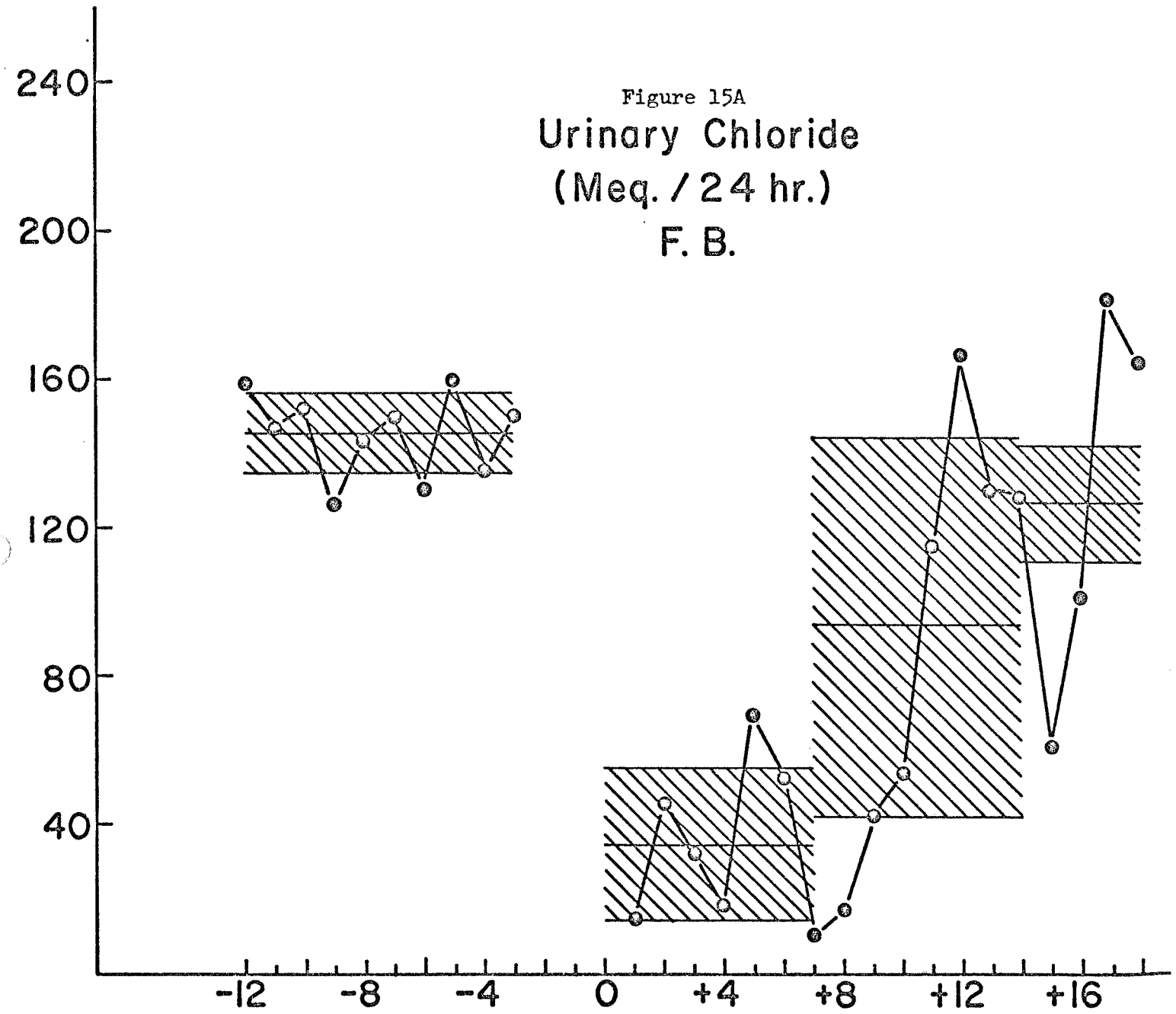
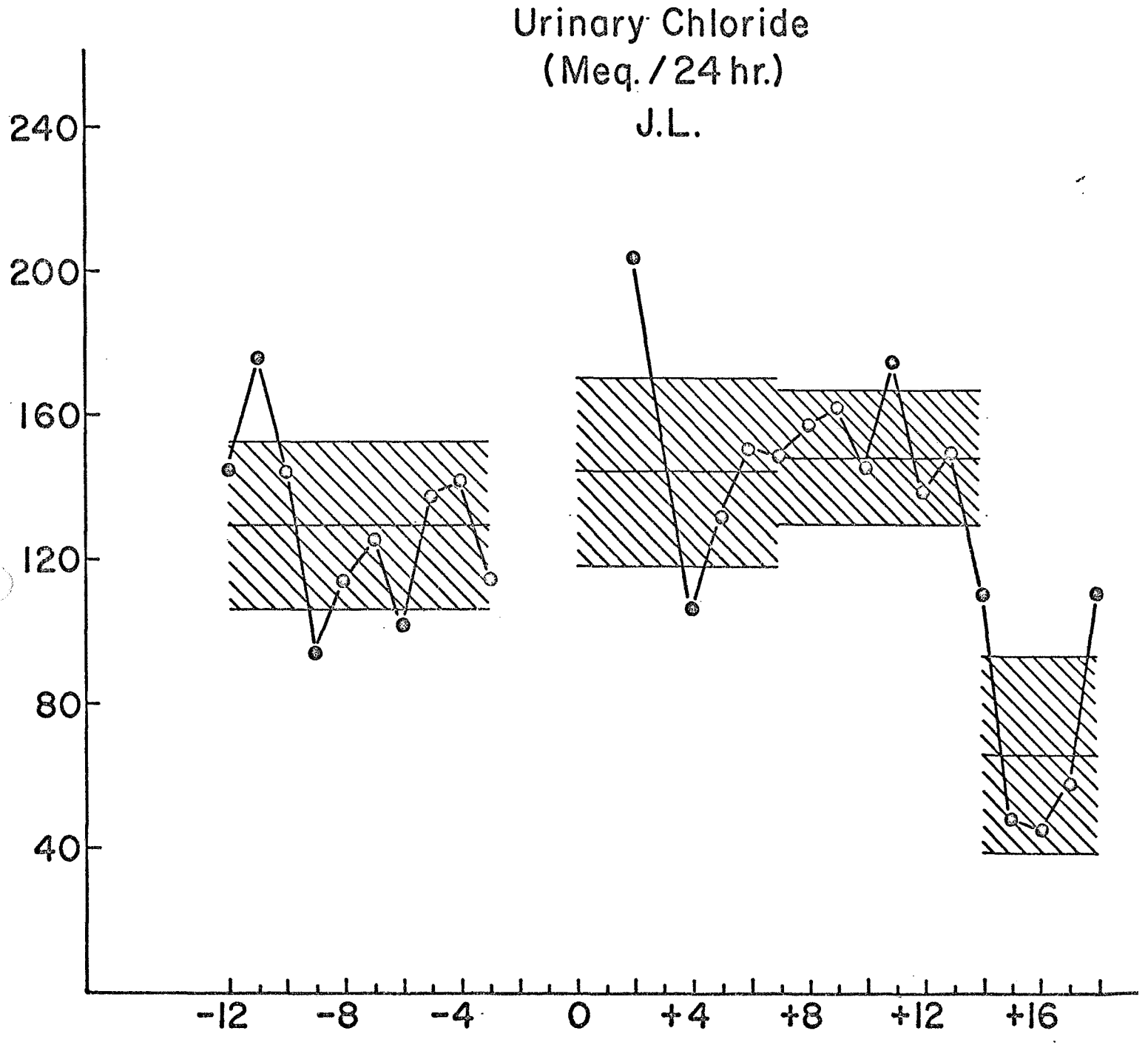

Urinary Chloride
(Meq. / 24 hr.)
F. B.
240
200
160
120
80
40
-12
-8
-4
0
+4
+8
+12
+16

Figure 15A

Figure 15B


Urinary Chloride
(Meq. / 24 hr.)
J.L.
240
200
160
120
80
40
-12
-8
-4
0
+4
+8
+12
+16