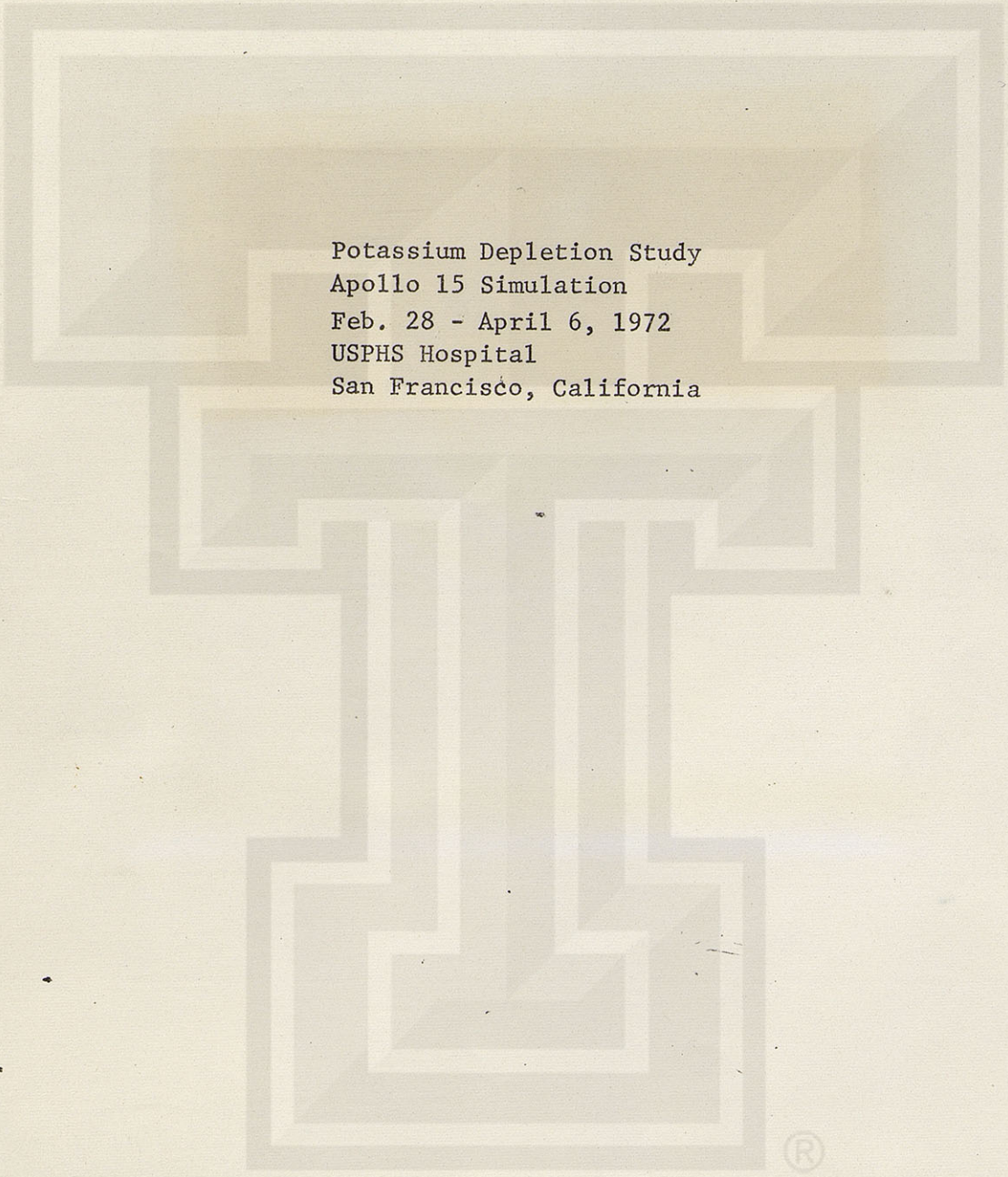




Potassium Depletion Study
Apollo 15 Simulation
Feb. 28 - April 6, 1972
USPHS Hospital
San Francisco, California

STUDY SCHEDULE
POTASSIUM DEPLETION STUDY

1. CALENDAR

Equilibration	E 1-9	2/28 - 3/4/72
Control	C 1-7	3/5 - 3/11/72
Bedrest-Low K^+ Diet	B 1-12	3/12 - 3/23/72
Recovery	R 1-14	3/24 - 4/6/72
2. DIET

200 meq Na^+ , 130 meq K^+	E 1-9, C 1-7, R 1-14	
200 meq Na^+ , 15 meq K^+	B 1-12	
3. a) ISOTOPE STUDIES

(^{125}I -RISA, ^{35}S , ^{51}Cr , 3H_2O , ^{42}K)		C1, C6, B2, B9, B12, R14
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b) BLOOD CHEMISTRIES
4. ADDITIONAL SERUM K^+

		B1 - R4
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5. EKG

a) 12-Lead		E(-7), C3, C6, C7, B 1-12, R 1-4
b) Continuous Tape		C1, C6, C7, B 1-12, R 1-2, R 21-22, R 24-25, R29
6. LBNP-EXERCISE STUDY

		E(-1), E1, C2, C7, R 1-4, R8, R15
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7. APEX-ECHOCARDIOGRAPHY,
SYSTOLIC TIME INTERVALS

		C2, C7, B3, R1, R14
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8. CARDIAC VOLUME X-RAY

		C7, R1, R15
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9. MUSCLE TESTING
(Cylex & Hand Dynanometer)

		C6, B3, B5, B9, B12, R4, R7, R14
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10. SWEAT STUDY

		C 4-5, B 6-7, B 10-11
--	--	-----------------------
11. URINE & STOOL COLLECTION

		Continuous
--	--	------------
12. EVA EXERCISE

Stand-up EVA		B5
EVA I		B6
EVA II		B7
EVA III		B8
Inflight EVA		B11

POTASSIUM DEPLETION STUDY

SUBJECT PROFILE

	Age	Ht.(in.)	Wt.(kg.)	
Subject 1 ("Scott")	25	70	81.5	Very muscular, athletic, unusual stamina.
Subject 2 ("Irwin")	25	68.75	73.1	Lean, muscular, athletic, good stamina. Smokes one pack per day.

DIET INFORMATION ON THE POTASSIUM-DEPLETION

PILOT STUDY

Period from 2/25/72 - 4/7/72

Janet McDonald
Research Dietitian

POTASSIUM-DEPLETION PILOT STUDY

General Information

Subjects: Kenneth W. Wheeler
James W. Sellers

Dates on Diet: 2/25/72 through 4/6/72

Equilibration phase - 3 days: 2/25/72 through 3/4/72
Diet order: 200 mEq Na; 130 mEq K

Control phase - 7 days: 3/5/72 through 3/11/72
Diet order: 200 mEq Na; 130 mEq K

Bedrest phase - 12 days: 3/12/72 through 3/23/72
Diet order: 200 mEq Na; 15 mEq K

Recovery phase - 14 days: 3/24/72 through 4/6/72
Diet order: 200 mEq Na; 130 mEq K

Description of Diet:

1. The diet was a metabolic balance diet consisting primarily of a formula which was low in electrolytes. The basic ingredient of the formula was a low-electrolyte powder called 7000-J, an experimental product donated by the Mead Johnson Company.
2. In addition to the formula, a small number of solid foods were included in the diet.
3. One menu for each subject was used throughout the study.
4. The only difference between the 130 mEq potassium diet and the 15 mEq potassium diet was the removal of potassium chloride from the formula in the latter.

Supplements to the Diet: Administered by the Nursing Staff

1. Four enteric-coated sodium chloride tablets per day were given, one tablet with each feeding. The tablets were 10 grains each or approximately 236 mg. Na each.
2. One "One-A-Day Vitamin with Iron" per day.
3. One Vitamin E capsule per day (100 IU).

General Information (cont.)

<u>Weights:</u>	<u>Wheeler</u>	<u>Sellars</u>
2/25/72	73.194 kg.	81.559 kg.
4/7/72	<u>70.810 kg.</u>	<u>78.676 kg.</u>
Weight loss	2.384 kg.	2.883 kg.

Diet Errors:

NONE

Comments:

1. The subjects tolerated the diet extremely well, considering the fact that the major part of their diet was a rather unpalatable formula.
2. A dozen different flavorings were provided for the subjects to use as desired in their formula. After about a week on the diet, experimenting with the various flavors, both subjects preferred only the citrus flavors and used those for the remainder of the study.

CALCULATED NUTRIENT COMPOSITION OF THE DIET

<u>Nutrient</u>	<u>Unit</u>	<u>Wheeler</u>	<u>3100</u>
Calories	----	2610	2994
Carbohydrate	grams	339.9	384.1
Fat	grams	104.6	121.3
Protein	grams	77.3	91.5
Nitrogen	grams	12.36	14.64
Calcium	mg. mEq.	1400 69.86	1661 82.88
Phosphorus	mg.	1484	1603
Sodium	mg. mEq.	4987 216.82	4989 216.91
Potassium **	mg. mEq.	4942 126.71	4947 126.84
Magnesium	mg. mEq.	369 30.34	372 30.59
Iron	mg.	21.3	21.3
Vitamin A	IU	6292	6292
Thiamine	mg.	1.83	1.83
Riboflavin	mg.	1.91	1.91
Niacin	mg.	22.4	22.4
Vitamin C	mg.	101	101

* Includes nutrients in the One-A-Day vitamin plus the NaCl tablets.

** Figures indicated are for the high potassium diet. The low potassium diet figures are as follows:

		<u>Wheeler</u>	<u>3100</u>
Potassium	mg. mEq.	463 11.87	468 12.00

FORMULA RECIPE

<u>Ingredient</u>	<u>Weight in grams</u>	
	<u>Wheeler</u>	<u>Sellars</u>
Product 7000-J	310.0	375.0
Corn oil	32.0	38.0
Dexin	32.0	38.0
Sodium chloride	5.6	5.6
Magnesium chloride ($\text{MgCl}_2 \cdot 6 \text{H}_2\text{O}$)	2.6	2.6
* Potassium chloride	8.5	8.5
** Trace element solution	10.0	10.0
*** Sodium phosphate solution	15.0	15.0
Distilled water	To make 1600 grams	To make 1800 grams

* For the 15 mEq. potassium diet, the potassium chloride was omitted from the formula.

** The trace element solution was made up by the PHS Hospital pharmacy and consisted of the following:

<u>Element</u>	<u>mg./10 ml.</u>
Copper	1.0
Zinc	7.5
Manganese	10.0
Iodine	0.25

*** The sodium phosphate solution (Na_2HPO_4) was made up by the PHS Hospital Pharmacy and contained approximately 780 mg. Na and 525 mg. P per 10 cc.

METABOLIC DIET MENU

BREAKFAST

Grams

400 Formula
23 White toast
5 Butter
10 Currant jelly
100 Mandarin oranges (cnd.)

Grams

450 Formula
23 White toast
5 Butter
10 Currant jelly
100 Mandarin oranges (cnd.)

LUNCH

400 Formula
23 White toast
5 Butter
10 Currant jelly
80 Royal Anne Cherries (cnd.)

450 Formula
23 White toast
5 Butter
10 Currant jelly
80 Royal Anne Cherries (cnd.)

DINNER

400 Formula
23 White toast
5 Butter
10 Currant jelly
100 Pineapple (cnd.)

450 Formula
23 White toast
5 Butter
10 Currant jelly
100 Pineapple (cnd.)

EVENING
SNACK

400 Formula
40 Sugar cookies (2) *

450 Formula
40 Sugar cookies (2) *

* The sugar cookies were made in the Metabolic Kitchen with all ingredients weighed.

POTASSIUM DEPLETION STUDY

Sleep Protocol

March 12	11:30 PM	to	March 13	7:15 AM
March 13	11:30 PM	to	March 14	7:15 AM
March 14	10:30 PM	to	March 15	6:30 AM
March 15	10:30 PM	to	March 16	7:00 AM
March 16	9:30 PM	to	March 17	5:00 AM

EVA # 1

March 17	6:30 PM	to	March 18	2:30 AM
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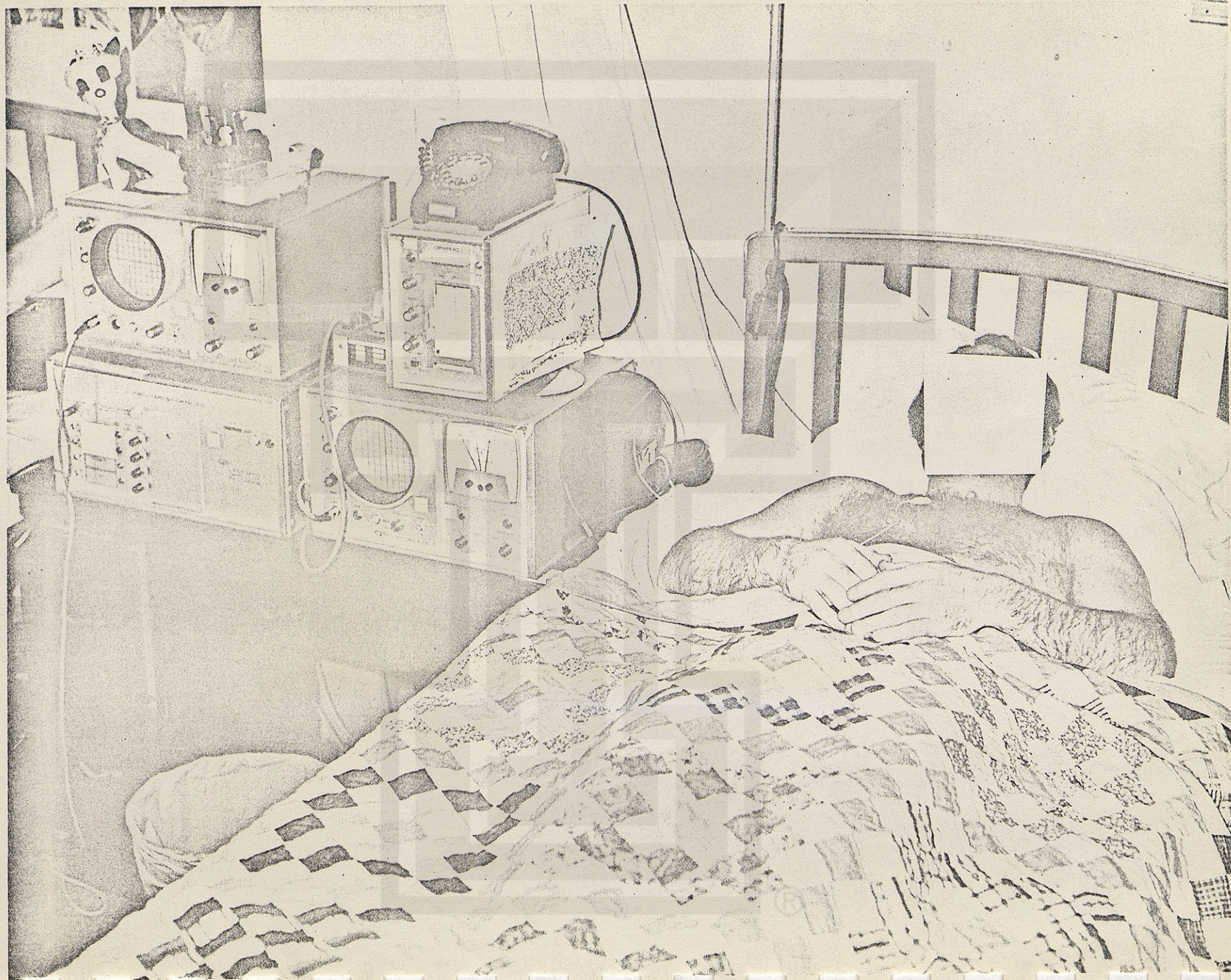
EVA # 2

March 18	4:00 PM	to	March 18	11:00 PM
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EVA # 3

March 19	8:30 PM	to	March 20	4:30 AM
March 20	8:15 PM	to	March 21	4:15 AM
March 21	8:30 PM	to	March 22	4:30 AM
March 22	9:15 PM	to	March 23	6:15 AM
March 23	10:15 PM	to	March 24	7:15 AM





Apollo Rsp/Mat

SNR #19.2.1-7-2971-399

September 8, 1971

To: W. R. Hawkins, M.D. DD
K. F. Hecht DD
G. F. Humbert, M.D. DD5
J. F. Zieglschmid, M.D. DD

cc: C. A. Berry, M.D. DA
E. C. Moseley, Ph.D. DE3
J. A. Rummel, Ph.D. DB6
J. M. Waligora DB6
C. L. Bommarito 5-2970 HA-60

Group Index: Biomedical Analysis

Subject: Apollo 15 Mission Report Metabolic Assessment
Inputs

The crew of Apollo 15 performed five periods of extravehicular activity (EVA). Each was supported by the Metabolic Assessment Team (MAT) in an effort to determine the metabolic energy expenditure of the extravehicular crewmen. Heart rate data on the Commander only was available during the stand-up EVA (SEVA). All three metabolic assessment methods were available throughout the three lunar surface EVA's. The inflight EVA provided metabolic data on all three crewmen by the heart rate method. Table 1 summarizes all five EVA's. The start and end times of the periods are given in Ground Elapsed Time (GET). Heart rates are an average of one minute rates. Figures 1-6 give heart rates and metabolic rates during the lunar surface EVA's as correlated to the activities of each EVA.

Stand-up EVA (SEVA)

The SEVA was completed following lunar touchdown. The CDR removed the tunnel hatch, or drogue, and stood up in the hatch allowing 360° visibility of the lunar surface. Landmarks were identified, traverse routes planned, photography completed, and the ALSEP location confirmed.

The average metabolic rate for the 39 minute SEVA was 997 Btu/hr. for the CDR. This rate was determined by the heart rate method using corrected preflight ergometric response test data. The preflight curve was corrected by examination of the postflight data and lunar surface EVA's metabolic results by the other methods. It was assumed that approximately 35% de-conditioning had occurred prior to the SEVA.

EVA I

The first lunar surface extravehicular period began at 119:39 GET. Following a 125 minute preparation period, a traverse was completed which included stops at two stations. After returning to the LM, the ALSEP was deployed and the EVA concluded. The average metabolic rate for the 392 minute EVA was 1097 Btu/hr for the CDR and 976 for the LMP. These results were determined by the integration of the oxygen consumption and LCG thermodynamics methods. Average metabolic rates for the discrete activities of EVA I are given in Table 2. These rates were, in general, higher than had been predicted prior to the mission.

EVA II

The second EVA began at 142:15 and lasted 433 minutes. As a result of the higher than predicted rates for the first EVA, the pre-mission predictions for the second EVA were modified as follows:

LRV Riding = 700 Btu/hr.

Station Activity = 1150 Btu/hr.

Overhead = 1050 Btu/hr.

The average rates for the second EVA were 1002 and 808 Btu/hr for the CDR and LMP. Rates for each activity are provided in Table 3. In general, the CDR's rates agreed with the post-EVA I predictions and the LMP's with the pre-mission predictions.

EVA III

The third EVA began at 163:18 GET and ended 290 minutes later. The second EVA predictions were retained for the third EVA. The average rates were 1031 and 810 Btu/hr. Table 4 gives rates for the activities of EVA III.

Inflight

The inflight EVA was started at 241:57 GET. The CMP egressed the CM and retrieved two film cassettes. The LMP stood in the hatch and played out the CMP's life support umbilical. The average metabolic rates were 464, 834 and 940 Btu/hr for the CDR, LMP and CMP, respectively. The predicted rate was 800-900 Btu/hr. The heart rate method was the only one available for this EVA. The calibration curve used was corrected for deconditioning by comparing EVA III results and postflight ergometric response test results. The maximum rates experienced were in excess of 2000 Btu/hr while the CMP removed the pan camera cassette.

Conclusions

1. The overall metabolic rates for the stand-up EVA were as predicted pre-mission.

2. The inflight predictions were confirmed (800-900 Btu/hr).
3. The predictions for lunar surface EVA's were too low, in general (see Table 5). However, lunar roving vehicle activities produced metabolic rates lower than expected.

Prepared by

L. J. Nelson
L. J. Nelson

Approved by

C. L. Bonmarito
C. L. Bonmarito

LJN:st
Attachments
File: 35-20

Commander

Surface activity	End time, hr:min	Duration, min	Average metabolic rate,		Metabolic production Btu
			Btu/hr	Btu/min	
Pre-egress operations	119:51	12	1485	24.75	297
Egress	119:59	08	1635	27.25	218
Television deployment	120:11	12	1795	29.92	359
Lunar roving vehicle offload & deployment	120:32	21	1386	23.10	485
Lunar roving vehicle configuration	121:45	73	1173	19.55	1427
Lunar roving vehicle traverse (lunar module to station 1)	122:11	26	486	8.10	211
Station 1 activities	122:29	18	977	16.28	293
Geological site selection	122:15	04	990	16.50	66
Radial sample	122:24	09	807	13.45	121
Traverse preparation	122:29	05	1272	21.20	106
Lunar roving vehicle traverse (station 1 to station 2)	122:35	06	460	7.67	46
Station 2 activities	123:26	51	1133	18.88	963
Description & documented sample	122:57	22	1057	17.68	389
Comprehensive sample	123:05	08	1148	19.13	155
Double core tube	123:16	11	1053	17.55	193
500 mm photography & traverse preparation	123:25	10	1368	22.76	228
Lunar roving vehicle traverse (station 2 to lunar module)	124:00	34	584	9.73	331
Experiments package offload	124:24	24	998	16.63	399
Experiments package traverse (lunar roving vehicle)	124:33	09	753	12.55	113
Heat flow experiment deployment	125:24	51	1121	18.68	953
Lunar ranging retro reflector deployment	125:33	09	1320	22.00	198
Photography & traverse preparation	125:38	05	1320	22.00	110
Lunar roving vehicle traverse (experiments package site to lunar module)	125:43	05	1272	21.20	106
Extravehicular activity closeout	125:58	15	1236	20.60	309
Lunar wind composition deployment & extravehicular activity termination	126:11	13	1611	26.85	349
		392	1097	18.25	7167

EXTRAVEHICULAR ACTIVITY PERIOD

Lunar Module Pilot

Surface activity	End time, hr:min	Duration, min	Average metabolic rate, Btu/hr	Btu/min	Metabolic production, Btu
Pre-egress operations	120:00	21	854	14.23	299
Egress	120:04	04	1035	17.25	69
Contingency sample collection	120:14	10	1308	21.80	218
Lunar roving vehicle offload & deployment	120:31	17	1211	20.18	343
Lunar roving vehicle configuration	121:16	45	976	16.27	732
Pallet transfer & power down	121:45	29	1380	23.00	667
Lunar roving vehicle traverse (lunar module to station 1)	122:11	26	459	7.65	199
Station 1 activities	122:29	18	603	10.05	181
Photography panorama	122:15	04	465	7.75	31
Radial sample	122:24	09	587	9.78	88
Traverse preparation	122:29	05	744	12.40	62
Lunar roving vehicle traverse (station 1 to station 2)	122:35	06	360	6.00	36
Station 2 activities	123:20	51	672	11.20	571
Photography panorama	122:57	22	502	8.37	184
Comprehensive sample	123:05	08	840	14.00	112
Double core tube	123:16	11	835	13.92	153
70 mm photography and traverse preparation	123:26	10	732	12.20	122
Lunar roving vehicle traverse (station 2 to lunar module)	124:00	34	360	6.00	204
Experiments package offload	124:24	24	1055	17.58	422
Experiments package traverse (walking)	124:28	04	1995	33.25	133
Experiments package interconnect	124:43	15	1440	24.00	360
Passive seismic experiment deploy.	124:51	08	1455	24.25	194
Solar wind experiment deployment	124:55	04	1290	21.50	86
Lunar surface magnetometer deploy.	125:10	15	1180	19.67	295
Sunshield deployment	125:18	08	1470	24.50	196
Antenna installation	125:25	07	1251	20.85	146
Solar thermal ion detector experi- ment deployment	125:34	09	1427	23.78	214
Central station activation	125:39	05	1128	18.80	94

METABOLIC ASSESSMENT OF THE FIRST
EXTRAVEHICULAR ACTIVITY PERIOD

Table 2
Page 3 of 3

Lunar Module Pilot (continued)

Surface activity	End time, hr:min	Duration, min	Average metabolic rate, Btu/hr	Btu/min	Metabol production, Btu
Lunar roving vehicle traverse (experiment package site to lunar module)	125:43	04	630	10.50	42
Extravehicular activity closeout	125:54	11	1456	24.27	267
Extravehicular activity termina- tion	126:11	17	1444	24.07	409
		392	976	16.27	6377

Commander

Surface activity	End time, hr:min	Duration, min	Average metabolic rate,		Metabolic production, Btu
			Btu/hr	Btu/min	
Pre-egress operations	142:24	09	707	11.78	106
Egress	142:29	05	1380	23.00	115
Equipment preparation	143:04	35	1207	20.12	704
Lunar roving vehicle navigation initialization	143:11	07	1114	18.57	130
Lunar roving vehicle traverse (lunar module to station 6)	143:54	43	441	7.35	316
Station 6 activities	144:58	64	1076	17.93	1148
Documented sample	144:25	31	1014	16.90	524
Soil mechanics trench	144:35	10	1032	17.20	172
Single core tube	144:39	04	1050	17.50	70
Documented sample	144:44	05	1308	21.80	109
500 mm photography and traverse preparation	144:58	14	1170	19.50	273
Lunar roving vehicle traverse (station 6 to station 6A)	145:01	03	990	16.33	49
Station 6A activities	145:23	22	1470	24.50	539
Lunar roving vehicle traverse (station 6A to station 7)	145:26	03	800	13.33	40
Station 7 activities	146:15	49	1103	18.38	901
Documented sample	145:57	31	1034	17.23	534
Comprehensive sample	146:06	09	1127	18.78	169
Documented sample and traverse preparation	146:15	09	1320	22.00	198
Lunar roving vehicle traverse (station 7 to station 4)	146:28	13	743	12.38	161
Station 4 activities	146:46	18	1253	20.88	376
Documented sample	146:42	14	1144	19.07	267
Traverse preparation	146:46	04	1635	27.25	109
Lunar roving vehicle traverse (station 4 to lunar module)	147:08	22	554	9.23	203
Lunar roving vehicle configuration	147:20	12	805	13.42	161
Lunar roving vehicle traverse (lunar module to experiments package site)	147:21	01	420	7.00	7

METABOLIC ASSESSMENT OF THE SECOND EXTRAVEHICULAR ACTIVITY PERIOD

Commander (continued)

Surface activity	End time, hr:min	Duration, min	Average metabolic rate,		Metabolic production, Btu
			Btu/hr	Btu/min.	
Experiments package site activities	148:32	71	965	16.08	1142
Heat flow experiment (continua- tion)	147:57	36	878	14.63	527
Geological site selection	148:14	17	1112	18.53	315
Deep core tube & traverse to lunar module	148:32	18	1000	16.67	300
Extravehicular activity closeout	149:19	47	1228	20.47	962
Closeout activities	148:53	21	1254	20.90	439
Flag deployment	148:58	05	1176	19.60	98
Closeout activities	149:19	21	1214	20.23	425
Extravehicular activity termination	149:28	09	1140	19.00	171
		433	1002	16.70	7231

METABOLIC ASSESSMENT OF THE SECOND EXTRAVEHICULAR ACTIVITY PERIOD

Lunar Module Pilot

Surface activity	End time, hr:min	Duration, min	Average metabolic rate, Btu/hr Btu/min	Metabolic production, Btu
Pre-egress operations	142:36	21	780 13.00	273
Egress	142:38	02	1380 23.00	46
Equipment preparation	143:04	26	1089 18.15	472
Lunar roving vehicle navigation initialization	143:11	07	814 13.57	95
Lunar roving vehicle traverse (lunar module to station 6)	143:54	43	360 6.00	258
Station 6 activities	144:58	64	812 13.53	866
Photography panorama	143:58	04	675 11.25	45
Documented sample	144:26	28	690 11.50	322
Soil mechanics trench	144:35	09	993 16.55	149
Single core tube	144:39	04	975 16.25	65
Documented sample	144:44	05	1248 20.80	104
70 mm magazine change and traverse preparation	144:58	14	776 12.93	181
Lunar roving vehicle traverse (station 6 to station 6A)	145:01	03	380 6.33	19
Station 6A activities	145:23	22	785 13.08	288
Photography panorama and geological description	145:19	18	816 13.60	245
Traverse preparation	145:23	04	645 10.75	43
Lunar roving vehicle traverse (station 6A to station 7)	145:26	03	360 6.00	18
Station 7 activities	146:15	49	676 11.27	552
Photography panorama	145:35	09	587 9.78	88
Documented sample	145:56	21	640 10.67	224
Comprehensive sample	146:06	10	702 11.70	117
Documented sample and traverse preparation	146:15	09	820 13.67	123
Lunar roving vehicle traverse (station 7 to station 4)	146:28	13	351 5.85	76

METABOLIC ASSESSMENT OF THE SECOND
EXTRAVEHICULAR ACTIVITY PERIOD

Page 4 of 4

Lunar Module Pilot (continued)

Surface activity	End time, hr:min	Duration, min	Average metabolic rate,		Metabolic production, Btu
			Btu/hr	Btu/min	
Station 4 activities	146:46	18	690	11.50	207
Photography panorama and documented sample	146:42	14	699	11.65	163
Traverse preparation	146:46	04	660	11.00	44
Lunar roving vehicle traverse (station 4 to lunar module)	147:08	22	350	5.83	128
Lunar roving vehicle configuration	147:30	22	908	15.13	333
Traverse to experiments package site (walking)	147:35	05	876	14.60	73
Experiments package site activities	148:28	53	1052	17.53	929
Experiments package photography	147:48	13	808	13.47	175
Sample collection	147:55	07	1174	19.57	137
Photography and discussion	148:02	07	720	12.00	84
Soil mechanics, trench	148:18	16	1290	21.50	344
Penetrometer	148:28	10	1134	18.90	189
Traverse to lunar module (walking)	148:33	05	1224	20.40	102
Extravehicular activity closeout	149:04	31	1094	18.23	565
Closeout activities	148:52	19	1143	19.05	362
Flag deployment	148:58	06	1050	17.50	105
Closeout activities	149:04	06	980	16.33	98
Extravehicular activity termination	149:28	24	1328	22.13	531
		433	808	13.47	5831

METABOLIC ASSESSMENT OF THE THIRD EXTRAVEHICULAR ACTIVITY PERIOD

Table 4
Page 1 of 4

Commander

Surface activity	End time, hr:min	Duration, min	Average metabolic rate, Btu/hr Btu/min	Metabolic production, Btu
Pre-egress operations	163:28	10	642 10.70	107
Egress	163:32	04	1275 21.25	85
Equipment preparation	104:04	32	943 15.72	503
Lunar roving vehicle traverse (lunar module to experiments package site)	164:07	03	840 14.00	42
Experiments package site activities	164:45	38	1037 17.28	657
Remove core tubes from surface	164:18	11	1315 21.92	241
Disassemble core tubes	164:37	19	973 16.22	308
Lunar roving vehicle evaluation	164:45	08	810 13.50	108
Lunar roving vehicle naviga- tion initialization	164:48	03	820 13.67	41
Lunar roving vehicle traverse (experiments package site to station 9)	165:02	14	429 7.15	100
Station 9 activities	165:17	15	1012 16.87	253
Lunar roving vehicle traverse (station 9 to station 9A)	165:19	02	660 11.00	22
Station 9A activities	166:14	55	923 15.38	846
Geological description	165:36	17	829 13.82	235
Documented sample	165:53	17	896 14.93	254
Comprehensive sample	166:01	08	945 15.75	126
Double core tube	166:09	08	840 14.00	112
Undocumented sample and traverse preparation	166:14	05	1428 23.80	119
Lunar roving vehicle traverse (station 9A to station 10)	166:17	03	740 12.33	37
Station 10 activities	166:29	12	1055 17.58	211
Lunar roving vehicle traverse (station 10 to experiments package site)	166:44	15	476 7.93	119

METABOLIC ASSESSMENT OF THE THIRD
EXTRAVEHICULAR ACTIVITY PERIOD

Table 4
Page 2 of 4

Commander (continued)

Surface activity	End time, hr:min	Duration, min	Average metabolic rate, Btu/hr		Metabolic production, Btu
				Btu/min	
Lunar roving vehicle traverse (experiments package site to lunar module)	166:46	02	660	11.00	22
Extravehicular activity closeout	168:01	75	1390	23.17	1738
Closeout activities	167:15	29	1219	20.32	589
Stamp cancellation and gravity demonstration	167:23	08	1360	23.00	184
Lunar roving vehicle positioning	167:53	30	1438	23.97	719
Closeout activities	168:01	08	1845	30.75	246
Extravehicular activity termination	168:08	07	1714	28.57	200
		290	1031	17.18	4983

METABOLIC ASSESSMENT OF THE THIRD
EXTRAVEHICULAR ACTIVITY PERIOD

Table 4
Page 3 of 4

: Lunar Module Pilot

Surface activity	End time, hr:min	Duration min	Average metabolic rate, Btu/hr	Metabolic production, Btu/min	Metabolic production, Btu
Re-egress operations	163:32	14	947	15.78	221
Egress	164:34	02	1380	23.00	46
Equipment preparation	164:03	29	799	13.32	386
Traverse to experiments package site (walking)	164:06	03	1340	22.33	67
Experiments package site activities	164:45	39	878	14.63	571
Remove core tubes from surface	164:18	12	920	15.33	184
Disassemble core tubes	164:22	04	1005	16.75	67
Photograph experiments packages	164:29	07	806	13.43	94
Disassemble core stems	164:37	08	953	15.88	127
Photograph lunar roving vehicle	164:45	08	742	12.38	99
Lunar roving vehicle navigation initialization	164:48	03	820	13.67	41
Lunar roving vehicle traverse (experiments package site to station 9)	165:02	14	373	6.22	87
Station 9 activities	165:17	15	624	10.40	156
Lunar roving vehicle traverse (station 9 to station 9A)	165:19	02	570	9.50	19
Station 9A activities	166:14	55	772	12.87	708
Documented sample	165:53	34	702	11.75	398
Comprehensive sample	166:01	08	938	15.63	125
Double core	166:09	08	848	14.13	113
Undocumented sample	166:14	05	864	14.40	72
Lunar roving vehicle traverse (station 9A to station 10)	166:17	03	360	6.00	18
Station 10 activities	166:29	12	780	13.00	156
70 mm photography panorama	166:20	03	920	15.33	46
Sample collection	166:29	09	733	12.22	110

METABOLIC ASSESSMENT OF THE THIRD
EXTRAVEHICULAR ACTIVITY PERIOD

Table 4
Page 4 of 4

Lunar Module Pilot (continued)

surface activity	End time, hr:min	Duration min	Average metabolic rate,		Metabolic production, Btu
			Btu/hr	Btu/min	
Lunar roving vehicle traverse (station 10 to experiments package site)	166:44	15	384	6.40	96
Core tube retrieval	166:45	01	660	11.00	11
Traverse to lunar module (walking)	166:47	02	1020	17.00	34
Extravehicular activity closeout	167:54	67	895	14.92	999
Extravehicular activity termination	168:08	14	1281	21.35	299
		290	810	13.50	3915

APOLLO 15

METABOLIC ASSESSMENT SUMMARY

ALL SURFACE EXTRAVEHICULAR ACTIVITY (Btu/hr)

	COMMANDER		LUNAR MODULE PILOT		BOTH CREWMEN	
	ACTUAL	PRE-MISSION PREDICTION	ACTUAL	PRE-MISSION PREDICTION	ACTUAL	PRE-MISSION PREDICTION
Lunar roving vehicle traverses only	580	608	405	603	494	606
Geological station activities only	1091	950	727	950	909	950
Oxygen load only	1246	956	1060	984	1152	970
Experiments package activities only	1035	941	1138	946	1085	904
All activities	1043	869	868	862	956	866

NAME
DAVE SCOTT

TEST TYPE
EXERCISE RESPONSE

LOCATION
KSC

DATE
6-29-71

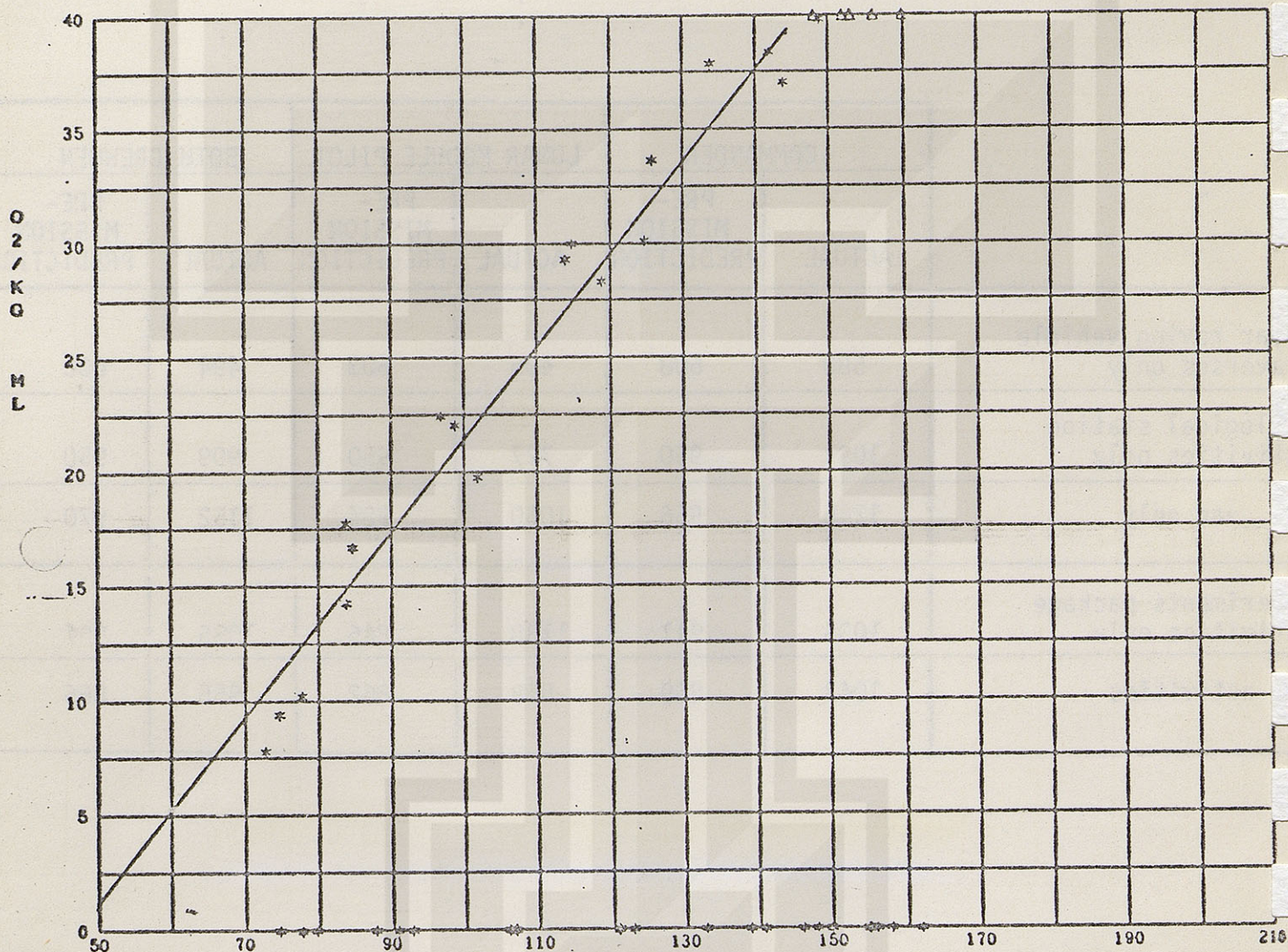
TIME
9.30

MISSION TIME
PREP

PRESSURE
768.50

TEMPERATURE
25.00

O₂/KG ML = .40472 HEART RATE + -19.08503
STANDARD DEVIATION = 1.97258 CORRELATION COEFFICIENT = .98618 COEFFICIENT OF DETERMINATION = .972556
O₂/KG ML Y120 = 29.4819 Y140 = 37.5764 Y160 = 45.6709 Y180 = 53.7654



HEART RATE

Preflight Mean Weight: 179.8 lbs

81.1 kgs

Height: 71.7 in.

182.1 cm.

NAME
A IRWIN

TEST TYPE
EXERCISE RESPONSE

LOCATION
KSC

DATE
6-29-71

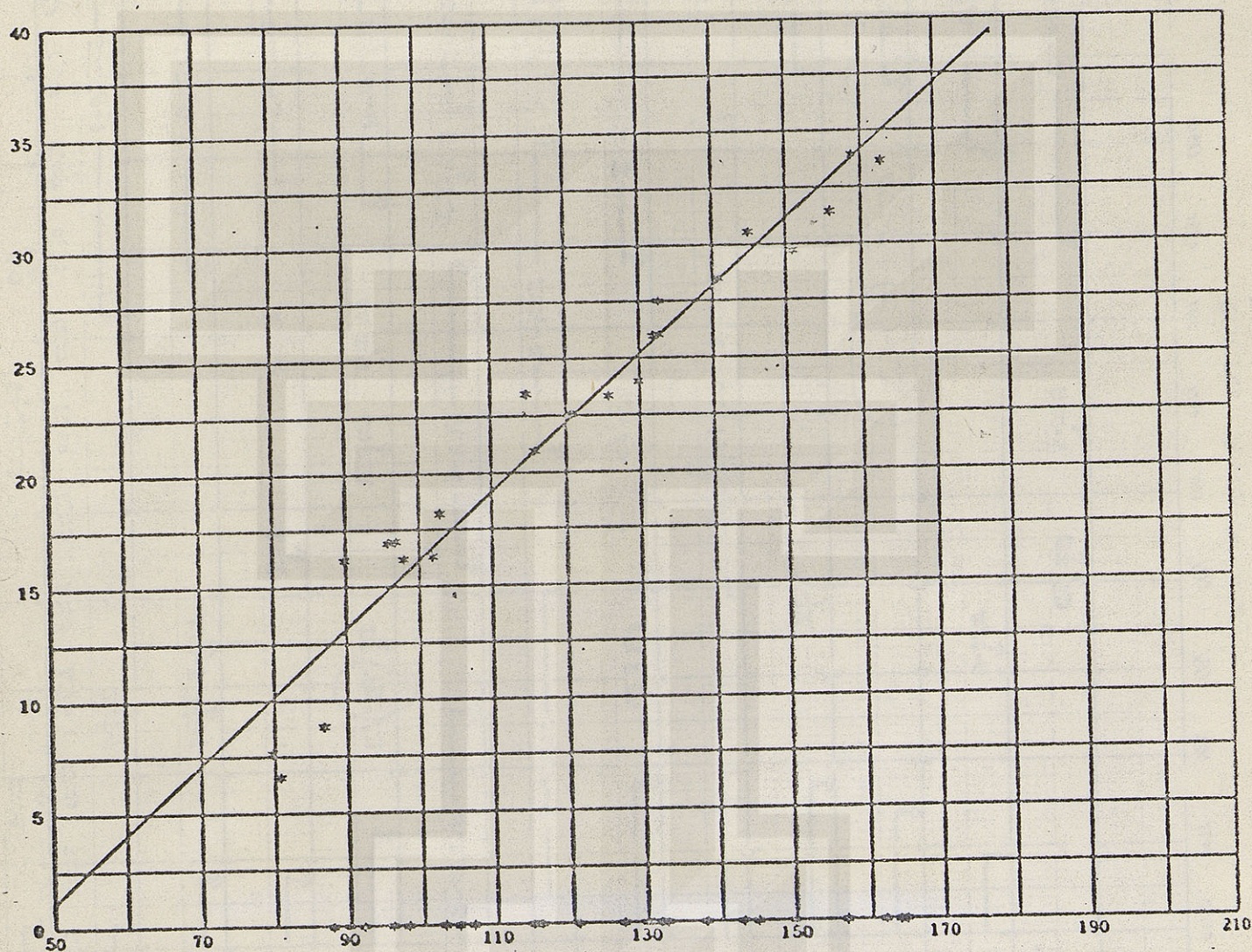
TIME
11. 0

MISSION TIME
PREF

PRESSURE
768.50

TEMPERATURE
25.00

02/03 ML = .30014 HEART RATE + -13.96722
STANDARD DEVIATION = 1.71032 CORRELATION COEFFICIENT = .97444 COEFFICIENT OF DETERMINATION = .949541
02/01 ML Y120 = 22.0494 Y140 = 28.0522 Y160 = 34.0550 Y180 = 40.0578



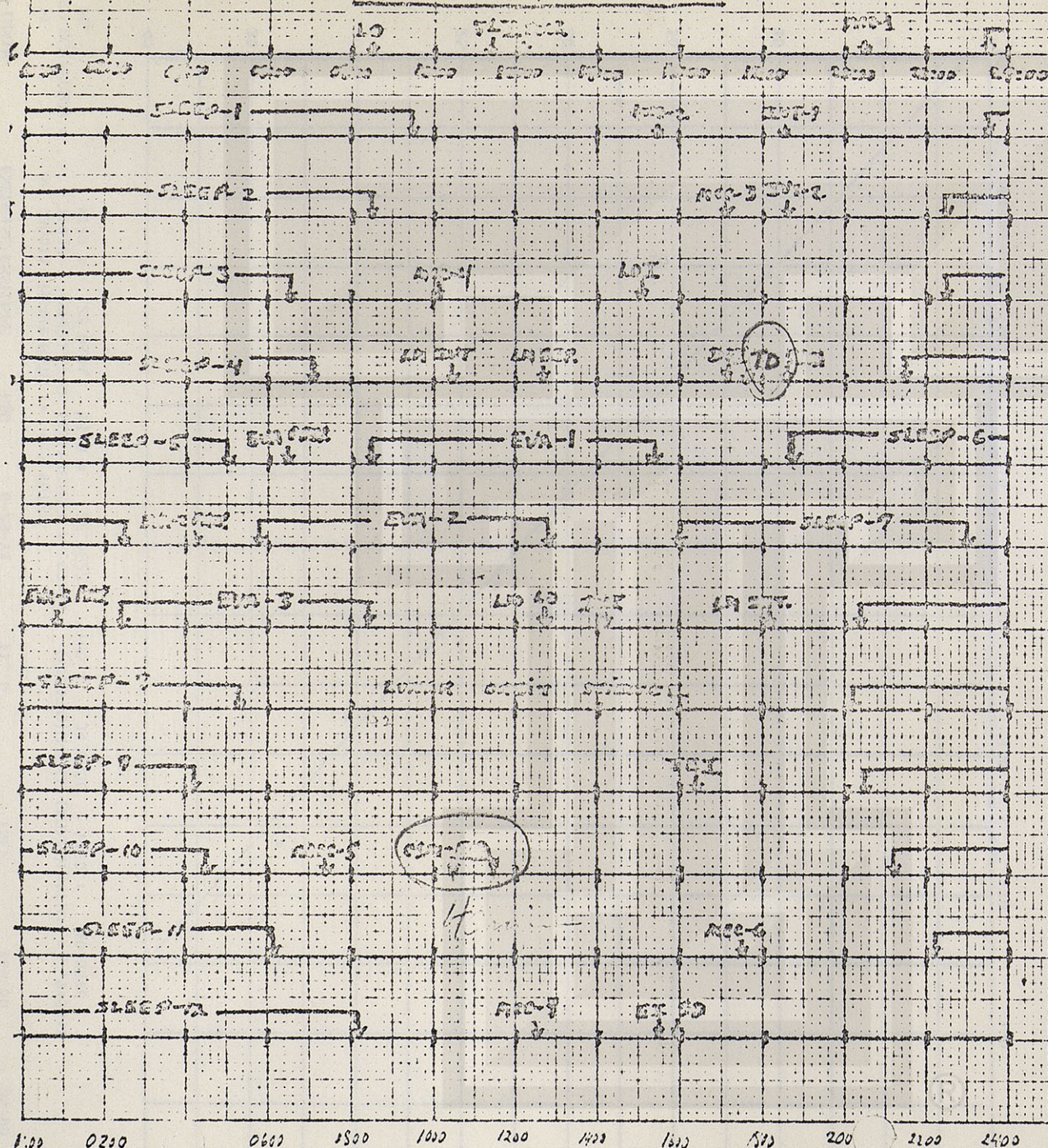
HEART RATE

Preflight Mean Weight: 163.9 lbs
74.3 kgs

Height: 68 in.
172.7 cm.

APOLLO 15 MEDICAL PLANNING SCHEDULE

STATION DAYLIGHT TIME



CENTRAL DAYLIGHT TIME

SIMULATION OF APOLLO 15 EXTRAVEHICULAR ACTIVITY

A. Conversion of Apollo 15 Metabolic Production Data for Experimental Utilization

In NASA/MSD memorandum of February 4, 1972 titled "Apollo 15 Sleep and Metabolic Time Lines (DB6-72-31)," astronaut energy utilization during extravehicular activity is presented in British Thermal Units (btu).

Since most tables of energy expenditure per unit of oxygen utilization are expressed in kilocalories (kcal), it has been necessary to convert the data in Table 1 to that shown in Table 2 on the basis of: 1 btu = 0.252 kcal.

The NASA memorandum provides total btu produced for each activity as well as the duration of the activity. Although expressed in total btu and btu/hr, it will be more convenient for use in the calculations below if expressed in btu per minute.

B. Determination of Experimental Work-Loads to Simulate Apollo 15 Extravehicular Activity

1. The btu production per liter of oxygen consumed varies with the Respiratory Quotient.* At zero carbohydrate utilization (RQ = 0.707) 18.595 btu are produced per liter and at 100% carbohydrate utilization (RQ = 1.00), 20.028 btu per liter.

The experimental diet will remain constant throughout the study, and RQ should remain relatively constant. Therefore, it appears that an insignificant error would be induced by using the RQ obtained on the final pre-bedrest exercise study in the determination of required work-loads. The maximum error irrespective of RQ would be 1.433 but/liter of oxygen consumed.

$$*RQ = \frac{\text{Vol. CO}_2 \text{ formed}}{\text{Vol. O}_2 \text{ consumed}}$$

2. Prior to bedrest, the subjects will undergo formal exercise testing on four occasions, two during the equilibration period, and two during the control period. These studies will be performed in the fasting initially basal state.

Work loads will be as follows:

- a) Resting
- b) 50 Watts
- c) 75 Watts
- d) 100 Watts
- e) An additional level chosen to induce a heart rate of 160/min. or above

At rest and during the 4th to 5th minute of each exercise level, oxygen consumption and carbon dioxide production will be determined. Heart rate will be recorded throughout the expired air collection. Blood pressure will be determined immediately before and after each collection. A rest period will be permitted between each level.

From this data, the following determinations will be made:

- a) Minute ventilation
- b) Oxygen consumption
- c) Carbon dioxide production
- d) Respiratory quotient
- e) Energy production in but/min.
 $\text{btu/min} = \text{O}_2 \text{ consumption (L)} \times \text{btu production/L at known RQ}$
- f) Mean heart rate
- g) Average blood pressure
- h) Derived maximal oxygen uptake at heart rate 180/min.
in ml O_2 /min. and ml/kg x min.

A graph will be constructed for each subject with work load (Watts) on the abscissa and energy utilization (btu/min) on the ordinate.

Use of this graph will allow determination of the ergometer work setting (Watts) required to simulate the astronaut's metabolic production in btu/min. This level will be used for the same duration as that of the astronaut.

Use of this method may well result in the volunteers doing heavier work than that actually performed by the astronauts, since a greater amount of energy expenditure will be required to do the same work after a period of bedrest.

TABLE 1

Respira- tory quotient	Percentage participation in total oxygen consumption		Percentage participation in total calorie production		Calories per liter oxygen	
	Carbo- hydrates (1)	Fats (2)	Carbo- hydrates (3)	Fats (4)	kcal (5)	log ₁₀
0.707	0	100.0	0	100.0	4.686	0.67080
0.71	1.02	99.0	1.10	98.9	4.690	0.67114
0.72	4.44	95.6	4.76	95.2	4.702	0.67228
0.73	7.85	92.2	8.40	91.6	4.714	0.67342
0.74	11.3	88.7	12.0	88.0	4.727	0.67456
0.75	14.7	85.3	15.6	84.4	4.739	0.67569
0.76	18.1	81.9	19.2	80.8	4.751	0.67682
0.77	21.5	78.5	22.8	77.2	4.764	0.67794
0.78	24.9	75.1	26.3	73.7	4.776	0.67906
0.79	28.3	71.7	29.9	70.1	4.788	0.68018
0.80	31.7	68.3	33.4	66.6	4.801	0.68129
0.81	35.2	64.8	36.9	63.1	4.813	0.68241
0.82	38.6	61.4	40.3	59.7	4.825	0.68352
0.83	42.0	58.0	43.8	56.2	4.838	0.68463
0.84	45.4	54.6	47.2	52.8	4.850	0.68573
0.85	48.8	51.2	50.7	49.3	4.862	0.68683
0.86	52.2	47.8	54.1	45.9	4.875	0.68793
0.87	55.6	44.4	57.5	42.5	4.887	0.68903
0.88	59.0	41.0	60.8	39.2	4.899	0.69012
0.89	62.5	37.5	64.2	35.8	4.911	0.69121
0.90	65.9	34.1	67.5	32.5	4.924	0.69230
0.91	69.3	30.7	70.8	29.2	4.936	0.69339
0.92	72.7	27.3	74.1	25.9	4.948	0.69447
0.93	76.1	23.9	77.4	22.6	4.961	0.69555
0.94	79.5	20.5	80.7	19.3	4.973	0.69663
0.95	82.9	17.1	84.0	16.0	4.985	0.69770
0.96	86.3	13.7	87.2	12.8	4.998	0.69877
0.97	89.8	10.2	90.4	9.58	5.010	0.69984
0.98	93.2	6.83	93.6	6.37	5.022	0.70091
0.99	96.6	3.41	96.8	3.18	5.035	0.70197
1.00	100.0	0	100.0	0	5.047	0.70303

TABLE 2

Respiratory Quotient	btu/liter $\cdot \text{O}_2$
0.707	18.595
0.71	18.611
0.72	18.659
0.73	18.706
0.74	18.758
0.75	18.806
0.76	18.853
0.77	18.905
0.78	18.952
0.79	19.000
0.80	19.052
0.81	19.099
0.82	19.147
0.83	19.595
0.84	19.246
0.85	19.294
0.86	19.345
0.87	19.393
0.88	19.440
0.89	19.488
0.90	19.540
0.91	19.587
0.92	19.635
0.93	19.687
0.94	19.734
0.95	19.782
0.96	19.833
0.97	19.881
0.98	19.929
0.99	19.980
1.00	20.028

POTASSIUM DEPLETION STUDY

EXTRAVEHICULAR ACTIVITY

Date	SCOTT - Subject 1			IRWIN - Subject 2		
	Duration (min)	Btu/Min	Watts	Duration (min)	Btu/Min	Watts
3/16	39	16.62	50	None		
3/17	12	24.75	82	21	14.23	43
	8	27.25	90	4	17.25	55
	12	29.92	100	10	21.80	72
	21	23.10	75	17	20.18	66
	73	19.55	63	45	16.27	52
	26	8.10	15	29	23.00	77
	18	16.28	50	26	7.65	16
	4	16.50	50	18	10.05	27
	9	13.45	39	4	7.75	18
	5	21.20	68	9	9.78	25
	6	7.67	13	5	12.40	36
	51	18.88	60	6	6.00	8
	22	17.68	55	51	11.20	31
	8	19.13	61	22	8.37	20
	11	17.55	55	8	14.00	42
	10	22.80	75	11	13.92	42
	34	9.73	22	10	12.20	35
	24	16.63	50	34	6.00	8
	9	12.55	35	24	17.58	57
	51	18.68	58	4	33.25	112
	9	22.00	72	15	24.00	80
	5	22.00	72	8	24.25	81
	5	21.20	68	4	21.50	72
	15	20.60	66	15	19.67	65
	13	26.85	90	8	24.50	82
				7	20.85	70
				9	23.78	80
				5	18.80	62
				4	10.50	28
				11	24.27	81
				17	24.07	80

POTASSIUM DEPLETION STUDY

EXTRAVEHICULAR ACTIVITY

SCOTT - Subject 1IRWIN - Subject 2

Date	Duration (min)	Btu/Min	Watts	Duration (min)	Btu/Min	Watts
3/18	9	11.78	31	21	13.00	39
	5	23.00	76	2	23.00	77
	35	20.12	65	26	18.15	60
	7	18.57	58	7	13.57	41
	43	7.35	12	43	6.00	9
	31	16.90	52	4	11.25	32
	10	17.20	53	28	11.50	33
	4	17.50	54	9	16.55	53
	5	21.80	71	4	16.25	51
	14	19.50	62	5	20.80	69
	3	16.33	50	14	12.93	38
	22	24.50	81	3	6.33	10
	3	13.33	38	18	13.60	41
	31	17.23	53	4	10.75	35
	9	18.78	60	3	6.00	9
	9	22.00	72	9	9.78	25
	13	12.38	34	21	10.67	28
	14	19.07	61	10	11.70	34
	4	27.25	91	9	13.67	41
	22	9.23	20	13	5.85	9
	12	13.42	38	14	11.65	33
	1	7.00	10	4	11.00	31
	36	14.63	43	22	5.83	9
	17	18.53	59	22	15.13	47
	18	16.67	51	5	14.60	45
	21	20.90	67	13	13.47	40
	5	19.60	63	7	19.57	63
	21	20.23	65	7	12.00	35
	9	19.00	61	16	21.50	73
				10	18.90	62
				5	20.40	67
				19	19.05	63
				6	17.50	57
				6	16.33	52
				24	22.13	73

POTASSIUM DEPLETION STUDY

EXTRAVEHICULAR ACTIVITY

Date	Duration (min)	<u>SCOTT</u> - Subject 1		Duration (min)	<u>IRWIN</u> - Subject 2	
		Btu/Min	Watts		Btu/Min	Watt
3/19	10	10.70	26	14	15.78	50
	4	21.25	69	2	23.00	77
	32	15.72	47	29	13.32	40
	3	14.00	41	3	22.33	74
	11	21.92	72	12	15.33	48
	19	16.22	49	4	16.75	54
	8	13.50	38	7	13.43	41
	3	13.67	39	8	15.88	50
	14	7.15	10	8	12.38	36
	15	16.87	52	3	13.67	42
	2	11.00	28	14	6.22	9
				15	10.40	27
	17	13.82	40	2	9.50	24
	17	14.93	44			
	8	15.75	48	34	11.70	33
	8	14.00	41	8	15.63	49
	5	23.80	78	8	14.13	43
	3	12.33	33	5	14.40	44
	12	17.58	56	3	6.00	8
	15	7.93	14			
	2	11.00	28	3	15.33	48
				9	12.22	35
	29	20.32	65	15	6.40	10
	8	23.00	75	1	11.00	31
	30	23.97	79	2	17.00	54
	8	30.75	104	67	14.92	47
	7	28.57	97	14	21.35	70
3/22	60	7.73	13	60	13.90	42

POTASSIUM DEPLETION STUDY

Body Weight
(kg)

Study Day	Subject 1	Subject 2
C1	80.433	72.174
C2	80.368	71.894
C3	80.438	71.894
C4	80.248	72.404
C5	80.023	72.295
C6	79.398	71.895
C7	79.828	72.445
B1	80.287	72.595
B2	79.407	71.485
B3	79.247	71.660
B4	79.267	71.095
B5	79.217	71.495
B6	79.832	71.265
B7	78.217	71.215
B8	79.297	71.595
B9	78.936	71.080
B10	79.198	71.490
B11	79.214	71.040
B12	79.606	70.860
R1	78.286	70.290
R2	79.596	71.400
R3	79.026	71.190
R4	78.256	70.650
R5	78.741	71.290
R6	78.716	71.735
R7	79.086	71.450
R8	79.216	71.360
R9	78.646	70.940
R10	79.316	71.135
R11	78.596	71.670
R12	79.066	71.570
R13	78.994	71.450
R14	79.966	70.740

POTASSIUM DEPLETION STUDY

Urine Volume & Creatinine

Subject 1			Subject 2		
Study Day	Urine Volume (ml)	Creatinine (mgm%)	Study Day	Urine Volume (ml)	Creatinine (mgm%)
C1	1100	1657	C1	1870	1751
C2	1375	2053	C2	1340	1224
C3	1190	1998	C3	1870	2207
C4	1565	2039	C4	2225	1806
C5	1270	1804	C5	2765	1792
C6	1670	1736	C6	1825	1717
C7	1190	1607	C7	1360	1696
B1	2050	2298	B1	2970	2030
B2	1140	2095	B2	1910	1745
B3	1170	2076	B3	2300	1810
B4	1400	1752	B4	2500	2166
B5	930	1644	B5	2820	1745
B6	1220	2381	B6	2250	1886
B7	960	2105	B7	1770	1788
B8	1350	2076	B8	2000	1727
B9	970	1977	B9	2080	1727
B10	1590	2006	B10	2490	1786
B11	1470	1816	B11	2310	1671
B12	1670	2095	B12	2180	1828
R1	880	1797	R1	1730	1644
R2	1640	1875	R2	2840	1752
R3	1235	1849	R3	2500	1655
R4	920	2053	R4	1400	1632
R5	820	1193	R5	1660	1601
R6	1080	2035	R6	2910	1897
R7	1455	2097	R7	2530	1784
R8	1300	2104	R8	2695	1571
R9	1120	1564	R9	2205	1565
R10	980	1982	R10	1540	1490
R11	490	1014	R11	2180	1653
R12	980	2124	R12	1875	1697
R13	870	1591	R13	2090	1464
R14	3055	1752	R14	2533	1535

POTASSIUM DEPLETION STUDY

Fluid Balance
(ml/24 hours)

Study Day	Subject 1			Subject 2		
	Intake	Output	Balance	Intake	Output	Balance
C1	2763	1252	1511	3236	2018	1218
C2	3328	1375	1953	3118	1340	1778
C3	2808	1190	1618	2788	1870	918
C4	2628	1565	1063	3028	2225	803
C5	3208	1279	1929	3263	2774	489
C6	3108	1806	1302	3123	1959	1164
C7	3288	1190	2098	3043	1360	1683
B1	3003	2064	939	3523	2984	539
B2	2691	1275	1416	3191	2050	1141
B3	2328	1176	1152	2928	2307	621
B4	3628	1405	2223	2748	2505	243
B5	2628	936	1692	3228	2826	402
B6	3628	1227	2401	3228	2256	972
B7	3608	966	2642	3528	1780	1748
B8	3043	1365	1678	3173	2015	1158
B9	3036	1105	1931	3456	2216	1240
B10	2728	1597	1131	3228	2496	732
B11	2723	1485	1238	3323	2325	998
B12	2882	1803	1079	3444	2315	1129
R1	3338	890	2448	4103	1736	2367
R2	3248	1648	1600	3818	2847	971
R3	3258	1240	2018	3178	2508	670
R4	3328	925	2403	3028	1405	1623
R5	3428	820	2608	3228	1660	1568
R6	3428	1080	2348	3128	2910	218
R7	2998	1455	1543	3218	2530	688
R8	2618	1306	1312	3908	2705	1203
R9	2918	1120	1798	3213	2205	1008
R10	3008	980	2028	3613	1540	2073
R11	3893	490	3403	4028	2180	1848
R12	2818	980	1838	3548	1875	1673
R13	3663	879	2784	3103	2099	1004
R14	3646	3192	454	4296	2676	1620

POTASSIUM DEPLETION STUDY

Potassium Balance
(meq/24 hours)

Subject 1

Study Day	Intake	Output			Balance
		Urine	Stool	Sweat	
C1	125.98	78.8	3.76	1.92	41.50
C2	125.98	110.2	3.76	1.92	10.1
C3	125.98	102.5	3.76	1.92	17.8
C4	125.98	119.6	5.29	1.92	- .83
C5	125.98	103.0	5.29	1.92	15.77
C6	125.98	103.3	5.29	1.92	15.47
C7	125.98	79.4	5.29	1.92	39.37
B1	14.5	51.9	3.78	1.92	-43.10
B2	14.5	30.8	3.78	1.92	-22
B3	14.5	24.7	3.78	1.92	-15.9
B4	14.5	22.4	3.78	1.92	-13.6
B5	14.5	16.4	3.05	1.92	- 4.95
B6	14.5	29.8	3.05	8.77	-27.12
B7	14.5	16.2	3.05	8.77	-13.52
B8	14.5	15.3	3.05	8.77	-12.62
B9	14.5	10.9	3.55	1.92	- 1.87
B10	14.5	12.4	3.55	2.71	- 4.16
B11	14.5	11.0	3.55	2.71	- 2.76
B12	14.5	16.3	3.55	1.92	- 7.27
R1	125.98	20.8	1.72	1.92	101.54
R2	125.98	43.4	1.72	1.92	78.94
R3	125.98	62.8	1.72	1.92	59.54
R4	125.98	87.8	1.72	1.92	34.54
R5	125.98	62.9	1.72	1.92	59.44
R6	125.98	129.9	1.72	1.92	- 7.56
R7	125.98	107.1	1.72	1.92	15.24
R8	125.98	93.6	1.64	1.92	28.82
R9	125.98	73.3	1.64	1.92	49.12
R10	125.98	76.6	1.64	1.92	45.82
R11	125.98	57.8	1.64	1.92	64.62
R12	125.98	96.1	1.64	1.92	26.32
R13	125.98	86.1	1.64	1.92	35.52
R14	125.98	104.9	1.64	1.92	17.52

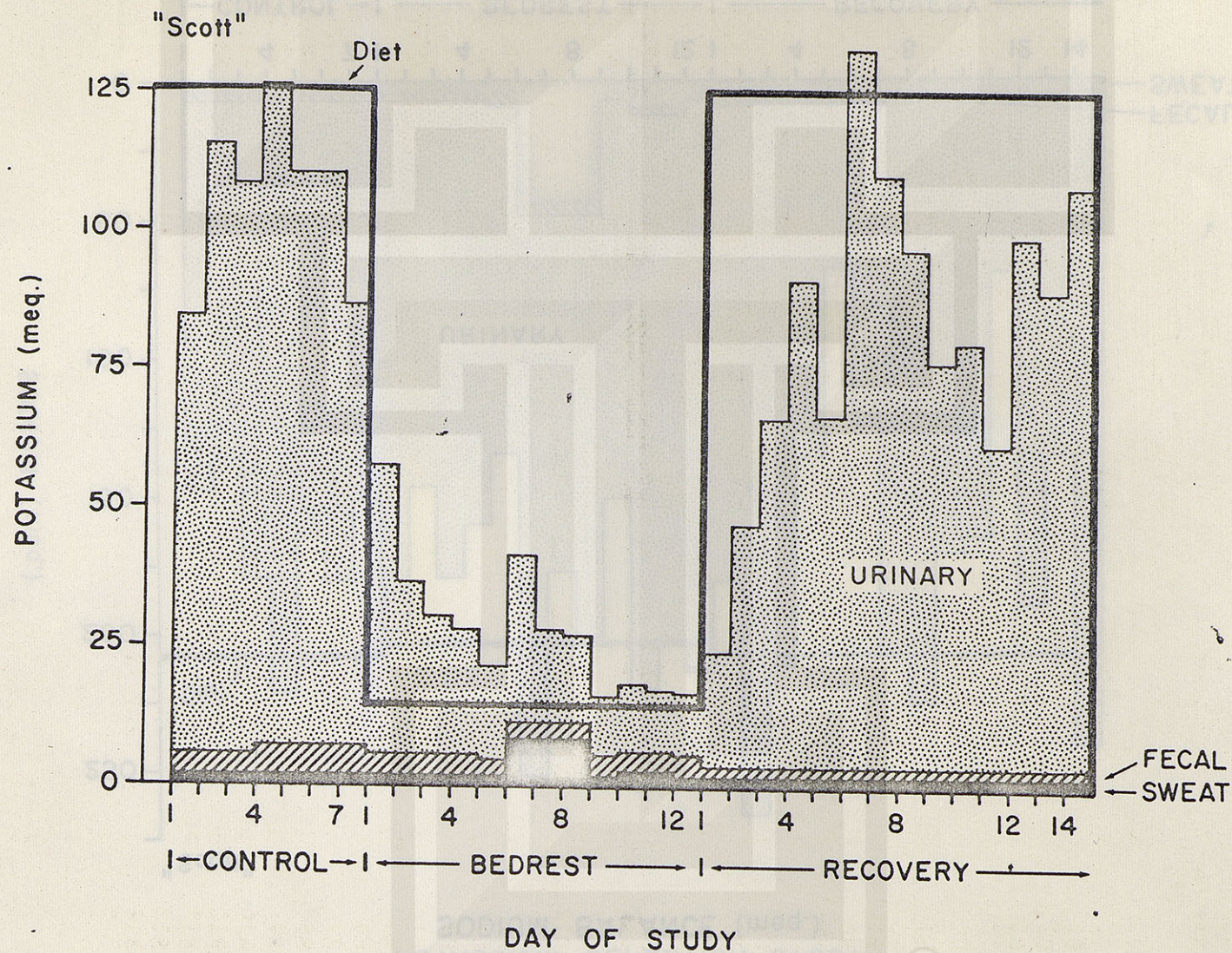
POTASSIUM DEPLETION STUDY

Sodium Balance
(meq/24 hours)

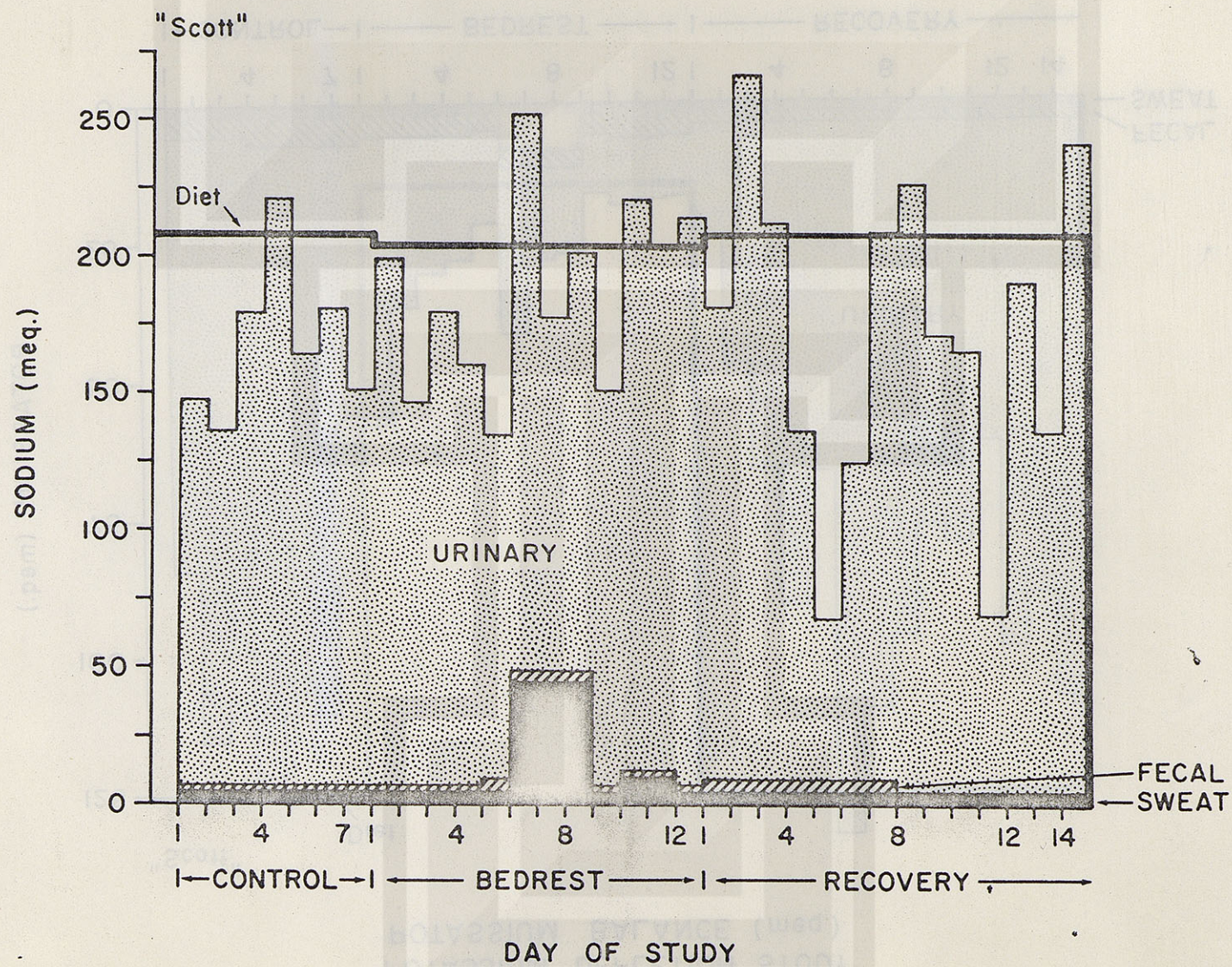
Subject 1

Study Day	Intake	Output			Balance
		Urine	Stool	Sweat	
C1	207.78	140.3	2.19	5.00	+60.29
C2	207.78	129.0	2.19	5.00	71.59
C3	207.78	171.5	2.19	5.00	29.09
C4	207.78	214.0	2.08	5.00	-13.30
C5	207.78	157.2	2.08	5.00	43.50
C6	207.78	173.5	2.08	5.00	27.20
C7	207.78	143.6	2.08	5.00	57.10
B1	203.72	190.8	2.80	5.00	+ 5.12
B2	203.72	138.5	2.80	5.00	57.42
B3	203.72	172.1	2.80	5.00	23.82
B4	203.72	152.5	2.80	5.00	43.42
B5	203.72	125.5	4.50	5.00	68.72
B6	203.72	204.0	4.50	43.82	-48.60
B7	203.72	129.7	4.50	43.82	25.70
B8	203.72	153.4	4.50	43.82	2.00
B9	203.72	144.0	2.38	5.00	52.34
B10	203.72	208.0	2.38	10.80	-17.46
B11	203.72	190.8	2.38	10.80	- 0.26
B12	203.72	207.5	2.38	5.00	-11.16
R1	207.78	172.2	2.47	5.00	+28.11
R2	207.78	257.3	2.47	5.00	-56.99
R3	207.78	202.9	2.47	5.00	- 2.59
R4	207.78	127.4	2.47	5.00	72.91
R5	207.78	58.6	2.47	5.00	141.71
R6	207.78	115.8	2.47	5.00	84.51
R7	207.78	200.2	2.47	5.00	.11
R8	207.78	221.2	.29	5.00	-18.71
R9	207.78	166.2	.29	5.00	36.29
R10	207.78	160.7	.29	5.00	41.79
R11	207.78	64.3	.29	5.00	138.19
R12	207.78	185.7	.29	5.00	16.79
R13	207.78	131.0	.29	5.00	71.49
R14	207.78	236.3	.29	5.00	-33.81

POTASSIUM DEPLETION STUDY POTASSIUM BALANCE (meq.)



POTASSIUM DEPLETION STUDY
SODIUM BALANCE (meq.)



POTASSIUM DEPLETION STUDY

Calcium Balance
(mgm/24 hours)

Subject 1

Study Day	Intake	Output		Balance
		Urine	Stool	
C1	1918	222	876	820
C2	1918	282	876	760
C3	1918	285	876	757
C4	1918	325	1085	833
C5	1918	266	1085	567
C6	1918	230	1085	603
C7	1918	173	1085	660
B1	1904	379	1546	-21
B2	1904	330	1546	28
B3	1904	385	1546	-27
B4	1904	455	1546	-97
B5	1904	346	712	846
B6	1904	435	712	757
B7	1904	458	712	734
B8	1904	471	712	721
B9	1904	416	1684	-196
B10	1904	516	1684	-296
B11	1904	471	1684	-251
B12	1904	462	1684	-242
R1	1924	399	530	995
R2	1924	403	530	991
R3	1924	302	530	1092
R4	1924	281	530	1113
R5	1924	172	530	1222
R6	1924	327	530	1067
R7	1924	389	530	1005
R8	1924	320	334	1270
R9	1924	302	334	1288
R10	1924	232	334	1358
R11	1924	128	334	1462
R12	1924	415	334	1175
R13	1924	236	334	1354
R14	1924	238	334	1352

POTASSIUM DEPLETION STUDY

Magnesium Balance
(mgm/24 hours)

Subject 1

Study Day	Intake	Output		Balance
		Urine	Stool	
C1	472	140	136	196
C2	472	205	136	131
C3	472	188	136	148
C4	472	195	170	107
C5	472	158	170	144
C6	472	139	170	163
C7	472	156	170	146
B1	466	219	204	43
B2	466	186	204	76
B3	466	192	204	70
R4	466	190	204	72
R5	466	166	108	192
R6	466	209	108	149
R7	466	222	108	136
R8	466	212	108	146
R9	466	188	228	50
R10	466	253	228	-15
R11	466	210	228	28
R12	466	206	228	32
R1	470	256	78	136
R2	470	218	78	174
R3	470	185	78	207
R4	470	195	78	197
R5	470	130	78	262
R6	470	193	78	199
R7	470	207	78	185
R8	470	201	48	191
R9	470	167	48	225
R10	470	142	48	250
R11	470	77	48	315
R12	470	285	48	107
R13	470	178	48	214
R14	470	146	48	246

POTASSIUM DEPLETION STUDY

Phosphate Balance
(mgm/24 hours)

Subject 1

Study Day	Intake	Output		Balance
		Urine	Stool	
C 1	1662	615	411	636
C 2	1662	796	411	455
C 3	1662	912	411	339
C 4	1662	874	531	257
C 5	1662	907	531	224
C 6	1662	631	531	500
C 7	1662	786	531	345
B 1	1688	918	748	22
B 2	1688	1037	748	-97
B 3	1688	881	748	59
B 4	1688	888	748	52
B 5	1688	963	315	410
B 6	1688	844	315	529
B 7	1683	1312	315	56
B 8	1683	1180	315	188
B 9	1683	1163	764	-244
B10	1683	970	764	-51
B11	1683	1114	764	-195
B12	1683	975	764	-56
R 1	1668	1024	258	386
R 2	1668	995	258	415
R 3	1668	839	258	571
R 4	1668	840	258	570
R 5	1668	904	258	506
R 6	1668	597	258	813
R 7	1668	938	258	472
R 8	1668	1087	162	419
R 9	1668	762	162	744
R10	1668	758	162	748
R11	1668	445	162	1061
R12	1668	1030	162	476
R13	1668	1063	162	443
R14	1668	969	162	539

POTASSIUM DEPLETION STUDY

Nitrogen Balance
(gms/24 hours)

Subject 1

Study Day	Intake	Output		Balance
		Urine	Stool	
C 1	14.86	8.34	0.66	5.86
C 2	14.86	11.40	0.66	2.80
C 3	14.86	11.53	0.66	2.67
C 4	14.86	12.68	0.85	1.33
C 5	14.86	11.57	0.85	2.44
C 6	14.86	11.42	0.85	2.59
C 7	14.86	10.35	0.85	3.66
B 1	14.84	13.86	0.90	0.08
B 2	14.84	12.51	0.90	1.43
B 3	14.84	12.36	0.90	1.58
B 4	14.84	12.49	0.90	1.45
B 5	14.84	10.33	0.61	3.90
B 6	14.84	14.25	0.61	-0.02
B 7	14.90	15.25	0.61	-0.96
B 8	14.90	14.98	0.61	-0.69
B 9	14.90	14.07	1.00	-0.17
B10	14.90	15.86	1.00	-1.96
B11	14.90	13.61	1.00	0.29
B12	14.90	15.46	1.00	-1.56
R 1	14.86	13.55	0.39	0.92
R 2	14.86	13.15	0.39	1.32
R 3	14.86	12.43	0.39	2.04
R 4	14.86	13.75	0.39	0.72
R 5	14.86	7.86	0.39	6.61
R 6	14.86	12.10	0.39	2.37
R 7	14.86	13.99	0.39	0.48
R 8	14.86	11.77	0.24	2.85
R 9	14.86	9.23	0.24	5.39
R10	14.86	9.24	0.24	5.38
R11	14.86	5.39	0.24	9.23
R12	14.86	12.53	0.24	2.09
R13	14.86	9.77	0.24	4.85
R14	14.86	11.38	0.24	3.24

POTASSIUM DEPLETION STUDY

Potassium Balance
(meq/24 hours)

Subject 2

Study Day	Intake	Output			Balance
		Urine	Stool	Sweat	
C1	125.05	134.2	2.63	1.79	-13.57
C2	125.05	100.7	2.63	1.79	19.93
C3	125.05	125.4	2.63	1.79	- 4.77
C4	125.05	115.3	3.82	1.79	4.14
C5	125.05	132.9	3.82	1.79	-13.46
C6	125.05	117.7	3.82	1.79	1.74
C7	125.05	122.9	3.82	1.79	- 3.46
B1	14.23	65.6	3.48	1.79	-56.64
B2	14.23	32.6	3.48	1.79	-23.64
B3	14.23	31.3	3.48	1.79	-22.34
B4	14.23	25.6	3.48	1.79	-16.64
B5	14.23	24.1	1.23	1.79	-12.89
B6	14.23	29.4	1.23	5.58	-36.21
B7	14.23	18.2	1.23	5.58	-10.78
B8	14.23	15.5	1.23	5.58	- 8.08
B9	14.23	14.7	2.60	1.79	- 4.86
B10	14.23	15.9	2.60	1.25	- 5.52
B11	14.23	15.7	2.60	1.25	- 5.32
B12	14.23	17.2	2.60	1.79	- 7.36
R1	125.05	23.5	3.68	1.79	96.08
R2	125.05	49.0	3.68	1.79	70.58
R3	125.05	112.1	3.68	1.79	7.48
R4	125.05	110.2	3.68	1.79	9.38
R5	125.05	137.2	3.86	1.79	-17.62
R6	125.05	147.7	3.68	1.79	-28.12
R7	125.05	126.1	3.86	1.79	- 6.52
R8	125.05	78.6	.7	1.79	43.96
R9	125.05	80.0	.7	1.79	42.5
R10	125.05	66.4	.7	1.79	56.16
R11	125.05	94.4	.7	1.79	28.16
R12	125.05	116.1	.7	1.79	6.46
R13	125.05	116.1	.7	1.79	6.46
R14	125.05	98.4	.7	1.79	24.16

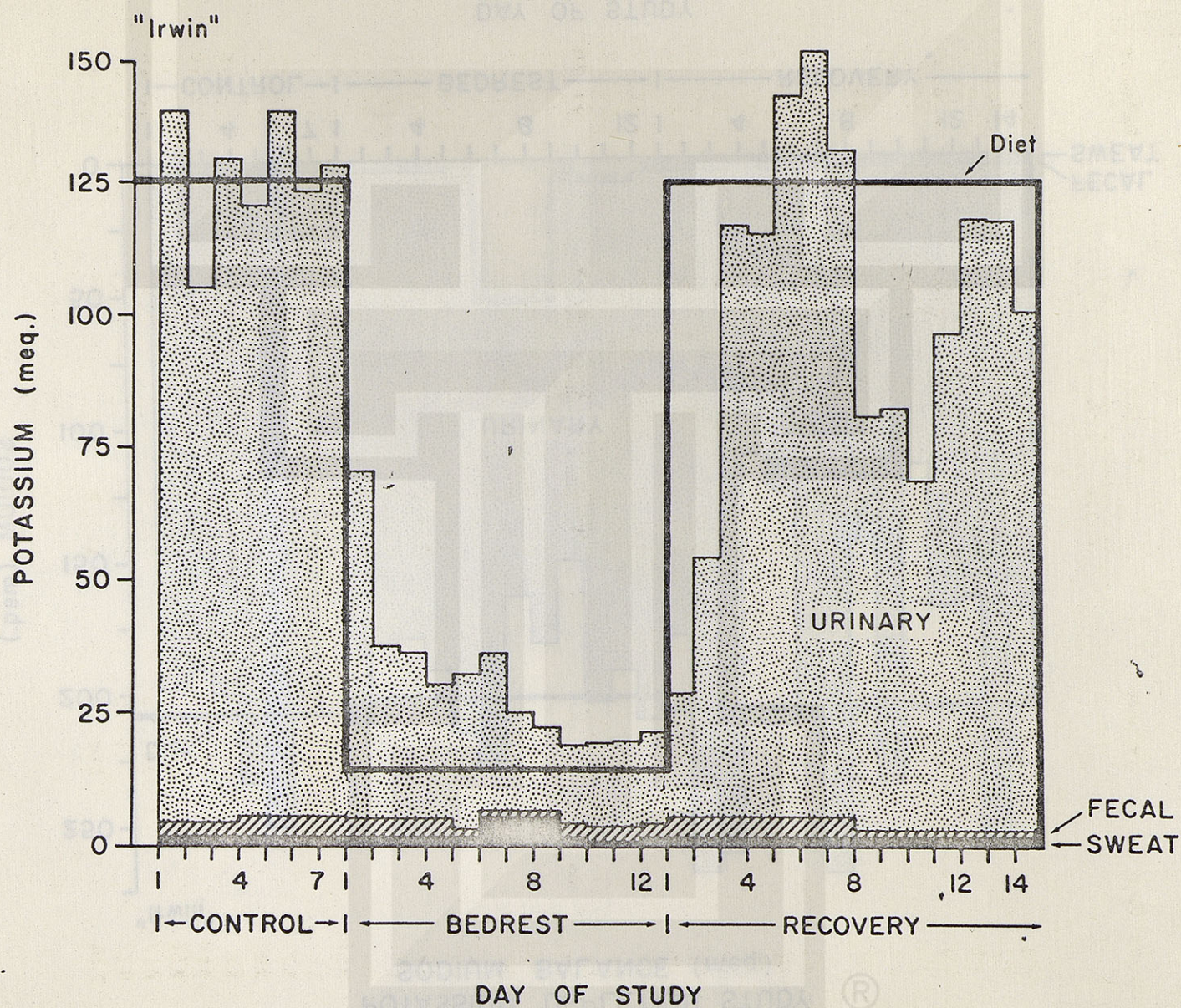
POTASSIUM DEPLETION STUDY

Sodium Balance
(meq/24 hours)

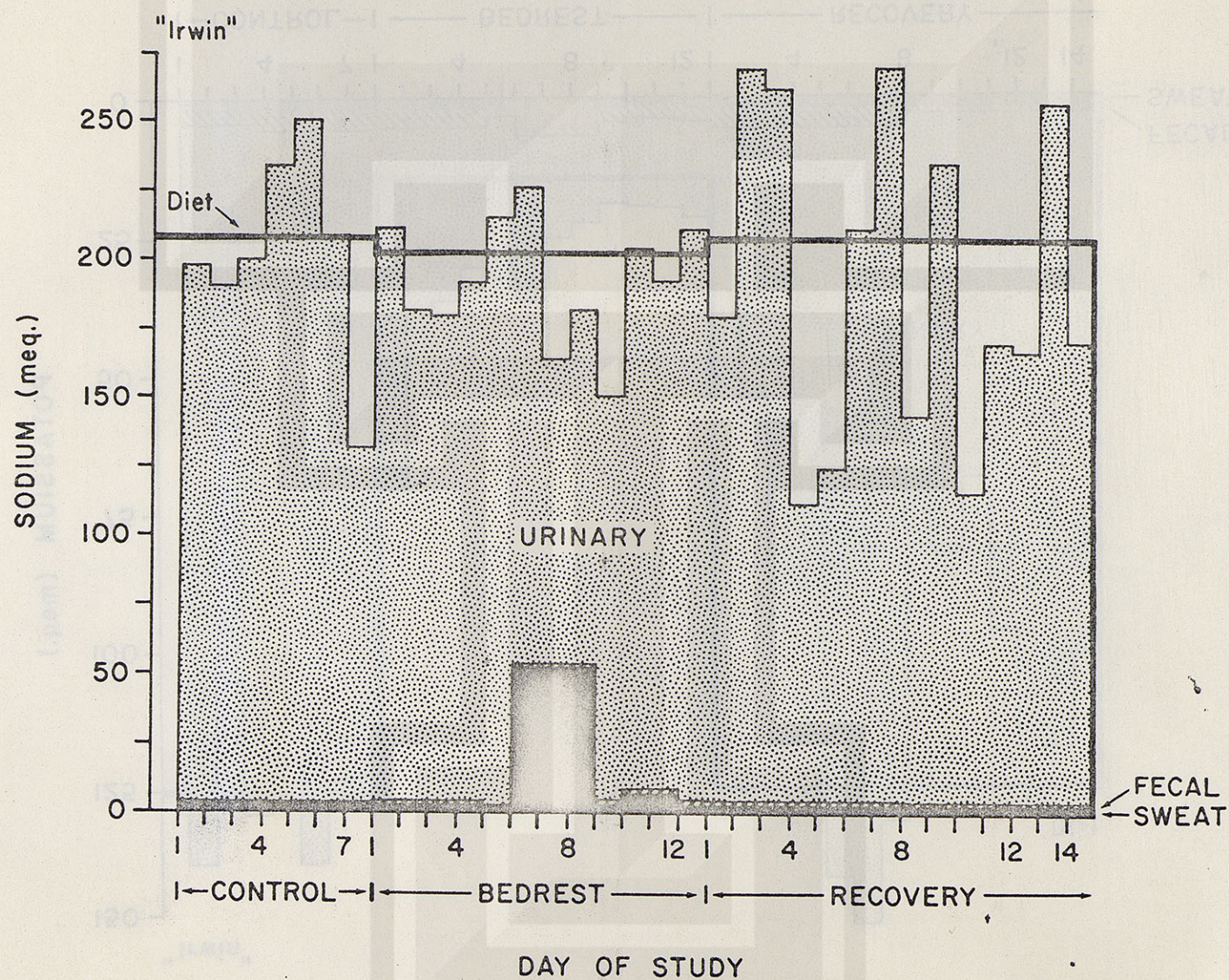
Subject 2

Study Day	Intake	Output			Balance
		Urine	Stool	Sweat	
C1	208.08	194.4	.46	2.85	+10.37
C2	208.08	86.9	.46	2.85	117.87
C3	208.08	197.0	.46	2.85	7.77
C4	208.08	230.6	.68	2.85	-26.05
C5	208.08	248.0	.68	2.85	-43.45
C6	208.08	205.5	.68	2.85	-.95
C7	208.08	128.2	.68	2.85	76.35
B1	202.10	207.7	1.38	2.85	- 9.83
B2	202.10	177.6	1.38	2.85	20.27
B3	202.10	176.0	1.38	2.85	21.87
R4	202.10	187.8	1.38	2.85	10.07
B5	202.10	212.4	.89	2.85	-14.04
B6	202.10	173.0	.89	52.89	-24.68
B7	202.10	110.3	.89	52.89	38.02
B8	202.10	127.8	.89	52.89	20.52
B9	202.10	145.5	2.39	2.85	51.36
B10	202.10	195.8	2.39	6.97	- 3.06
B11	202.10	183.4	2.39	6.97	9.34
B12	202.10	206.5	2.39	2.85	- 9.64
R1	208.08	175.4	1.55	2.85	+28.28
R2	208.08	265.6	1.55	2.85	-61.92
R3	208.08	258.4	1.55	2.85	-54.72
R4	208.08	107.4	1.55	2.85	96.28
R5	208.08	121.1	1.55	2.85	82.58
R6	208.08	208.0	1.55	2.85	- 4.32
R7	208.08	266.4	1.55	2.85	-62.72
R8	208.08	140.9	.17	2.85	+64.16
R9	208.08	232.7	.17	2.85	-27.64
R10	208.08	112.9	.17	2.85	92.16
R11	208.08	167.5	.17	2.85	37.56
R12	208.08	164.4	.17	2.85	40.66
R13	208.08	265.0	.17	2.85	-59.94
R14	208.08	167.8	.17	2.85	37.26

POTASSIUM DEPLETION STUDY POTASSIUM BALANCE (meq.)



POTASSIUM DEPLETION STUDY SODIUM BALANCE (meq.)



POTASSIUM DEPLETION STUDY

Calcium Balance
(meq/24 hours)

Subject 2

Study Day	Intake	Output		Balance
		Urine	Stool	
C1	1616	491	374	751
C2	1616	394	374	848
C3	1616	616	374	626
C4	1616	612	668	336
C5	1616	538	668	410
C6	1616	315	668	433
C7	1616	455	668	493
B1	1592	647	918	27
R2	1592	599	918	75
R3	1592	604	918	70
R4	1592	559	918	115
R5	1592	652	548	392
R6	1592	588	548	456
R7	1592	642	548	402
R8	1592	599	548	445
R9	1592	616	1004	-28
R10	1592	644	1004	-56
R11	1592	624	1004	-36
R12	1592	663	1004	-75
R1	1594	619	719	256
R2	1594	706	719	169
R3	1594	588	719	287
R4	1594	502	719	373
R5	1594	523	719	352
R6	1594	650	719	225
R7	1594	601	719	274
R8	1594	434	146	1014
R9	1594	530	146	918
R10	1594	310	146	1138
R11	1594	477	146	971
R12	1594	339	146	1109
R13	1594	402	146	1046
R14	1594	362	146	1086

POTASSIUM DEPLETION STUDY

Magnesium Balance
(mgm/24 hours)

Subject 2

Study Day	Intake	Output		Balance
		Urine	Stool	
C1	460	140	81	239
C2	460	162	81	217
C3	460	240	81	139
C4	460	190	154	116
C5	460	153	154	153
C6	460	182	154	124
C7	460	199	154	107
B1	458	234	199	25
B2	458	191	199	68
B3	458	208	199	51
B4	458	227	199	32
B5	458	227	117	114
B6	458	215	117	126
B7	458	240	117	101
B8	458	200	117	141
B9	458	209	212	37
B10	458	218	212	28
B11	458	207	212	39
B12	458	217	212	29
R1	452	236	168	48
R2	452	248	168	36
R3	452	194	168	90
R4	452	227	168	57
R5	452	190	168	94
R6	452	202	168	82
R7	452	181	168	103
R8	452	193	33	226
R9	452	203	33	216
R10	452	98	33	321
R11	452	206	33	213
R12	452	165	33	254
R13	452	146	33	273
R14	452	142	33	277

POTASSIUM DEPLETION STUDY

Phosphate Balance
(mgm/24 hours)

Subject 2

Study Day	Intake	Output		Balance
		Urine	Stool	
C 1	1582	1052	212	318
C 2	1582	560	212	810
C 3	1582	1426	212	-56
C 4	1582	1071	396	115
C 5	1582	914	396	272
C 6	1582	936	396	250
C 7	1582	1161	396	25
B 1	1544	1385	511	-352
B 2	1544	1045	511	-12
B 3	1544	1094	511	-61
B 4	1544	1312	511	-279
B 5	1544	1165	286	93
B 6	1544	1310	286	-52
B 7	1511	1103	286	122
B 8	1511	1269	286	-44
B 9	1511	918	512	81
B10	1511	1182	512	-183
B11	1511	1114	512	-115
B12	1511	1117	512	-118
R 1	1570	801	388	381
R 2	1570	937	388	245
R 3	1570	1040	388	142
R 4	1570	1237	388	-55
R 5	1570	1020	388	162
R 6	1570	1083	388	99
R 7	1570	1076	388	106
R 8	1570	944	77	549
R 9	1570	968	77	525
R10	1570	599	77	894
R11	1570	1041	77	452
R12	1570	1305	77	188
R13	1570	937	77	556
R14	1570	850	77	643

POTASSIUM DEPLETION STUDY

Nitrogen Balance
(gms/24 hours)

Subject 2

Study Day	Intake	Output		Balance
		Urine	Stool	
C 1	12.60	11.65	0.36	0.56
C 2	12.60	8.74	0.36	3.50
C 3	12.60	14.44	0.36	-2.20
C 4	12.60	12.45	0.60	-0.45
C 5	12.60	11.10	0.60	0.90
C 6	12.60	11.83	0.60	0.17
C 7	12.60	13.04	0.60	-1.04
B 1	12.49	14.55	0.68	-2.74
B 2	12.49	12.40	0.68	-0.59
B 3	12.49	12.70	0.68	-0.89
B 4	12.49	15.00	0.68	-3.19
B 5	12.49	13.43	0.42	-1.36
B 6	12.49	14.39	0.42	-2.32
B 7	12.41	15.12	0.42	-3.13
B 8	12.41	14.64	0.42	-2.65
B 9	12.41	13.92	0.86	-2.37
B10	12.41	13.76	0.86	-2.21
B11	12.41	11.47	0.86	0.08
B12	12.41	13.79	0.86	-2.24
R 1	12.34	12.36	0.65	-0.67
R 2	12.34	12.32	0.65	-0.63
R 3	12.34	12.18	0.65	-0.49
R 4	12.34	12.82	0.65	-1.13
R 5	12.34	11.73	0.65	-0.04
R 6	12.34	12.17	0.65	-0.48
R 7	12.34	11.80	0.65	-0.11
R 8	12.34	9.45	0.14	2.75
R 9	12.34	8.92	0.14	3.28
R10	12.34	7.90	0.14	4.30
R11	12.34	10.80	0.14	1.40
R12	12.34	10.79	0.14	1.41
R13	12.34	9.19	0.14	3.01
R14	12.34	8.69	0.14	3.51

POTASSIUM DEPLETION STUDY
Daily Urinary Chloride Excretion
(meq/day)

Study Day	Subject 1	Subject 2
C1	202.0	
C2	214.8	168.5
C3	259.9	308.5
C4	301.5	320.3
C5	241.7	322.8
C6	236.9	289.5
C7	185.6	229.2
B1	232.0	227.7
B2	154.2	187.5
B3	166.19	177.7
B4	146.50	173.1
B5	120.60	209.0
B6	198.20	170.0
B7	122.00	109.1
B8	140.31	113.7
B9	136.33	148.0
B10	193.61	183.5
B11	176.87	185.1
B12	196.87	198.8
R1	186.83	211.3
R2	316.33	341.2
R3	264.85	368.2
R4	224.43	190.5
R5	117.68	224.3
R6	238.22	312.7
R7	269.42	344.9
R8	279.2	186.1
R9	237.2	287.3
R10	220.2	160.2
R11	119.1	234.4
R12	274.7	209.1
R13	200.7	307.4
R14	276.7	217.9

POTASSIUM DEPLETION STUDY

URINE ENDOCRINOLOGY

Subject 1

Day of Study	Hydro-cortisone $\mu\text{g}/\text{TV}$	Epinephrine $\mu\text{g}/\text{TV}$	Nor-epi. $\mu\text{g}/\text{TV}$	17 Keto. mg/TV	Aldo. $\mu\text{g}/\text{TV}$
C-1	46.0	6.0	16.9	17.1	9.2
C 1	28.3	10.1	25.8	13.5	6.1
C 2	60.3	9.7	25.8	21.0	13.0
C 3	55.9	14.0	28.1	19.4	13.3
C 4	66.2	9.3	25.9	20.9	15.5
C 5	48.7	6.2	25.9	18.8	2.8
C 6	50.4	2.4	23.6	17.1	3.3
C 7	50.7	6.5	28.9	16.9	1.8
B 1	78.2	5.7	33.3	18.6	4.8
B 2	54.0		41.0	21.0	2.0
B 3	48.6	11.3	23.4	19.9	2.6
B 4	58.6	8.3	31.3	19.8	2.3
B 5	32.8	5.8	23.9	14.7	1.1
B 6	77.9	11.3	41.1	21.3	3.9
B 7	43.0	7.3	31.8	17.5	2.6
B 8	51.9	12.7	33.5	16.3	15.4
B 9	50.3	5.7	39.0	21.0	2.9
B10	79.7	11.1	28.5	21.5	3.2
B11	71.8	10.9	29.2	17.8	5.3
B12	91.6	12.7	40.3	27.5	5.7
R 1	62.2	9.8	46.2	11.3	4.6
R 2	70.5	12.9	55.4	21.2	4.2
R 3	62.4	10.8	53.2	17.9	6.0
R 4	60.8	6.0	59.6	17.6	5.7
R 5	37.8	5.2	28.0	8.7	3.9
R 6	59.2	12.8	40.9	13.3	4.5
R 7	77.6	19.2	47.4	19.6	4.6
R 8	66.7	17.7	40.4	22.5	4.6
R 9	48.8	8.8	27.4	17.8	2.6
R10	69.7	9.2	34.2	19.5	4.4
R11	26.2	3.6	21.2	10.0	5.6
R12	53.1	21.5	47.5		7.4
R13		7.4	42.9		10.3
R14	127.8	6.0	45.0	12.1	2.6

POTASSIUM DEPLETION STUDY

URINE ENDOCRINOLOGY

Subject 2

Day of Study	Hydro-cortisone $\mu\text{g}/\text{TV}$	Epinephrine $\mu\text{g}/\text{TV}$	Nor-epi. $\mu\text{g}/\text{TV}$	17 Keto. mg/TV	Aldo. $\mu\text{g}/\text{TV}$
C-1	67.4	17.2	32.3	14.2	28.2
C 1	42.9	9.2	23.5	8.7	15.8
C 2	54.9	9.6	26.9	8.5	21.1
C 3	61.8	9.6	48.1	14.1	26.0
C 4	77.6	5.6	36.4	13.4	16.7
C 5	67.3	4.7	24.9	15.1	10.9
C 6	70.9	7.3	35.7	12.3	7.7
C 7	58.8	5.9	30.1	11.8	17.8
B 1	79.2	4.4	38.6	13.2	11.7
B 2	74.5	8.0	30.3	14.1	4.4
B 3	64.8	12.6	35.2	17.6	7.4
B 4	86.6	7.1	31.2	19.3	3.3
B 5	103.0	6.4	28.8	14.3	9.3
B 6	88.2	9.5	46.2	15.4	3.0
B 7	74.9	7.0	40.0	13.6	7.1
B 8	61.0	7.6	42.8	12.9	6.9
B 9	94.9	4.0	43.1	19.0	9.2
B10	88.2	2.8	36.7	19.1	7.4
B11	88.0	3.6	39.1	17.9	6.9
B12	104.6	7.5	49.0	23.1	5.6
R 1	61.9	9.6	43.8	14.2	5.1
R 2	76.9	16.6	37.5	15.7	5.7
R 3	91.5	28.6	38.6	13.3	8.3
R 4	42.5	9.8	38.2	13.6	5.7
R 5	62.8	11.3	41.5	16.5	20.3
R 6	99.5	8.9	30.4	16.1	6.0
R 7	57.6	13.9	32.4	14.4	4.0
R 8	94.5	18.2	48.4	15.7	
R 9	51.6	8.5	33.5	13.5	7.6
R10	26.9	8.2	40.3	12.5	10.6
R11	27.2	14.3	54.5	11.8	3.6
R12	53.3	10.2	54.1	10.9	5.3
R13	72.0	5.8	37.6	9.8	5.9
R14	83.5	5.3	40.6	8.9	3.4

POTASSIUM DEPLETION STUDY
Serum Sodium and Potassium
(mgm/L)

Study Day	Subject 1		Subject 2	
	Na ⁺	K ⁺	Na ⁺	K ⁺
C1	140	4.38	139	4.58
C6	137	3.95	137	4.05
B1	137	3.96	138	4.39
B2	140	4.10	139	3.95
B3	140	4.55	139	4.10
B4	139	4.52	139	4.76
B5	139	4.24	138	4.82
B6	138	4.01	137	4.29
B7	136	4.25	135	4.30
B8	138	3.80	138	4.26
B9	140	3.57	139	3.70
B10	139	3.72	139	4.62
B11	138	4.60	138	4.56
B12	141	3.84	140	3.47
R1	137	4.11	140	4.13
R2	136	4.20	136	4.55
R3	136	4.42	136	4.54
R4	137	4.70	135	4.69
R8	138	4.31	137	4.79
R14	140	4.09	140	4.22

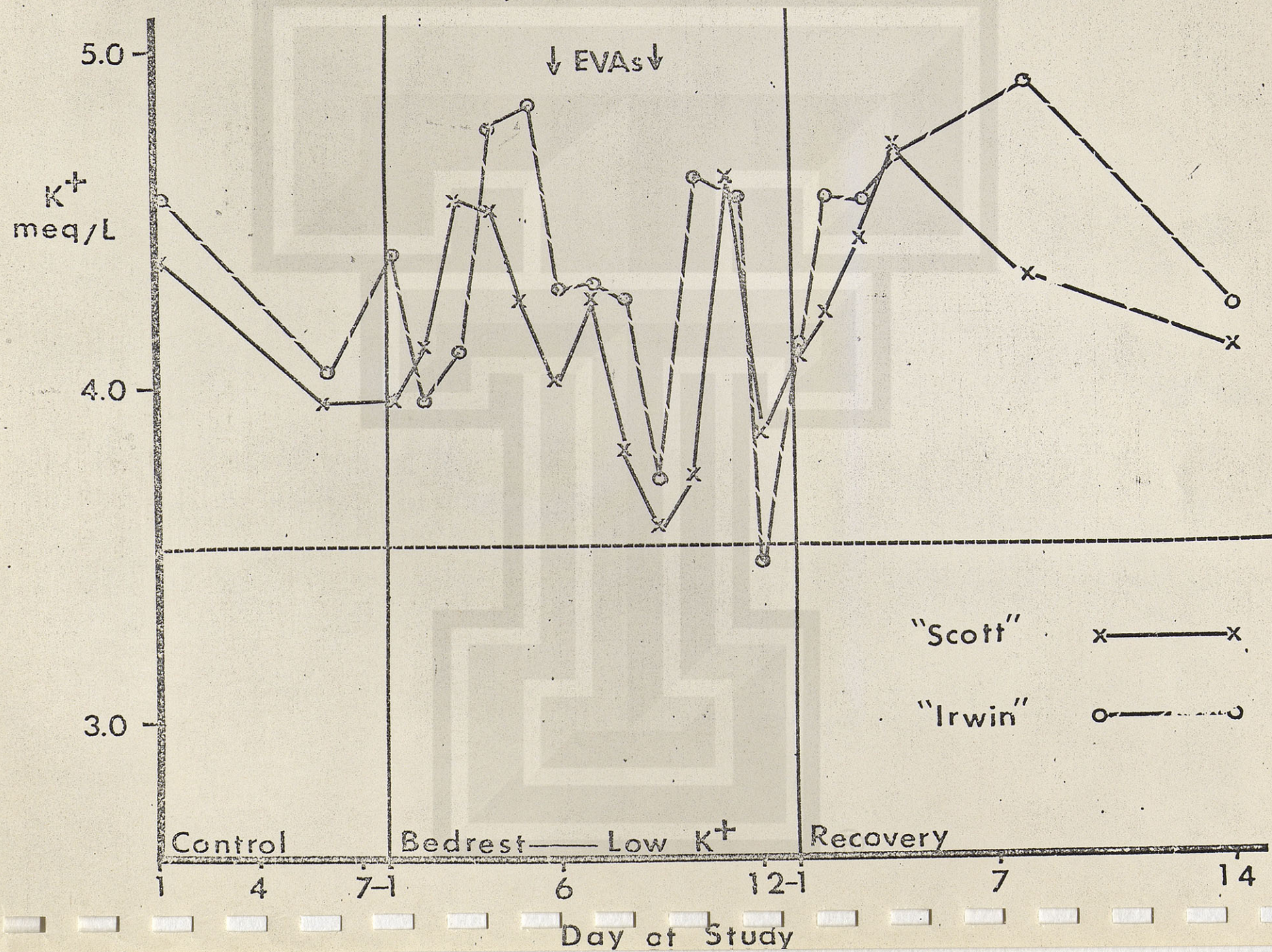
POTASSIUM DEPLETION STUDY

Red Blood Cell Potassium

(gm K^+ /100 gm RBC)

Study Day	Subject 1	Subject 2
C1	0.32	0.32
C6	0.31	0.31
B2	0.32	0.32
B9	0.33	0.30
B12	0.31	0.31
R14	0.33	0.33

SERUM K^+



POTASSIUM DEPLETION STUDY

Subject 1

Study Day	Whole Blood			Serum					
	pH	meq/L Na ⁺	meq/L K ⁺	meq/L Cl ⁻	meq/L CO ₂	mg% Ca ⁺⁺	mg% Mg ⁺⁺	mg% Cr	mg% PO ₄ ⁻
C1	7.34	139.9	4.38	103.0	28.5	9.0	1.84	1.10	3.62
C6	7.35	137.2	3.95	100.2	28.0	8.7	1.79	1.10	3.75
B2	7.35	139.5	4.10	102.9	29.0	8.8	1.85	1.08	3.62
B9	7.37	139.7	3.57	102.7	27.3	8.7	1.80	1.00	2.90
B12	7.33	140.5	3.84	102.0	27.0	9.9	1.84	1.00	3.45
R14	7.36	140.0	4.09	101.7	26.4	8.6	1.79	0.98	3.60

POTASSIUM DEPLETION STUDY

Subject 2

Study Day	Whole Blood	Serum				mg% Ca^{++}	mg% Mg^{++}	mg% Cr	mg% PO_4^{--}
	pH	meq/L Na^+	meq/L K^+	meq/L Cl^-	meq/L CO_2				
C1	7.31	138.6	4.58	98.3	29.0	8.7	1.91	1.00	3.40
C6	7.34	136.8	4.05	101.9	28.8	8.8	1.95	1.00	3.52
B2	7.35	138.8	3.95	102.3	29.8	8.7	1.98	1.05	3.65
B9	7.30	139.3	3.70	101.6	28.0	8.6	2.03	0.90	3.10
F12	7.31	139.9	3.47	103.2	27.6	8.8	2.01	0.95	3.22
R14	7.35	140.0	4.22	100.5	27.4	8.9	1.99	0.95	3.52

POTASSIUM DEPLETION STUDY

PLASMA ENDOCRINOLOGY

	Day of Study	Hydrocortisone $\mu\text{g}/100\text{ ml}$	Angiotensin $\mu\text{g}/\text{ml}/\text{hr}$
Subject 1	C 1	9.4	0.19
	C 6	10.0	0.49
	B 2	10.6	1.38
	B 9	14.0	0.23
	B 12	9.6	0.16
	R 14	9.0	0.46
Subject 2	C 1	9.0	1.01
	C 6	7.6	0.48
	B 2	9.6	0.34
	B 9	10.0	0.20
	B 12	14.0	0.20
	R 14	11.2	0.1

POTASSIUM DEPLETION STUDY

Body Fluid Compartments

Subject 1

Study Day	Plasma Volume (L)	Extracellular Fluid Volume (L)	Red Cell Mass (L)	Total Body Water (L)	Weight (kg)
C1	3.702	18.0	2.420	51.059	80.433
C6	3.673	18.1	2.368	51.256	79.398
B2	3.582	17.6	2.298	48.092	79.407
B9	3.684	17.9	2.183	48.316	78.936
B12	3.393	17.6	2.156	46.699	79.606
R14	4.008	18.4	2.242	51.196	79.966

POTASSIUM DEPLETION STUDY

Body Fluid Compartments

Subject 2

Study Day	Plasma Volume (L)	Extracellular Fluid Volume (L)	Red Cell Mass (L)	Total Body Water (L)	Weight (kg)
C1	3.019	15.7	2.048	43.444	72.174
C6	2.913	15.8	1.940	43.732	71.895
B2	2.982	15.5	1.879	42.556	71.485
B9	3.034	15.4	1.804	43.834	71.080
B12	2.984	15.5	1.752	40.963	70.860
R14	3.061	15.5	1.824	42.192	70.740

BAYLOR COLLEGE OF MEDICINE
TEXAS MEDICAL CENTER
HOUSTON, TEXAS 77025

April 18, 1972

DEPARTMENT OF INTERNAL MEDICINE

Dr. Kenneth Hyatt
Public Health Service Hospital
15th Avenue and Lake Street
San Francisco, California 94118

Dear Dr. Hyatt:

Enclosed are the results of the total exchangeable potassium performed for the potassium depletion study. The results indicate a significant drop in exchangeable potassium of both subjects. During the repletion period both subjects returned to their prestudy levels. We are looking forward to seeing your balance data so that we can compare it with our calculated values. One value (Subject #23/13) was unsatisfactory. The direction of the error suggests that he inadvertently received a greater dose of ^{42}K than he should have received. Alternately, the spot urine's K concentration may have been too low. We have checked the spot urine and found its concentration of K to be as reported by your laboratory; therefore, incorrect dosage is the most plausible explanation for the unsatisfactory result. There does not appear to have been a significant change in extracellular fluid.

Thank you for the fine hospitality extended to my personnel and to me. Each of us was impressed with your metabolic ward. I hope that we will be able to join forces again on another study. We look forward to the time when we will have the opportunity to meet with you, your staff and others who helped with the study to discuss this interesting data:

Sincerely,

Philip C. Johnson, M.D.

Philip C. Johnson, M.D.
Professor of Medicine

PCJ:lsb

Enclosure

TOTAL BODY POTASSIUM

		<u>meq/Kg BW</u>		<u>Total meq K</u>	
		Subject #1	Subject #2	Subject #1	Subject #2
3 -	5	48.9	44.3	3933	3197
3 -	10	48.8	45.2	3890	3259
3 -	13	47.4	34.2*	3785	
3 -	20	44.2	42.5	3497	3031
3 -	23	41.9	41.1	3327	2916
4 -	6	49.7	44.6	3950	3170

EXTRACELLULAR FLUID VOLUME (30 Minute)

		<u>ml/Kg BW</u>		<u>Liters</u>	
		Subject #1	Subject #2	Subject #1	Subject #2
3 -	5	224	218	18.0	15.7
3 -	10	227	219	18.1	15.8
3 -	13	220	215	17.6	15.5
3 -	20	226	216	17.9	15.4
3 -	23	222	218	17.6	15.5
4 -	6	218	218	18.4	15.5

*All known possible lab errors were checked and we cannot find any plausible explanation for this value.

TOTAL BODY POTASSIUM

	<u>meq/Kg BW</u>		<u>Total meq K</u>	
	Subject #1	Subject #2	Subject #1	Subject #2
3-5	48.9	44.3	3933	3197
3-10	48.8	45.2	3890	3259
6-16	51.0	45.5	3876	3311

The last determination on Subject #1 was high when expressed as meq/Kg while his total meq K are almost the same as the pre-study values. These values indicate that Subject #1's 4 kg weight loss (March - 80 kg; June - 76 kg) was a loss of non or low potassium containing tissue. Subject #2's values in June are almost the same as his March values.

These results tend to rule out the possibility that the high potassium diet effected the determinations made on 3-5 and 3-10.

COMPARISON OF K^+ LOSS

BALANCE VS $^{42}\text{K}^*$

Day of Study	Subject 1		Subject 2	
	Balance	^{42}K	Balance	^{42}K
B 2	- 4	-105	- 60	unknown
B 9	-114	-393	-190	-228
B 12	-130 (-3.3%)	-563 (-14.5%)	-213 (-6.5%)	-343 (-10.5%)
B 14	+480	+ 60	+164	- 89

* Status at end of B6 and ^{42}K study used for comparison.

Total body K ⁺ on B6:	Subject 1	=	3890 meq
	Subject 2	=	3259 meq