and share a common internal reference to the ambient oxygen concentration, temperature, and barometric pressure. The output of each cell can be displayed on a front panel meter or recorded by remote equipment with a resolution of 0.01%. When the unit is operated in the different mode, the difference between the outputs of the two cells can be obtained with a resolution of 0.001%.

To take advantage of the higher resolution and to further isolate the measurements from the effects of fluctuating ambient conditions, we operated the analyzer in the differential mode. The first cell was always sampling a common source of ambient air entering the metabolism cages, and the second cell alternately sampled air exhausted from one of the four metabolism cages. The critical measurement for calculating oxygen consumption is the oxygen-concentration difference between the incoming and the exhausted air, and the analyzer provides this measurement continuously, independently of changes in ambient conditions. This mode of operation also eliminated the need for daily instrument calibration with a gas of known absolute oxygen concentration. Since both cells were referenced internally to ambient conditions and cell #1 was continuously measuring ambience, the daily calibration procedure simply adjusts the instrument to indicate the accepted ambient oxygen concentration of 20.90%. This value applies only to air samples from which the vapor pressure of water has been eliminated through drying of the air sample. Prior to gas sampling, therefore, surge bottles filled with anhydrous calcium sulfate, $CaSO_4$ (Drierite), were connected in-line with the airstream exiting from the metabolism cages.

The accuracy of the oxygen measurements was little affected by small perturbations in the airflow rates through the system. It is very critical, however, that the daily calibration procedure be performed under airflow conditions identical to those when actual gas exchange measurements are taken. The airflow rates chosen for this system were in the range of highest stability for each particular measuring device used. The rate at which air must be drawn through each chamber to sustain a rat has been experimentally determined to be approximately 2300 ml/min at 21°C. This

value was evaluated at various ambient temperatures to ensure its acceptability prior to final experimentation. The airflow through each of the four chambers was continually maintained by a master pump adjusted to draw approximately 10 L/min. This flow was not monitored directly, only as the sum of the four airflows through the chambers. The balance of airflow between the chambers was controlled by needle valves. The mass flow through each chamber was electronically monitored by flow meters (Kurz Instruments, Model #565) inserted in the air lines leaving the chambers. Temperature sensors were placed in the intake and exhaust air lines of each chamber so that chamber temperature rise would be indicated.

The air flowing into each chamber was derived from a common inlet, and sampling for cell #1 was made at this point. A PDP 11/23 microcomputer-based monitoring unit electrically switched four solenoid-actuated on/off flow valves so that the air sampled for cell #2 was alternately drawn from each of the four chambers at 30-s intervals. The same line drawing air to cell #2 for oxygen concentration measurements also passed through the sensor for the carbon dioxide analyzer. This analyzer (Applied Electrochemistry, Model CC-2) is the companion instrument to the oxygen analyzer with a 0.01% resolution. The microcomputer logged all data pertaining to each unit, including airflow rate, oxygen and carbon dioxide concentration, and air temperatures. These data were collected and retained by the microcomputer for up to 23 h daily and then off-loaded to the PDP 11/34 computer for storage.

Colonic and tail temperatures of rats as well as inlet and outlet temperatures of the metabolic chamber were measured with thermistors. All other measurements on body mass, food/water consumption, health profile, immunological assessments, and histopathological evaluations were the same as in the 6- and 12-mo study described earlier in this report.

Results

Mortality

Table 14 lists the number of animal deaths during the three 6-wk exposures. At 17.8°C and 15 mW/cm^2, two rats died--one during the 3d week and another during the last week. At 22.2°C and 15 mW/cm^2, two rats died during the 1st week (day 4); these were replaced. At 26.7°C and 15 mW/cm^2 all 10 rats died the 1st day. These were replaced but at 7.5 mW/cm^2; two of these died during the 1st week. At 26.7°C and 10 mW/cm^2, 7 of the 10 rats died on the 1st day; two of these seven were replaced, but all five remaining rats died within 3 days. None of the animals in the 0 and 5-mW/cm^2 groups died in any of the temperature studies.

TABLE 14. EFFECTS OF MICROWAVE EXPOSURE AND TEMPERATURE ON RAT MORTALITY IN CIRCULAR WAVEGUIDES

	Animal Death				
	Power density (mW/cm^2)				
T (°C)	0	5	7.5	10	15
17.8	0	0	NA	0	2
22.2	0	0	NA	0	2
26.7	0	0	2	10	10

The differences in temperature at the outlet and inlet of the chamber over 1 day are presented in Figures 12-14. At 17.8°C the 5-mW/cm^2 exposure group was lower than the others. The same result was seen at 22.2°C; the drop seen in the 15-mW/cm^2 group at 0600 was due to the death of an animal. At 26.7°C the exposed rats died between 1800 and 2000 in both the 10- and 15-mW/cm^2 groups, which caused the drop in temperature. These data indicated that live-animal response plays an important part in the rise of chamber temperature.

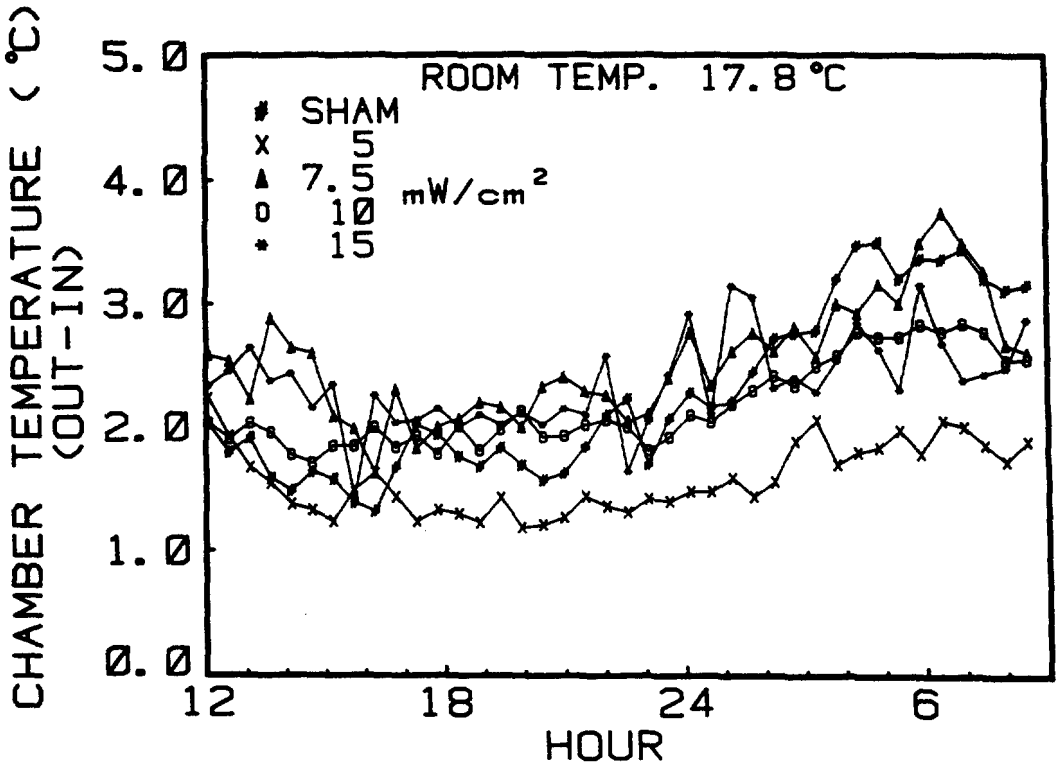

Figure 12. Increase in chamber temperature at 17.8°C.

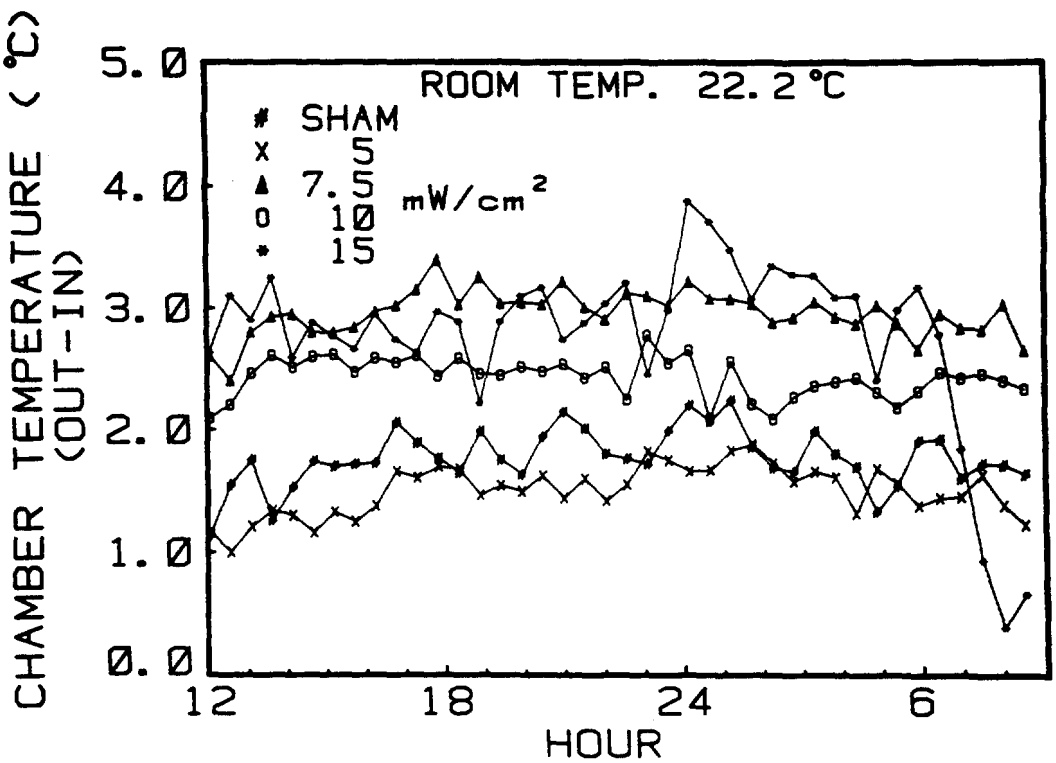

Figure 13. Increase in chamber temperature at 22.2°C.

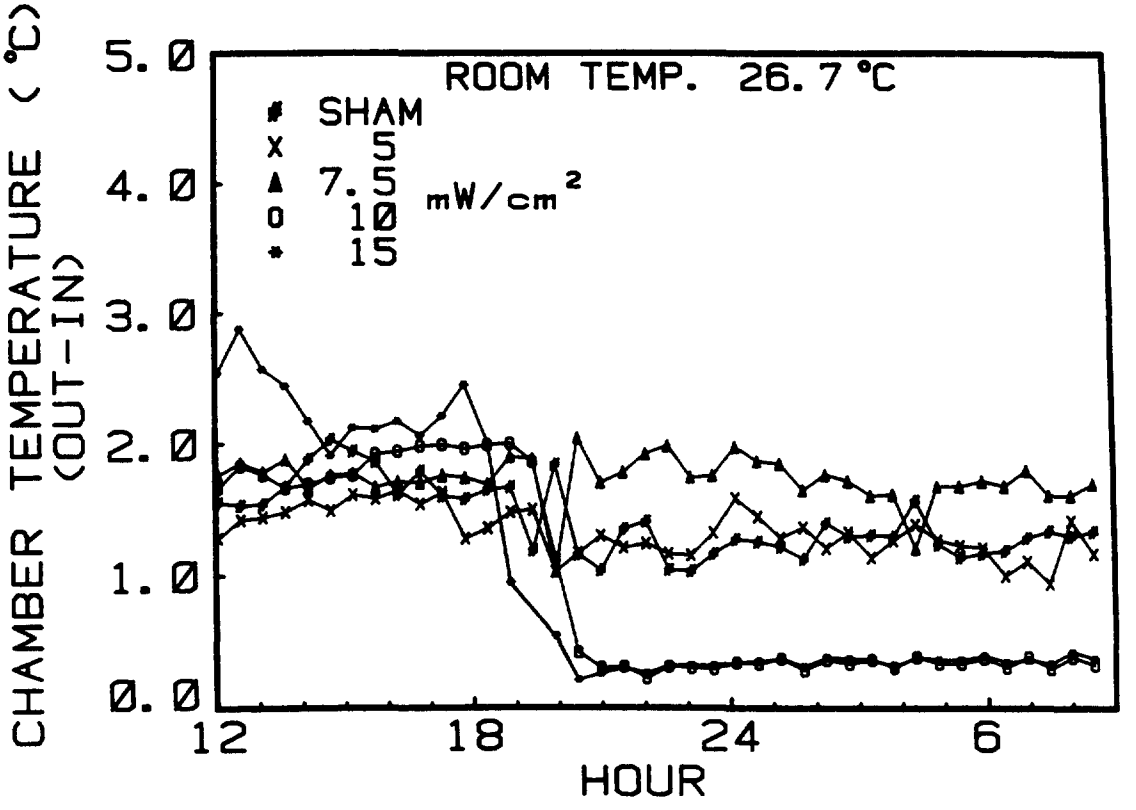

Figure 14. Increase in chamber temperature at 26.7°C.

Body Temperature

Colonic and tail temperatures were measured on a separate group of rats. The tail temperature had large variations and did not provide any meaningful results for a small sample size; therefore, only colonic temperature measurements were completed. (See Table 15.) Each set of data was an average of 2-5 measurements on at least two rats and at 5-h and 1-, 2-, and 3-day exposures. At 0- and 5-mW/cm^2 exposures, there were no significant body temperature changes for any ambient temperature. Changes larger than 1°C occurred at 15 mW/cm^2 at all three ambient temperatures and at 7.5 and 10 mW/cm^2 at 26.7^{o}C. These body temperature rises correlate with the animal deaths (Table 14). The data indicate that the rats survived the 6-wk experiment if their body temperature remained regulated less than 1°C above their normal temperature. Above this limit, the animals' thermoregulation failed and they eventually died. Recently Berman et al. (1985) studied the lethality in mice and rats exposed to microwaves as a function of exposure duration and ambient temperatures.

TABLE 15. EFFECTS OF MICROWAVE EXPOSURE AND TEMPERATURE ON RAT COLONIC TEMPERATURE IN CIRCULAR WAVEGUIDES

	Change in Core Temperature (^{o}C)				
	Power density (mW/cm^2)				
T (^{o}C)	0	5	7.5	10	15
17.8	0.08±0.17	-0.28±0.19	0.20±0.04	0.00±0.51	1.16±0.59
22.2	0.26±0.13	-0.40±0.30	0.50±0.15	1.00±0.40	6.20±0.20
26.7	0.14±0.25	0.60±0.41	2.52±1.03	3.73±1.53	6.33±1.44

Body Mass and Consumption of Food and Water

Figure 15 presents daily average body mass for the 22.2°C ambient temperature. To simplify statistical analysis, data were averaged weekly and compared using analysis of variance with repeated measures. Figures 16-18 show the weekly averages for 17.8, 22.2, and 26.7°C. Table 16 lists the weekly means and standard errors of body mass. At 17.8°C and 0, 5, and 10 mW/cm^2, growth rates were similar; at 15 mW/cm^2, growth rate apparently decreased. At 22.2°C, growth rate decreased with increasing exposure level. At 26.7°C and 7.5 mW/cm^2, no growth was seen. Statistical analysis using analysis of variance with repeated measures on three sets of data were performed: 1) temperature at 17.8 and 22.2°C and radiation of 0, 5, 10, and 15 mW/cm^2; 2) temperature at 17.8, 22.2, and 26.7°C and radiation of 0 and 5 mW/cm^2; 3) temperature at 26.7°C and radiation of 0, 5, and 7.5 mW/cm^2.

Statistical results for set 1 show significant effects of temperature ($f = 27.75$, $df = 1,72$, $p < 0.0001$); radiation ($f = 18.57$, $df = 3,72$, $p < 0.0001$); time ($f = 176.97$, $df = 5,360$, $p < 0.0001$); time-radiation interaction ($f = 5.96$, $df = 15,360$, $p < 0.001$); and time-temperature-radiation interaction ($f = 1.98$, $df = 15,360$, $p = 0.016$). Detailed analysis pf weekly variations is shown in Table 17. The L, M, and H represent the 17.8, 22.2, and 26.7°C; and the numbers are the power densities. Results for set 2 indicate significant effects of temperature ($f = 6.97$, $df = 2,54$, $p = 0.002$); radiation ($f = 8.71$, $df = 1,54$, $p = 0.0047$); temperature-radiation ($f = 5.18$, $df = 2,54$, $p = 0.0088$); and time ($f = 268.56$, $df = 5,270$, $p < 0.0001$). When combined across time, conditions within the following three groups show no differences: H-5, L-0, L-5; L-0, L-5, M-5, H-0; L-5, M-5, H-0, M-0. Among the groups, there were significant differences at $p < 0.01$.

The 3d set of data showed a significant effect of radiation ($f = 15.09$, $df = 2,25$, $p = 0.0001$); time ($f = 47.89$, $df = 5,125$, $p < 0.0001$); and time-radiation interaction ($f = 14.45$, $df = 10,125$, $p < 0.0001$). An analysis of weekly variations is shown in Table 18.

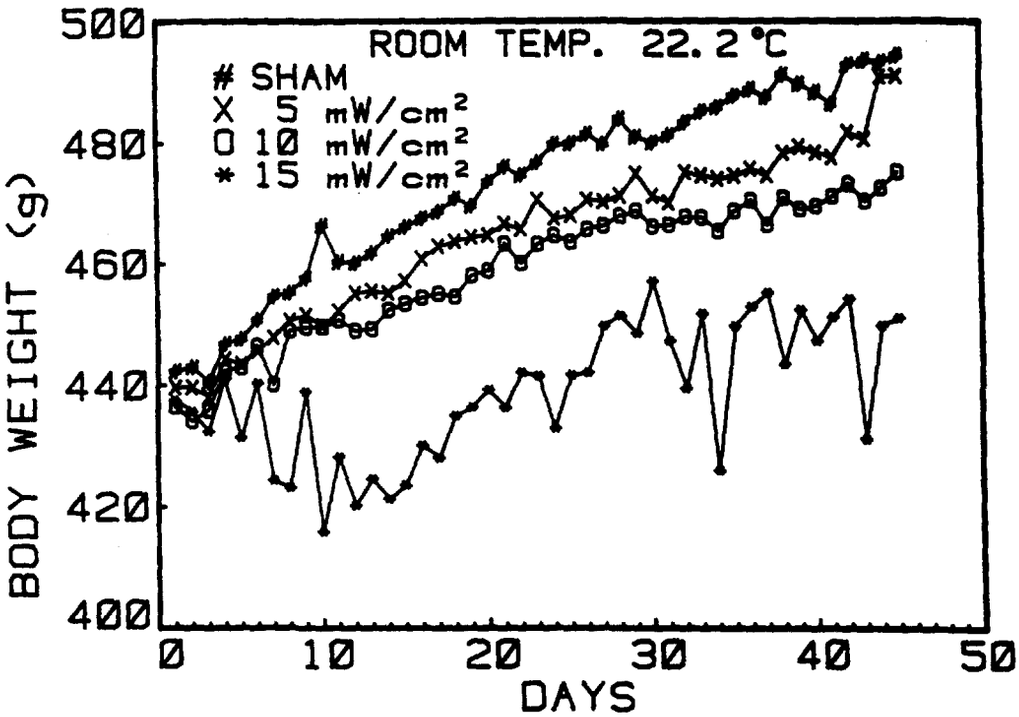

Figure 15. Example of daily average body mass data at 22.2°C.

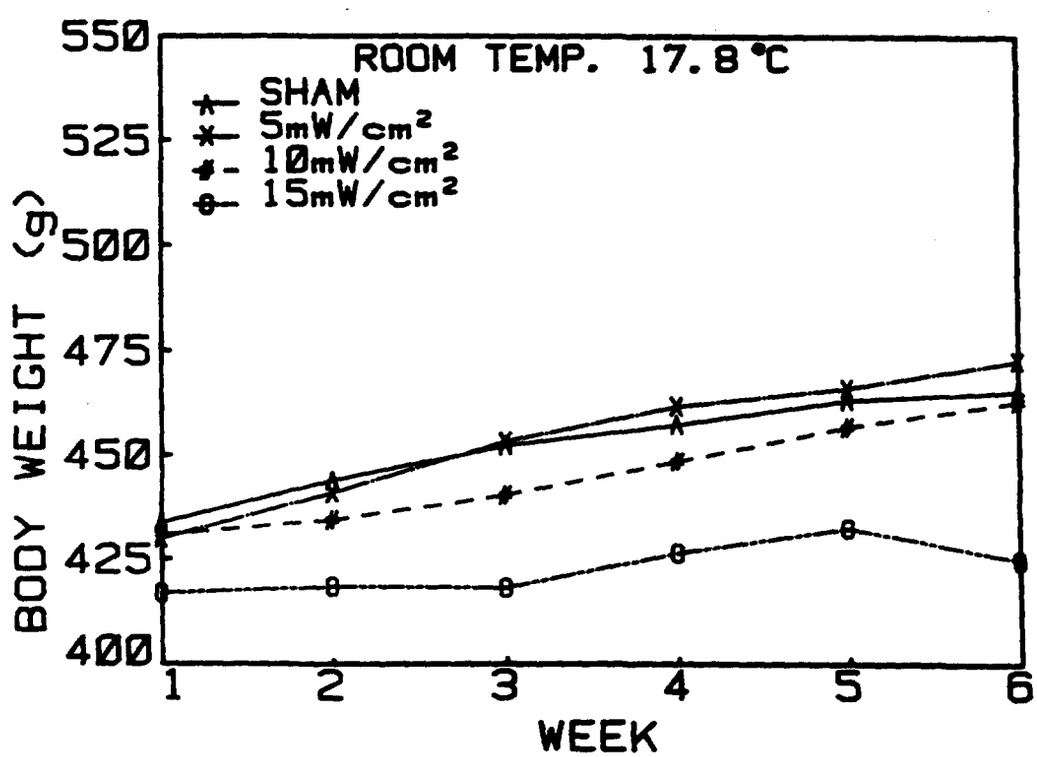

Figure 16. Weekly average body mass at 17.8°C.

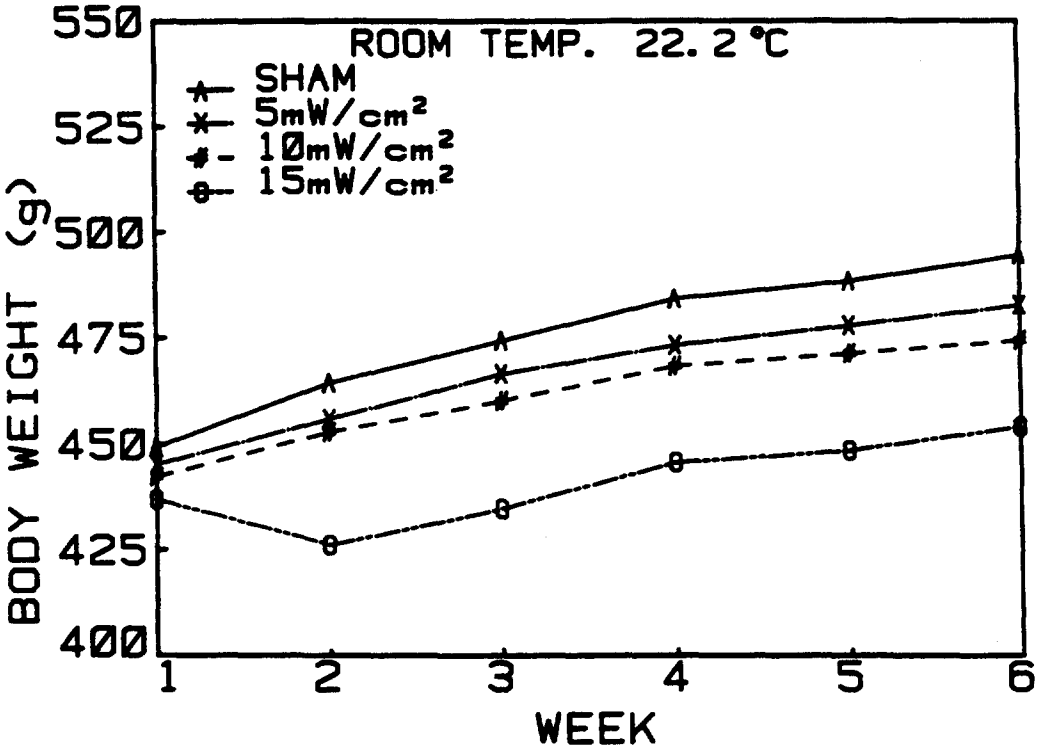

Figure 17. Weekly average body mass at 22.2°C.

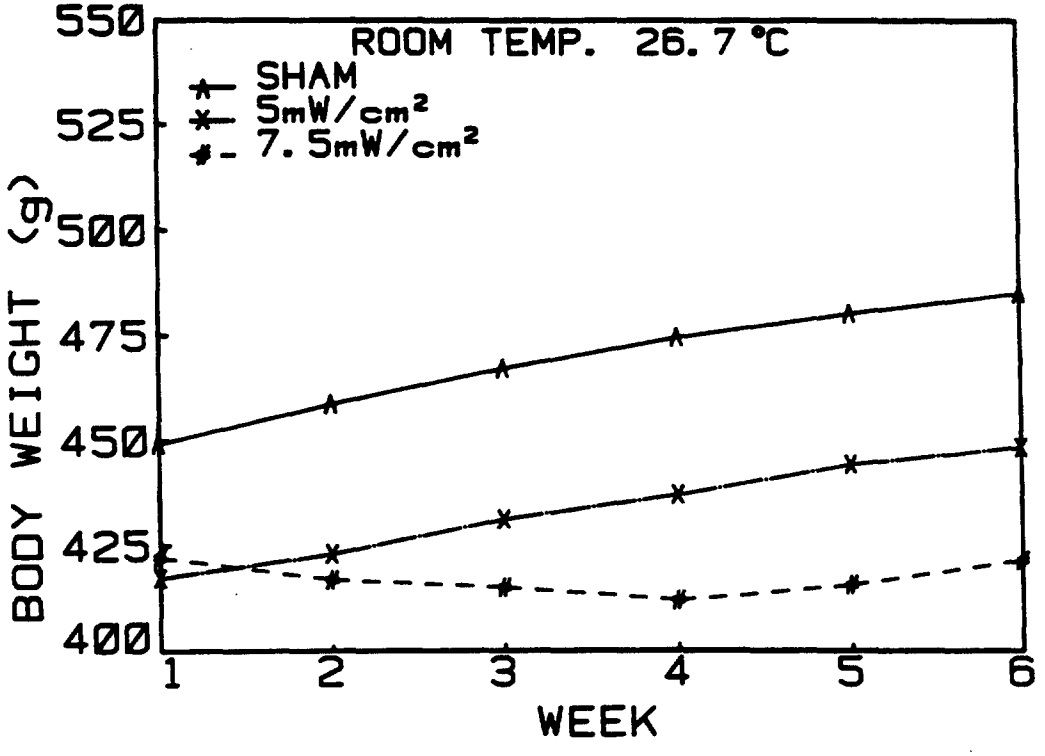

Figure 18. Weekly average body mass at 26.7°C.

TABLE 16. WEEKLY MEANS AND STANDARD ERRORS OF BODY MASS

Weeks	Power Density (mW/cm^2)							
	0		5		10		15	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
T=17.8°C								
1	433.6	4.49	429.8	4.11	430.7	4.74	416.8	7.12
2	443.7	4.81	440.7	4.52	434.2	5.82	418.3	5.28
3	452.2	5.69	453.2	5.34	440.2	6.48	418.1	5.22
4	457.3	6.29	461.7	5.57	448.4	5.15	426.4	3.40
5	463.1	7.72	466.0	6.80	456.7	5.44	432.2	3.45
6	465.2	8.98	472.6	7.21	462.8	5.53	424.6	3.95
T=22.2°C								
1	449.3	3.13	445.2	4.62	442.3	3.00	436.8	2.56
2	464.5	3.73	456.0	5.25	452.9	2.28	426.1	4.02
3	474.4	4.49	466.6	5.50	460.2	2.15	434.7	4.27
4	484.3	5.38	473.3	5.91	468.4	2.56	445.7	5.00
5	488.5	5.79	478.0	6.70	471.4	4.17	448.5	6.04
6	494.7	5.50	482.8	7.08	474.5	6.04	454.1	6.29
T=26.7°C					7.5			
1	449.2	8.38	417.2	5.79	422.0	6.32		
2	458.6	8.47	422.9	5.38	416.7	6.07		
3	467.0	7.75	431.1	5.79	414.9	5.38		
4	474.6	7.37	437.0	5.25	411.9	4.62		
5	480.3	8.16	444.3	6.83	415.6	6.01		
6	485.0	7.15	448.3	8.44	421.4	6.64		

TABLE 17. COMPARISON OF BODY MASS AT DIFFERENT TIMES OF EXPOSURE TO 0, 5, 10, AND 15 mW/cm^2 POWER AT 17.8°C (L) and 22.2°C (M)

Week	Condition							
1	L-15	L-5	L-10	L-0	M-15	M-10	M-5	M-0
2	L-15	M-15	L-10	L-5	L-0	M-10	M-5	M-0
3	L-15	M-15	L-10	L-0	L-5	M-10	M-5	M-0
4	L-15	M-15	L-10	L-0	L-5	M-10	M-5	M-0
5	L-15	M-15	L-10	L-0	L-5	M-10	M-5	M-0
6	L-15	M-15	L-10	L-0	L-5	M-10	M-5	M-0

Body mass increasing from left to right.
Body mass did not differ significantly between underscored conditions.
Between conditions underscored by the same line, body-mass difference is statistically significant at $p < 0.01$.

TABLE 18. COMPARISON OF BODY MASS AT DIFFERENT TIMES OF EXPOSURE TO 0, 5, AND 7.5 mW/cm^2 AT 26.7°C

Week	Exposure level		
1	5	7.5	0
2	7.5	5	0
3	7.5	5	0
4	7.5	5	0
5	7.5	5	0
6	7.5	5	0

Food consumption was analyzed in the same way as body mass. Figures 19-21 show the weekly average food consumption data. The means and standard errors are shown in Table 19. Food consumption apparently drops as power density increases, for all temperatures. Set 1 data (17.8 and 22.2^{o}C; 0, 5, 10, and 15 mW/cm^2) showed significant effects of radiation ($f = 103.8$, $df = 3,72$, $p < 0.0001$); time ($f = 5.46$, $df = 5,360$, $p = < 0.0001$); and time-temperature ($f = 7.62$, $df = 5,360$, $p < 0.0001$). When averaged across 6 wk and the two temperatures, differences among the four exposure levels are all significantly different at $p < 0.01$. When averaged across the four exposure levels, differences of temperature effect were significant during first 2 wk only ($p < 0.01$).

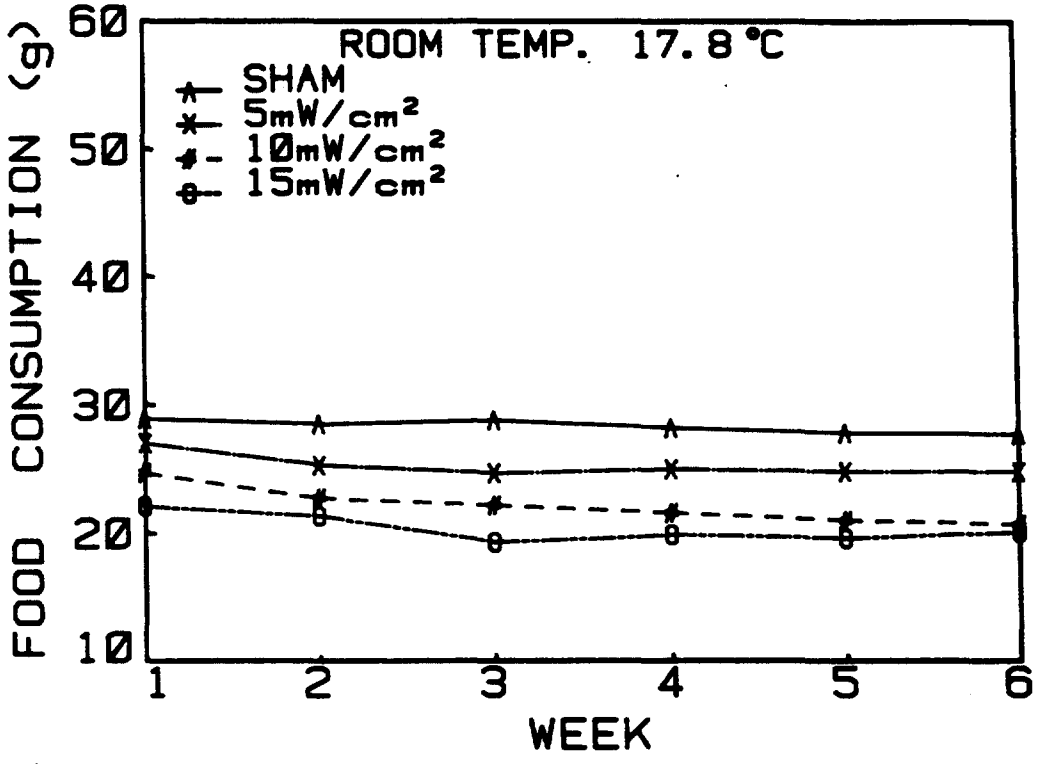

Figure 19. Weekly average food consumption at 17.8^{o}C.

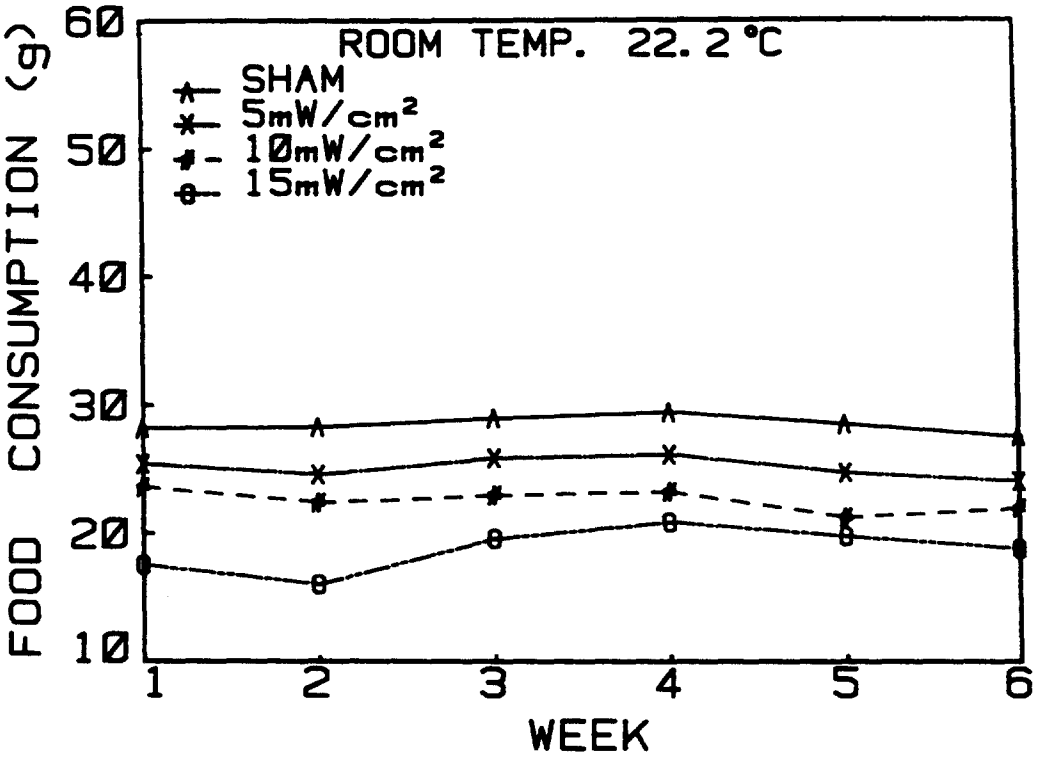

Figure 20. Weekly average food consumption at 22.2°C.

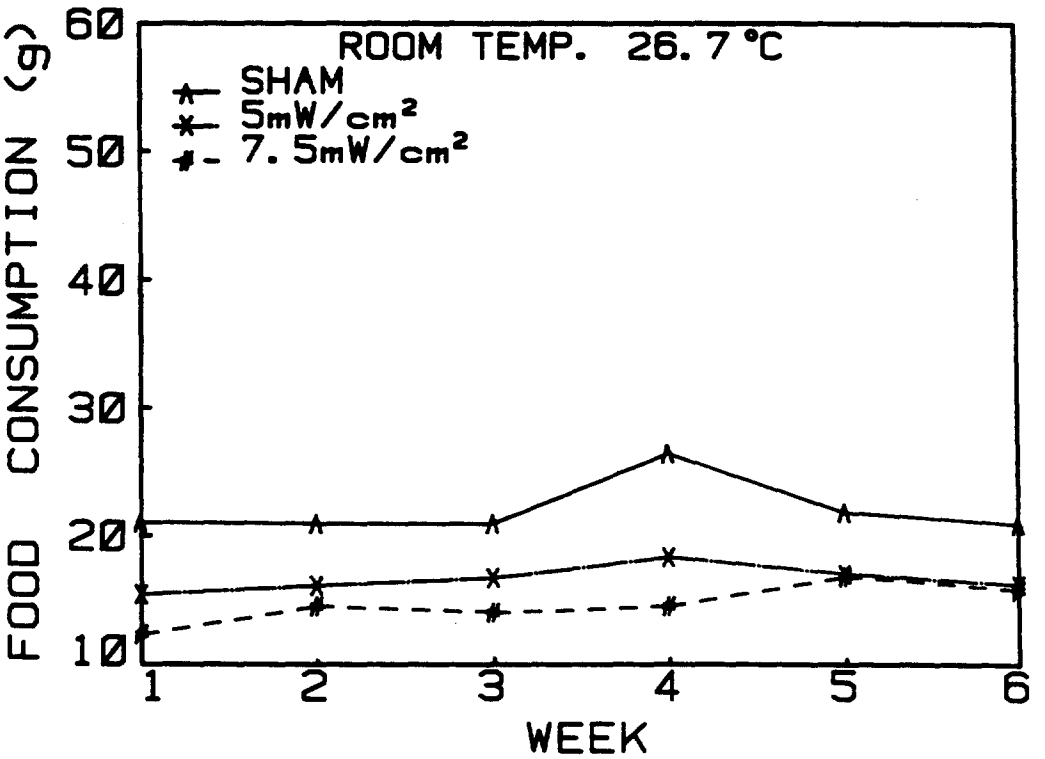

Figure 21. Weekly average food consumption at 26.7°C.

TABLE 19. WEEKLY MEANS AND STANDARD ERRORS OF FOOD CONSUMPTION

	Power Density (mW/cm^2)							
	0		5		10		15	
Week	Mean	SE	Mean	SE	Mean	SE	Mean	SE
T=17.8°C								
1	28.9	0.72	27.0	0.72	24.7	0.76	22.1	1.11
2	28.5	0.41	25.3	0.79	22.7	0.82	21.3	1.17
3	28.8	1.01	24.8	0.98	22.3	0.63	19.3	0.51
4	28.2	1.14	25.0	0.98	21.6	0.57	19.9	0.28
5	27.8	0.73	24.8	0.85	21.0	0.32	19.6	0.51
6	27.7	0.70	24.8	0.76	20.7	0.54	20.1	0.63
T=22.2°C								
1	28.2	1.08	25.4	0.51	23.6	0.38	17.5	1.11
2	28.3	0.70	24.6	0.57	22.4	0.63	16.0	0.95
3	29.0	0.54	25.9	0.73	23.0	1.11	19.6	0.70
4	29.5	0.54	26.2	0.89	23.3	0.95	20.9	0.66
5	28.6	0.76	24.8	0.70	21.3	1.17	19.8	0.70
6	27.6	0.76	24.2	0.73	22.0	1.33	18.8	0.98
T=26.7°C					7.5			
1	21.0	0.73	15.4	0.74	12.3	0.28		
2	20.9	0.47	16.1	0.51	14.5	0.63		
3	20.9	0.73	16.7	0.47	14.0	0.22		
4	26.4	1.52	18.3	0.70	14.5	0.79		
5	21.8	0.66	17.0	0.76	16.8	0.35		
6	20.9	0.47	16.2	0.47	15.8	0.54		

Set 2 analysis (17.8, 22.2, and 26.7°C; 0 and 5 mW/cm^2) indicated that significant effects were of temperature ($f = 121.27$, $df = 2,54$, $p < 0.0001$), radiation ($f = 74.35$, $df = 1,54$, $p < 0.0001$), time ($f = 8.23$, $df = 5,270$, $p < 0.0001$), and time-temperature ($f = 5.29$, $df = 10,270$, $p < 0.0001$). When averaged across 6 wk and the three temperatures, food consumption was significantly reduced for the 5-mW/cm^2 exposed rats when compared to the sham exposed ($p < 0.01$). When the 0 and 5-mW/cm^2 data were combined, differences were seen between the 26.7 and the 17.8/22.2°C groups. No difference was found between the 17.8 and 22.2°C groups.

Results for the set 3 data (26.7°C; 0, 5, and 7.5 mW/cm^2) showed effects of radiation ($f = 55.93$, $df = 2,25$, $p < 0.0001$), time ($f = 13.67$, $df = 5,125$, $p < 0.0001$), and time-radiation ($f = 5.42$, $df = 10,125$, $p < 0.0001$). Analysis across time is shown in Table 20.

TABLE 20. COMPARISON OF FOOD CONSUMPTION AT DIFFERENT TIMES OF EXPOSURE TO 0, 5, and 7.5 mW/cm^2 AT 26.7°C

Week	Exposure Condition		
1	7.5	5	0
2	7.5	5	0
3	7.5	5	0
4	7.5	5	0
5	7.5	5	0
6	7.5	5	0

Daily water consumption showed large variations. Even the weekly averages (Figures 22-24) did not have consistent patterns. The same statistical analysis as for body mass was done on these data. Table 21 shows the weekly means and standard errors of the water consumption. Set 1 data (17.8 and 22.2^{o}C; 0, 5, 10, and 15 mW/cm^{2}) showed effects of radiation ($f = 3.45$, $df = 3,72$, $p = 0.02$); time ($f = 11.4$, $df = 5,360$, $p < 0.0001$); time-temperature ($f = 9.10$, $df = 5,360$, $p < 0.0001$); and time-radiation ($f = 2.31$, $df = 15,360$, $p = 0.0038$). Averaged across the four exposure levels, temperature effect was significant only during week 5.

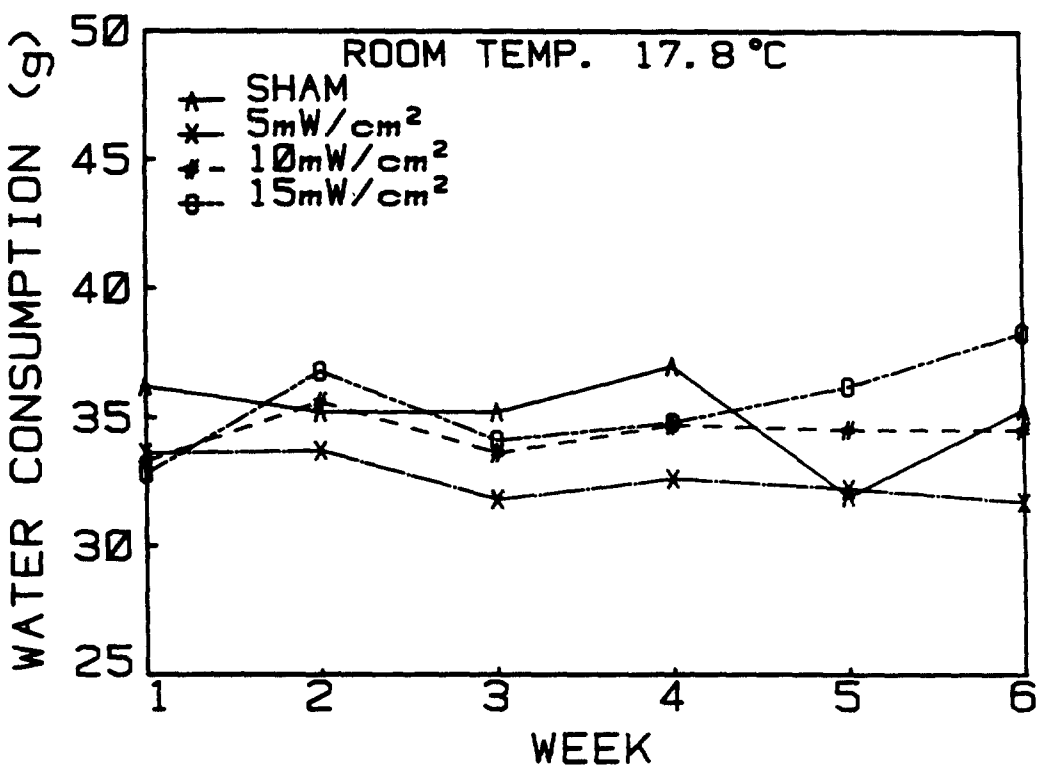

Figure 22. Weekly average water consumption at 17.8^{o}C.

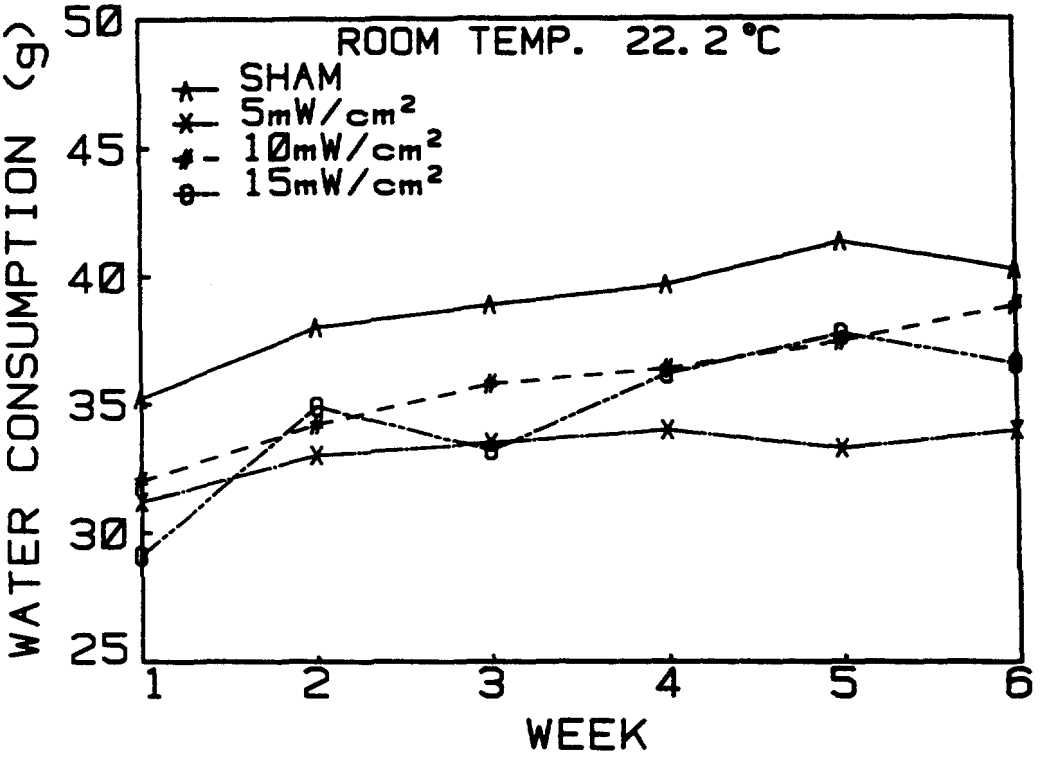

Figure 23. Weekly average water consumption at 22.2°C.

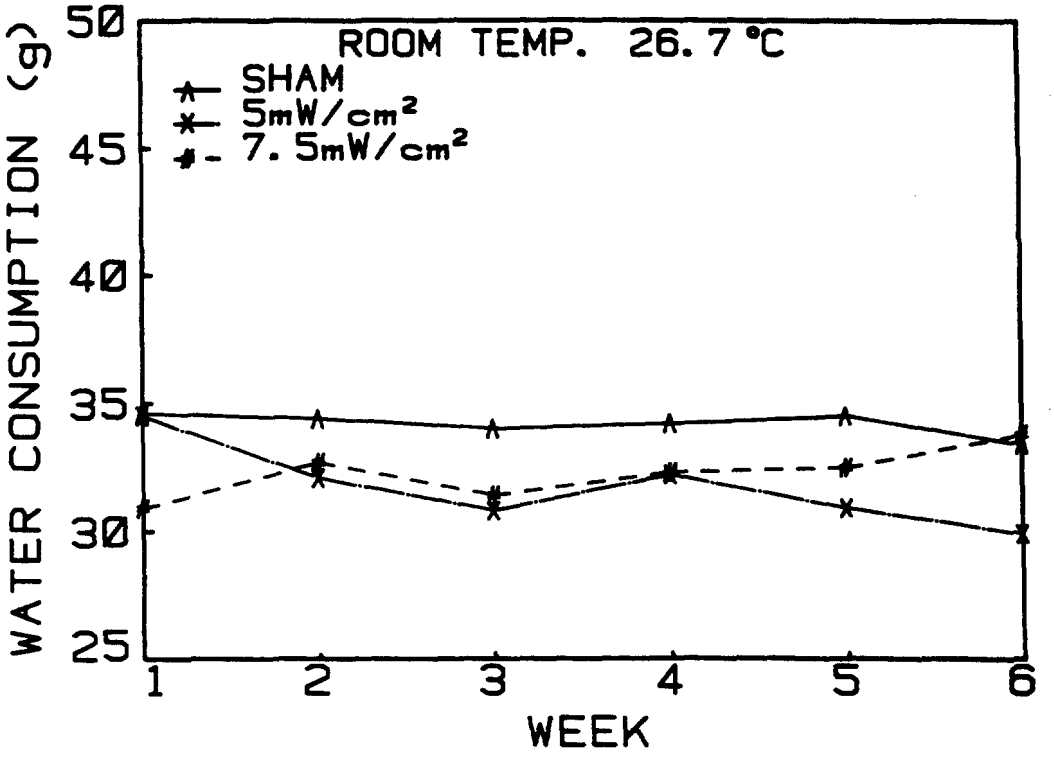

Figure 24. Weekly average water consumption at 26.7°C.

TABLE 21. WEEKLY MEANS AND STANDARD ERRORS OF WATER CONSUMPTION

	Power density (mW/cm^2)							
	0		5		10		15	
Week	Mean	SE	Mean	SE	Mean	SE	Mean	SE
T=17.8°C								
1	36.2	1.11	33.6	0.79	33.3	1.55	32.8	0.76
2	35.2	0.47	33.7	0.57	35.6	1.01	36.8	0.63
3	35.2	0.92	31.8	0.85	33.6	1.64	34.1	1.17
4	37.1	1.83	32.6	0.92	34.7	1.64	34.8	1.17
5	32.0	3.42	32.3	1.20	34.5	1.64	36.2	1.87
6	35.3	1.36	31.8	0.76	34.5	1.48	38.3	1.80
T=22.2°C								
1	35.2	1.99	31.2	1.13	32.0	0.79	29.2	1.83
2	38.0	2.47	33.1	1.11	34.2	0.82	34.9	2.75
3	38.9	2.21	33.5	1.14	35.8	1.52	33.2	1.42
4	39.7	2.25	34.0	1.11	36.5	2.06	36.2	0.82
5	41.4	2.12	33.3	0.98	37.6	1.96	37.8	0.85
6	40.3	2.12	34.0	1.39	38.9	2.44	36.6	1.11
T=26.7°C					7.5			
1	34.6	1.42	34.5	1.64	30.9	1.04		
2	34.4	1.45	32.1	1.61	32.7	0.92		
3	34.0	1.45	30.8	1.01	31.4	1.07		
4	34.2	1.61	32.2	1.23	32.3	1.11		
5	34.5	1.58	30.9	1.26	32.5	1.36		
6	33.4	1.61	29.9	1.64	33.8	1.99		

Set 2 data (17.8, 22.2, and 26.7^{o}C; 0 and 5 mW/cm^2) also showed effects of radiation ($f = 12.35$, $df = 1,54$, $p = 0.0009$); time-temperature ($f = 6.67$, $df = 10,270$, $p < 0.0001$); and time-radiation ($f = 3.07$, $df = 5,270$, $p = 0.0232$). The temperature effect was analyzed weekly for data averaged across two exposure levels. Table 22 shows the results. In general, rats drank more water at 22.2^{o}C than at 17.8^{o}C and less than at 26.7^{o}C, but the significant difference ($p < 0.01$) occurs only at the 5th and 6th wk of exposure. At 26.7^{o}C, the only significant difference was time-radiation ($f = 2.50$, $df = 10,125$, $p = 0.0009$). When analyzed across time, the time-radiation interaction was apparently due to changes of each exposure level across time rather than differences among exposure levels at each time.

TABLE 22. COMPARISON OF WATER CONSUMPTION AT DIFFERENT TIMES OF EXPOSURE TO 0 AND 5 mW/cm^2 AVERAGED AT 17.8°C (L), 22.2°C (M), and 26.7°C (H)

Week	Temperature		
1	M	H	L
2	H	L	M
3	H	L	M
4	H	L	M
5	H	L	M
6	H	L	M

Animal Health Profile

Tables 23-25 tabulate the means and standard errors of the serum chemistry, T_4, protein electrophoresis, and hematology data of the 120 rats exposed to microwave radiation at 0, 5, 7.5, 15 mW/cm^2 and 17.8, 22.2, and 26.7^{o}C ambient temperatures.

TABLE 23. SERUM CHEMISTRY AND THYROXINE DATA OF RATS EXPOSED TO VARIOUS LEVELS OF MICROWAVE RADIATION AT THREE ENVIRONMENTAL TEMPERATURES

Parameter	Exposure (mW/cm^2)	17.8^{o}C Mean	17.8^{o}C SE	22.2^{o}C Mean	22.2^{o}C SE	26.7^{o}C Mean	26.7^{o}C SE
Glucose	0	120.2	2.89	109.9	1.51	121.1	2.62
	5	122.5	2.15	116.5	1.78	118.9	3.19
	7.5	-	-	-	-	116.1	2.65
	10	120.8	2.55	108.8	2.98	-	-
	15	120.4	2.09	111.6	2.03	-	-
BUN	0	21.8	0.53	19.6	0.45	18.5	0.03
	5	18.4	0.34	17.7	0.47	17.5	0.60
	7.5	-	-	-	-	15.9	0.36
	10	17.1	0.46	17.5	1.03	-	-
	15	16.3	0.47	15.5	0.27	-	-
Creatinine	0	0.5	0.03	0.58	0.01	0.63	0.03
	5	0.5	0.02	0.57	0.02	0.60	0.02
	7.5	-	-	-	-	0.56	0.02
	10	0.5	0.03	0.55	0.02	-	-
	15	0.5	0.02	0.58	0.03	-	-
Na+	0	143.1	0.57	140.7	0.76	144.5	0.60
	5	141.9	0.60	141.1	0.95	143.4	0.45
	7.5	-	-	-	-	144.3	0.53
	10	142.5	0.84	141.6	0.67	-	-
	15	142.4	0.42	140.9	0.57	-	-
K+	0	6.01	0.27	5.54	0.19	6.07	0.12
	5	5.84	0.22	5.73	0.19	6.48	0.25
	7.5	-	-	-	-	6.04	0.11
	10	5.73	0.28	5.59	0.16	-	-
	15	5.62	0.20	5.37	0.21	-	-
Cl-	0	102.8	0.44	103.1	0.60	104.3	0.37
	5	102.9	0.23	103.2	0.51	104.6	0.45
	7.5	-	-	-	-	104.8	0.47
	10	103.6	0.26	104.4	0.37	-	-
	15	104.9	0.53	104.0	0.92	-	-

TABLE 23 (continued)

Parameter	Exposure (mW/cm^2)	17.8°C Mean	17.8°C SE	22.2°C Mean	22.2°C SE	26.7°C Mean	26.7°C SE
CO_2	0	30.0	0.63	29.1	0.60	26.9	0.57
	5	29.8	0.42	29.0	0.58	26.5	0.58
	7.5	-	-	-	-	27.3	0.84
	10	28.7	0.57	28.9	0.69	-	-
	15	27.8	0.47	28.9	0.52	-	-
Uric Acid	0	1.24	0.09	1.57	0.14	1.22	0.10
	5	1.30	0.05	1.54	0.14	1.33	0.08
	7.5	-	-	-	-	1.19	0.06
	10	1.25	0.08	1.59	0.11	-	-
	15	1.34	0.07	1.58	0.13	-	-
Ion Gap	0	10.3	0.88	8.50	0.88	13.3	0.30
	5	9.20	0.51	8.90	0.94	12.3	0.58
	7.5	-	-	-	-	12.3	0.22
	10	10.2	0.71	8.30	0.47	-	-
	15	9.78	0.85	8.00	0.99	-	-
Ionized Calcium	0	4.89	0.05	4.87	0.05	4.72	0.08
	5	4.93	0.04	4.87	0.03	4.34	0.09
	7.5	-	-	-	-	4.51	0.06
	10	4.87	0.04	4.80	0.03	-	-
	15	4.79	0.03	4.76	0.03	-	-
Calcium	0	10.1	0.03	10.1	0.02	9.80	0.04
	5	10.2	0.07	10.1	0.02	9.18	0.07
	7.5	-	-	-	-	9.53	0.11
	10	10.2	0.05	10.1	0.04	-	-
	15	10.0	0.06	9.90	0.05	-	-
P	0	6.86	0.21	6.27	0.17	6.00	0.37
	5	6.91	0.20	6.08	0.13	5.89	0.14
	7.5	-	-	-	-	5.86	0.11
	10	6.58	0.20	6.08	0.12	-	-
	15	6.63	0.14	6.10	0.11	-	-
Alka. Phos.	0	287.7	27.4	210.1	13.9	239.3	16.7
	5	218.0	12.0	206.4	9.58	183.7	13.9
	7.5	-	-	-	-	233.4	13.2
	10	206.6	15.8	196.3	10.3	-	-
	15	186.7	8.3	178.1	9.58	-	-
LDH	0	647.2	78.4	746.3	95.1	818.9	65.6
	5	608.8	70.0	568.2	31.6	771.2	51.6
	7.5	-	-	-	-	890.1	32.0
	10	618.5	82.8	727.0	78.8	-	-
	15	638.4	52.2	692.3	64.8	-	-
SGOT	0	106.6	8.1	154.0	22.9	104.7	3.3
	5	100.4	4.8	105.8	4.0	121.9	15.0
	7.5	-	-	-	-	120.5	7.3
	10	108.5	9.2	119.3	8.6	-	-
	15	113.4	3.5	148.0	18.4	-	-

Parameter	Exposure (mW/cm^2)	17.8°C Mean	17.8°C SE	22.2°C Mean	22.2°C SE	26.7°C Mean	26.7°C SE
SGPT	0	41.1	2.5	70.0	18.8	41.1	3.6
	5	34.6	2.1	40.1	1.2	52.5	14.8
	7.5	-	-	-	-	44.1	4.4
	10	36.8	2.8	45.2	4.7	-	-
	15	38.0	1.1	43.3	4.8	-	-
Cholesterol	0	102.1	4.8	107.1	4.8	93.7	3.4
	5	99.9	3.0	106.6	3.2	77.1	5.4
	7.5	-	-	-	-	79.0	5.2
	10	94.6	3.8	94.4	3.2	-	-
	15	90.0	4.4	91.6	5.6	-	-
Triglyceride	0	106.6	12.0	103.4	6.1	141.7	12.1
	5	92.8	9.8	103.8	5.9	127.7	8.2
	7.5	-	-	-	-	116.3	7.0
	10	99.8	6.0	98.3	4.9	-	-
	15	119.8	8.2	108.6	7.2	-	-
Total Protein	0	5.9	0.05	6.01	0.08	6.03	0.05
	5	5.9	0.04	6.04	0.06	6.16	0.09
	7.5	-	-	-	-	6.19	0.06
	10	6.0	0.07	6.20	0.07	-	-
	15	6.0	0.09	6.60	0.08	-	-
Albumin	0	3.26	0.02	3.37	0.04	3.33	0.03
	5	3.29	0.02	3.39	0.04	3.44	0.06
	7.5	-	-	-	-	3.43	0.05
	10	3.34	0.02	3.42	0.03	-	-
	15	3.31	0.06	3.36	0.04	-	-
Globulin	0	2.70	0.04	2.64	0.04	2.70	0.07
	5	2.67	0.03	2.65	0.04	2.72	0.06
	7.5	-	-	-	-	2.76	0.02
	10	2.73	0.05	2.78	0.05	-	-
	15	2.74	0.06	2.70	0.05	-	-
A/G	0	1.22	0.03	1.30	0.02	1.25	0.04
	5	1.24	0.02	1.29	0.03	1.27	0.03
	7.5	-	-	-	-	1.25	0.02
	10	1.22	0.02	1.25	0.02	-	-
	15	1.20	0.03	1.25	0.02	-	-
BUN/Cre	0	42.0	2.18	33.9	0.72	29.8	1.02
	5	36.7	1.58	31.3	0.32	29.2	0.31
	7.5	-	-	-	-	28.5	1.12
	10	34.9	1.77	31.9	1.61	-	-
	15	29.6	1.15	27.2	1.22	-	-
T4	0	5.01	0.20	4.46	0.35	3.96	0.27
	5	5.13	0.14	4.32	0.20	3.42	0.38
	7.5	-	-	-	-	2.96	0.28
	10	4.89	0.18	3.73	0.24	-	-
	15	4.39	0.28	3.64	0.42	-	-

TABLE 24. PROTEIN ELECTROPHORESIS DATA OF RATS EXPOSED TO VARIOUS LEVELS OF MICROWAVE RADIATION AT THREE ENVIRONMENTAL TEMPERATURES

Parameter	Exposure	17.8°C		22.2°C		26.7°C	
	(mW/cm^2)	Mean	SE	Mean	SE	Mean	SE
Albumin	0	54.1	1.20	51.6	1.51	55.0	0.89
	5	55.4	1.09	50.7	0.92	55.5	0.86
	7.5	-	-	-	-	55.8	3.11
	10	54.6	1.66	51.5	0.48	-	-
	15	55.3	1.39	53.1	1.29	-	-
Alpha 1	0	19.2	1.03	19.8	1.21	18.7	0.86
	5	18.3	0.81	21.0	0.84	19.5	0.86
	7.5	-	-	-	-	17.6	0.89
	10	20.0	1.46	19.7	0.77	-	-
	15	18.8	1.05	19.0	0.80	-	-
Alpha 2	0	6.70	0.45	7.60	0.34	6.20	0.39
	5	6.70	0.33	7.70	0.26	6.20	0.20
	7.5	-	-	-	-	5.63	0.23
	10	6.50	0.40	7.70	0.26	-	-
	15	5.89	0.19	7.50	0.22	-	-
Beta	0	15.6	0.43	16.1	0.48	15.4	0.27
	5	13.9	1.01	15.6	0.34	14.3	0.40
	7.5	-	-	-	-	15.8	0.37
	10	14.7	0.34	15.5	0.31	-	-
	15	15.3	0.41	15.1	0.41	-	-
Gamma	0	4.50	0.27	4.90	0.43	4.60	0.34
	5	4.60	0.22	4.90	0.28	4.50	0.27
	7.5	-	-	-	-	4.75	0.28
	10	4.20	0.42	5.60	0.37	-	-
	15	4.67	0.48	6.20	0.42	-	-
A/G	0	1.20	0.07	1.09	0.06	1.24	0.04
	5	1.24	0.07	1.04	0.03	1.25	0.04
	7.5	-	-	-	-	1.43	0.09
	10	1.24	0.08	1.07	0.03	-	-
	15	1.27	0.08	1.11	0.03	-	-

TABLE 25. HEMATOLOGY DATA OF RATS EXPOSED TO VARIOUS LEVELS OF MICROWAVE RADIATION AT THREE ENVIRONMENTAL TEMPERATURES

Parameter	Exposure	17.8°C		22.2°C		26.7°C	
	(mW/cm2)	Mean	SE	Mean	SE	Mean	SE
WBC	0	5.88	0.53	5.38	0.40	10.5	4.52
	5	6.49	0.79	5.16	0.29	6.82	0.95
	7.5	-	-	-	-	5.75	0.29
	10	5.75	0.52	5.36	0.54	-	-
	15	4.51	0.38	5.28	0.40	-	-
RBC	0	7.70	0.11	7.51	0.04	7.50	0.28
	5	7.73	0.07	7.60	0.05	7.79	0.10
	7.5	-	-	-	-	7.67	0.42
	10	7.68	0.12	7.65	0.08	-	-
	15	7.47	0.12	7.35	0.20	-	-
HGB	0	14.9	0.24	14.6	0.11	13.7	0.68
	5	14.9	0.14	14.9	0.11	14.6	0.15
	7.5	-	-	-	-	14.7	0.18
	10	15.0	0.22	15.1	0.13	-	-
	15	14.9	0.12	14.9	0.11	-	-
HCT	0	42.0	0.89	40.8	0.43	38.4	2.70
	5	41.9	0.48	41.4	0.51	42.5	0.63
	7.5	-	-	-	-	41.9	0.74
	10	42.3	0.74	42.0	0.43	-	-
	15	42.4	0.76	42.0	0.45	-	-
MCV	0	54.5	0.76	54.3	0.43	51.7	1.56
	5	54.1	0.48	54.3	0.50	54.5	0.85
	7.5	-	-	-	-	54.4	1.35
	10	55.1	0.39	54.8	0.31	-	-
	15	56.7	0.34	55.7	0.64	-	-
MCH	0	19.4	0.26	19.5	0.15	18.5	0.27
	5	19.3	0.13	19.6	0.11	18.8	0.25
	7.5	-	-	-	-	19.2	0.33
	10	19.5	0.25	19.7	0.13	-	-
	15	19.9	0.22	19.8	0.12	-	-
MCHC	0	35.6	0.33	35.8	0.34	35.0	0.33
	5	35.6	0.40	36.0	0.22	34.5	0.28
	7.5	-	-	-	-	35.0	0.30
	10	35.5	0.53	35.9	0.20	-	-
	15	35.2	0.41	35.6	0.28	-	-
Lymphocyte	0	4.57	0.41	3.62	0.22	4.61	0.39
	5	5.49	0.69	3.85	0.28	4.85	0.66
	7.5	-	-	-	-	4.64	0.29
	10	4.44	0.62	3.42	0.57	-	-
	15	3.67	0.32	3.92	0.34	-	-
Neutrophil	0	1.12	0.23	1.62	0.26	1.12	0.20
	5	0.86	0.17	1.15	0.19	1.79	0.43
	7.5	-	-	-	-	0.89	0.13
	10	1.14	0.18	1.71	0.36	-	-
	15	0.71	0.11	1.15	0.17	-	-

TABLE 25 (continued)

Parameter	Exposure	17.8°C		22.2°C		26.7°C	
	(mW/cm2)	Mean	SE	Mean	SE	Mean	SE
Mono	0	118.4	34.0	77.6	39.6	130.1	29.0
	5	60.7	23.2	77.7	25.0	132.6	53.9
	7.5	-	-	-	-	124.3	33.5
	10	57.2	22.2	113.7	43.2	-	-
	15	114.6	34.1	122.1	59.5	-	-
Eosin	0	40.5	15.6	33.0	12.0	57.4	18.7
	5	68.1	26.1	86.7	38.4	49.2	20.0
	7.5	-	-	-	-	87.5	28.1
	10	95.2	31.2	39.4	18.6	-	-
	15	20.1	14.2	22.4	17.1	-	-

Statistical analysis using analysis of variance was done on each parameter according to the same arrangement as described before: 1) 17.8 and 22.2°C and 0, 5, 10, and 15 mW/cm^2; 2) 17.8, 22.2, and 26.7°C and 0 and 5 mW/cm^2; 3) 26.7°C and 0, 5, and 7.5 mW/cm^2.

Table 26 lists the statistical results of these analyses. Most effects were due to temperature change. Consistent temperature effects observed in sets 1 and 2 are on glucose, BUN, creatinine, sodium, uric acid, ion gap, phosphorus, alkaline phosphatase, albumin, BUN-to-creatine ratio, T_4, alpha 2, A/G ratio, and lymphocyte. Three parameters consistently show radiation effects in all three sets: BUN, ionized calcium, alkaline phosphatase. None of the protein electrophoresis and hematology parameters were affected by the up-to-lethal level of microwave radiation and high environmental temperature.