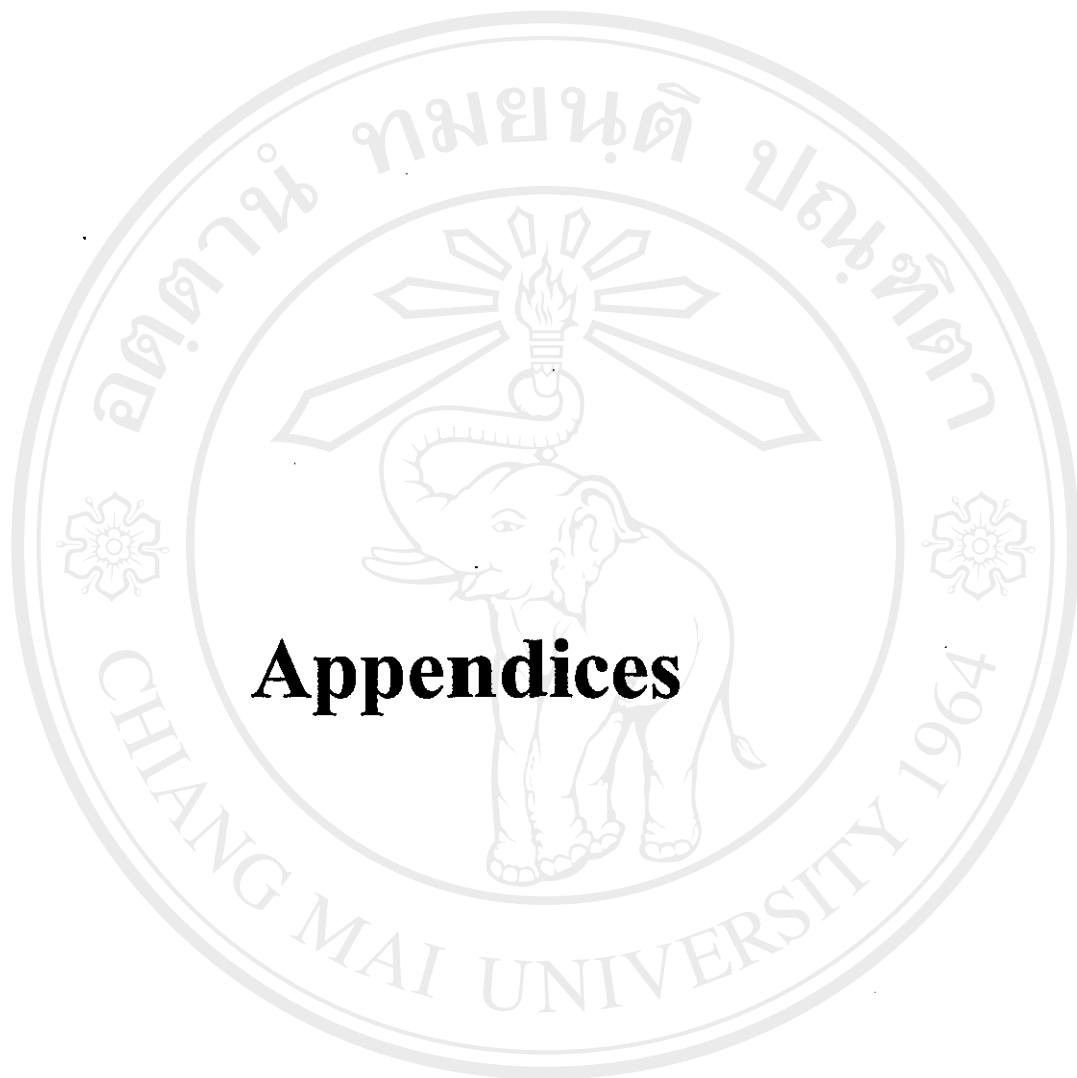




Appendices

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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APPENDIX A

Carbon monoxide gas was generated from carbon monoxide generating system with the reaction between formic acid (HCOOH) and concentrated sulfuric acid (H_2SO_4). Oxygen and oxidizing agents were trapped with reducing agent, sodium dithionite. Figure 26 was shown the in house carbon monoxide generating system.

Reagent preparation for carbon monoxide generating system

Place 36 g of NaOH (6 N) and 0.75 g of $\text{Na}_2\text{S}_2\text{O}_4$ (0.5%) in distilled water 150 ml

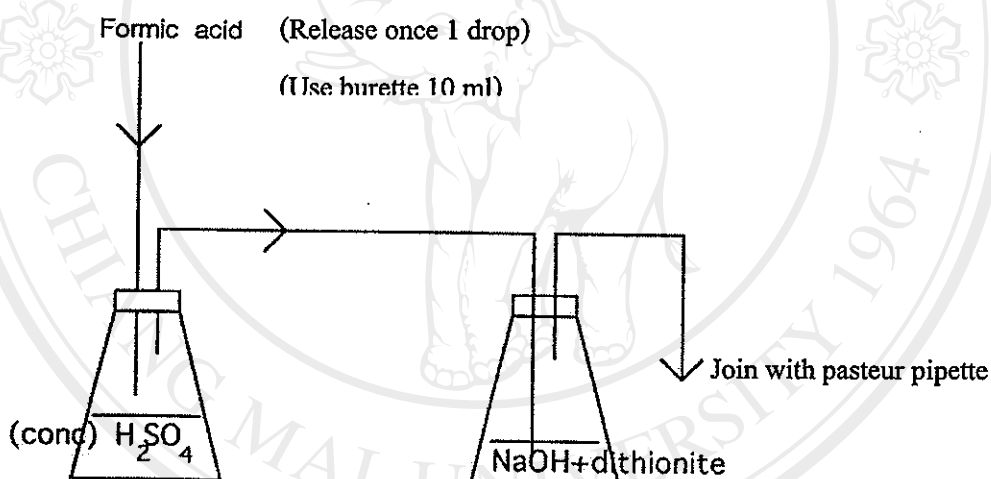


Figure 26 The carbon monoxide generating system was used to produce carbon monoxide gas in this study.

APPENDIX B



Figure 27. The Sprague- Dawley rats were used in this experiment.



Figure 28. The rat was anaesthetized and fixed on the plate.



Figure 29. Neck skin was cut to prepare for blood collection.

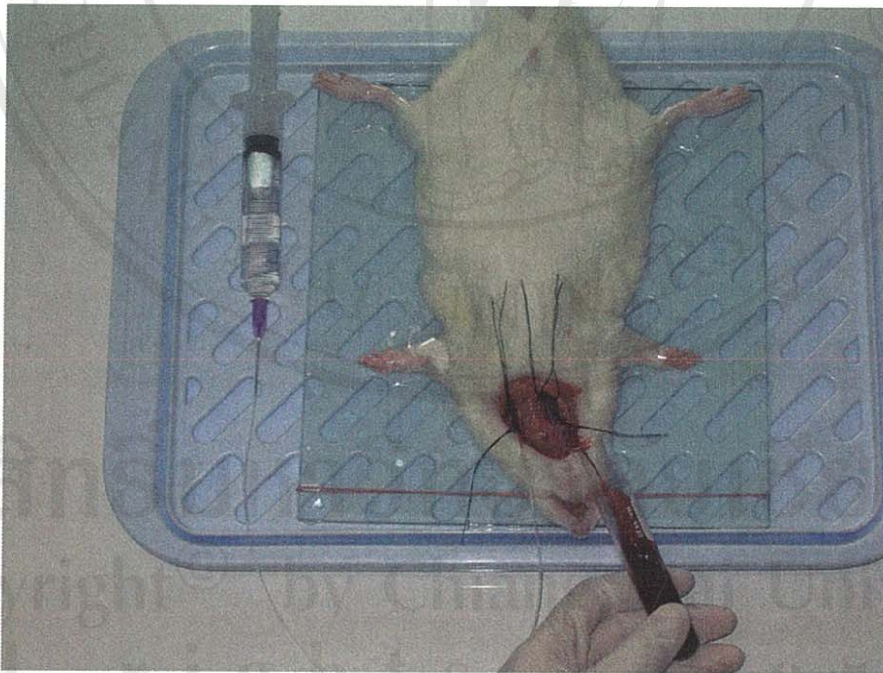


Figure 30. The blood sample was collected from the carotid artery.



Figure 31. The internal organ of the rat were flushed with 0.9% NSS for the internal organs collection.

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APPENDIX C

Table 18 Carbon monoxide concentrations measured at the Rin Kham intersection for 7 days.

Day	Time (Hr)													Average
	6.00-7.00	7.00-8.00	8.00-9.00	9.00-10.00	10.00-11.00	11.00-12.00	12.00-13.00	13.00-14.00	14.00-15.00	15.00-16.00	16.00-17.00	17.00-18.00		
Monday	3.85	3.05	4.30	3.30	3.25	3.70	2.30	3.60	3.30	4.25	6.15	9.40	4.20	
Tuesday	4.30	3.00	2.35	3.50	2.75	2.80	2.55	2.55	3.45	4.90	8.45	4.45	3.75	
Wednesday	4.45	3.45	3.40	2.60	2.65	3.25	3.10	2.80	3.45	3.05	5.05	7.40	3.72	
Thursday	4.00	3.80	2.80	2.45	2.65	2.20	1.90	2.95	4.35	5.05	5.55	8.45	3.85	
Friday	5.05	5.10	2.35	2.35	2.25	2.40	1.50	3.00	1.65	4.20	6.00	7.70	3.63	
Saturday	6.10	3.05	1.95	1.45	1.00	0.75	1.40	1.35	1.70	3.05	3.65	6.65	2.68	
Sunday	2.50	1.75	1.90	1.15	1.30	0.90	0.70	0.75	1.35	2.35	3.30	4.10	1.84	
Average/Day													3.38 ± 0.83	

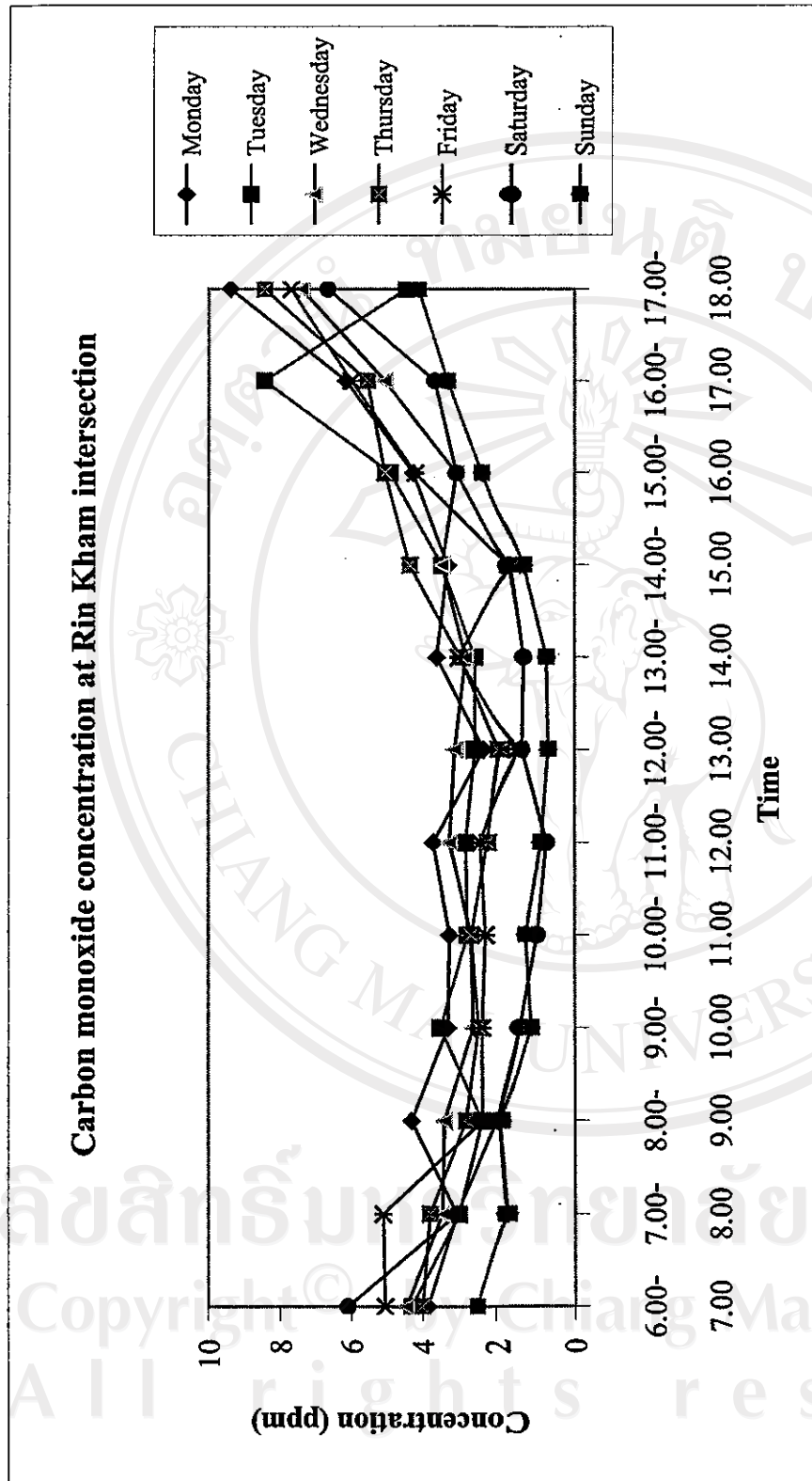


Figure 32 Carbon monoxide concentration at the Rin Kham intersection measured from 6 a.m. to 6 p.m. in 7 days, Monday through Sunday.

Table 19 Carbon monoxide concentrations measured at the Khuang Sing intersection for 7 days.

Day	Time (Hr)												Average
	6.00-7.00	7.00-8.00	8.00-9.00	9.00-10.00	10.00-11.00	11.00-12.00	12.00-13.00	13.00-14.00	14.00-15.00	15.00-16.00	16.00-17.00	17.00-18.00	
Monday	-	-	2.40	2.95	3.55	2.25	2.50	3.90	3.90	4.25	6.70	- *	3.60
Tuesday	1.70	2.75	4.50	3.30	2.85	3.40	2.65	1.75	2.50	3.40	3.750	7.15	3.31
Wednesday	1.80	3.15	3.60	2.65	3.50	4.75	2.65	2.75	1.15	2.50	3.70	5.45	3.14
Thursday	1.80	3.30	4.10	2.60	1.95	2.05	1.80	1.10	1.75	1.20	4.10	8.05	2.82
Friday	2.60	3.70	4.40	3.50	4.85	4.20	3.70	3.90	4.60	6.60	4.00	7.05	4.43
Saturday	2.50	4.70	4.75	4.10	3.40	4.70	4.30	2.95	3.90	2.90	3.95	- *	3.83
Sunday	1.75	3.05	1.65	1.90	2.30	1.55	1.00	1.45	- *	- *	2.70	2.70	2.01
Average/Day													3.30 ± 0.77

* Not detected

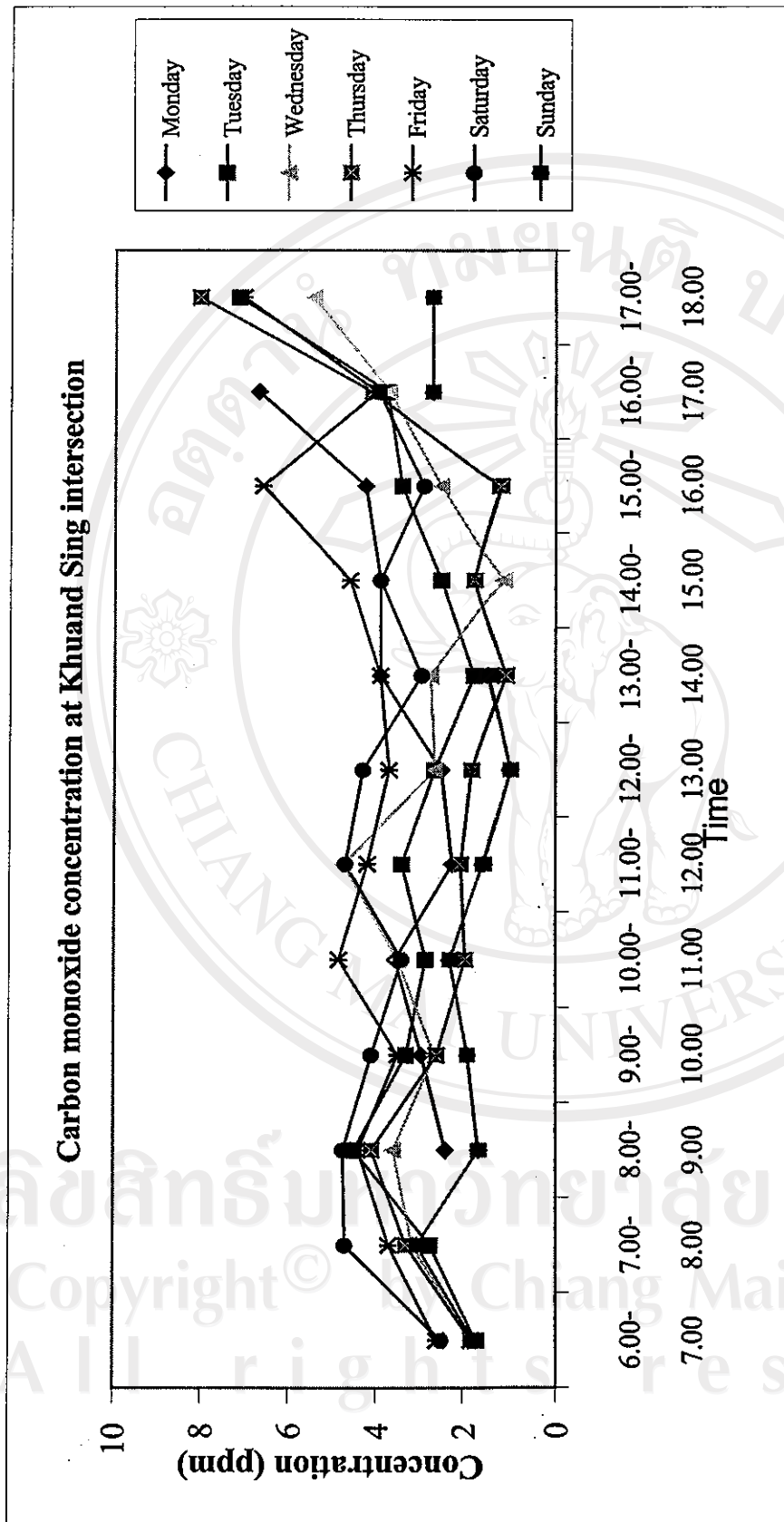


Figure 33 Carbon monoxide concentration at the Khung Sing intersection measured from 6 a.m. to 6 p.m. in 7 days, Monday through Sunday.

Table 20 Carbon monoxide concentrations measured at the Juvenile Court intersection for 7 days.

Day	Time (Hr)												Average
	6.00-7.00	7.00-8.00	8.00-9.00	9.00-10.00	10.00-11.00	11.00-12.00	12.00-13.00	13.00-14.00	14.00-15.00	15.00-16.00	16.00-17.00	17.00-18.00	
Monday	3.70	3.10	2.05	1.90	2.05	2.50	3.25	3.55	5.35	4.75	6.15	- *	3.49
Tuesday	4.70	7.20	3.05	4.00	3.55	2.95	1.75	2.25	1.90	1.65	2.70	2.75	3.20
Wednesday	3.20	6.15	6.05	3.85	4.60	2.65	2.60	2.50	3.20	2.10	2.95	5.30	3.76
Thursday	7.10	5.80	3.45	2.65	2.95	2.95	3.00	3.00	2.95	2.55	5.15	- *	3.78
Friday	3.70	7.30	5.75	4.50	3.55	3.15	3.35	2.75	3.60	3.45	2.95	5.45	4.13
Saturday	4.80	6.65	5.00	3.75	4.25	2.85	2.50	3.30	2.40	4.00	3.95	- *	3.95
Sunday	3.75	5.60	6.25	3.35	2.95	2.90	2.85	2.30	2.65	2.90	3.70	7.05	3.85
Average/Day													3.74 ± 0.31

* Not detected

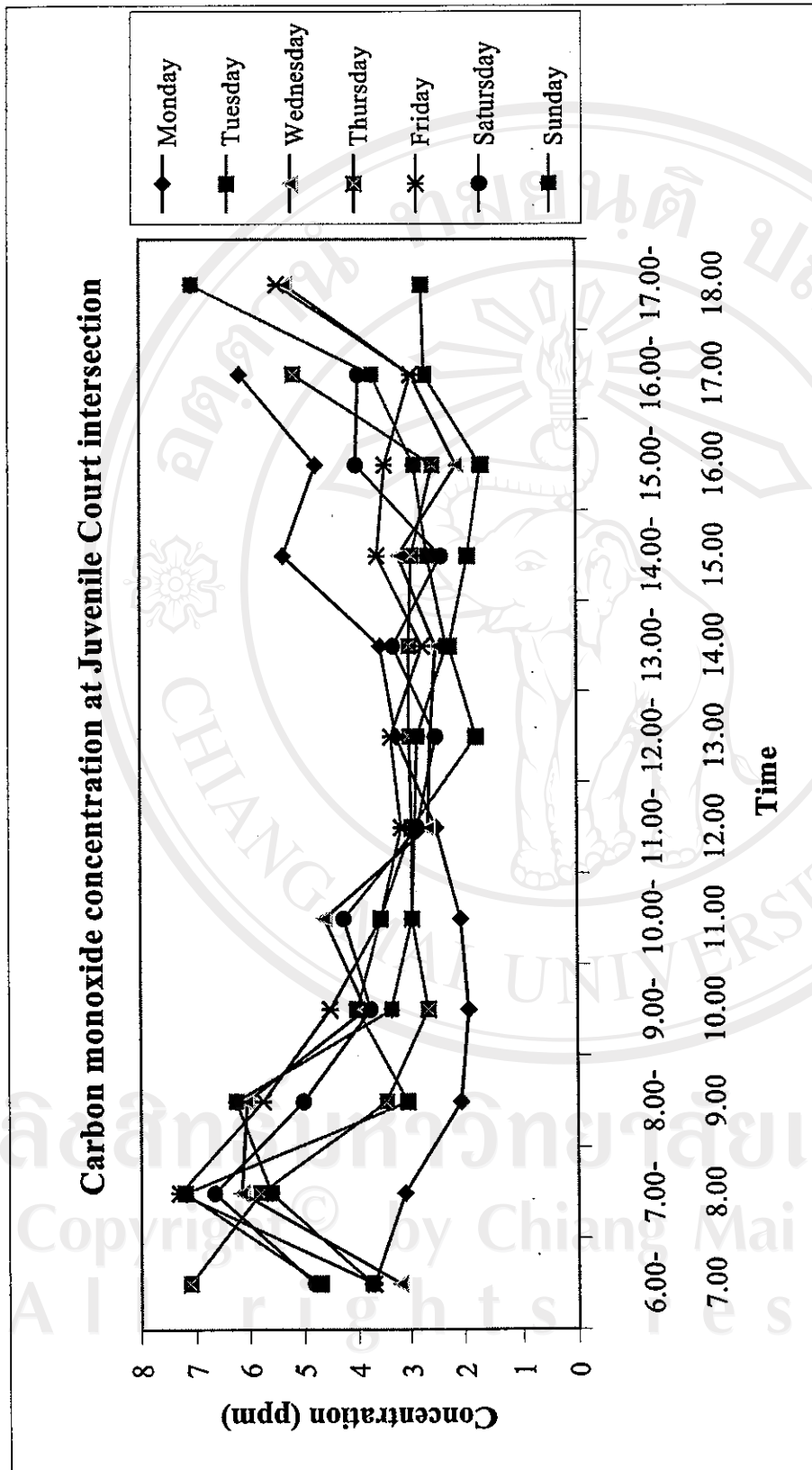


Figure 34 Carbon monoxide concentration at the Juvenile Court intersection measured from 6 a.m. to 6 p.m. in 7 days, Monday through Sunday.

Table 21 Carbon monoxide concentrations measured at the Nawarat bridge intersection for 7 days.

	Time (Hr)											Average
	6.00-7.00	7.00-8.00	8.00-9.00	9.00-10.00	10.00-11.00	11.00-12.00	12.00-13.00	13.00-14.00	14.00-15.00	15.00-16.00	16.00-17.00	
6.00-7.00	6.00-7.00	7.00-8.00	8.00-9.00	9.00-10.00	10.00-11.00	11.00-12.00	12.00-13.00	13.00-14.00	14.00-15.00	15.00-16.00	16.00-17.00	
7.00-8.00	7.00-8.00	8.00-9.00	9.00-10.00	10.00-11.00	11.00-12.00	12.00-13.00	13.00-14.00	14.00-15.00	15.00-16.00	16.00-17.00		
3.05	4.50	3.85	3.60	4.50	4.15	4.40	3.80	3.30	3.20	5.30		
2.55	2.90	3.75	3.95	6.15	4.65	3.65	3.30	3.80	3.75	4.50		
3.00	3.60	4.10	5.05	4.85	5.15	4.55	5.75	4.30	4.80	4.30		
3.60	3.40	3.75	4.05	5.70	4.10	4.05	3.55	4.75	5.20	3.55		
3.55	7.00	4.95	6.85	5.40	4.90	3.85	4.90	5.10	5.45	5.90		
3.25	4.70	7.00	6.50	5.60	2.70	2.55	2.85	3.35	4.45	6.10		
3.10	3.95	5.20	4.55	5.20	4.50	4.40	4.95	3.25	4.95	4.70		

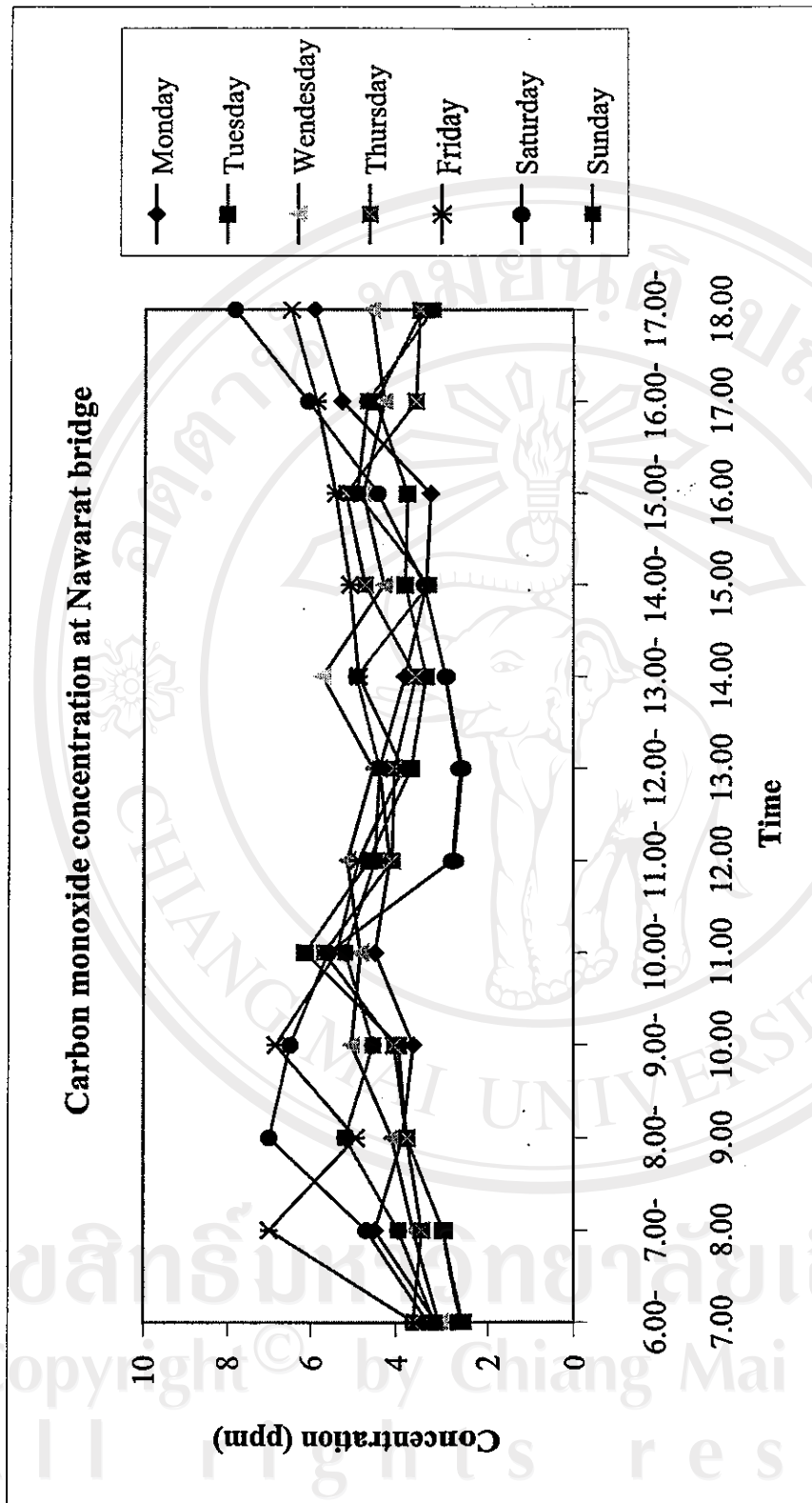


Figure 35 Carbon monoxide concentration in The Nawarat bridge measured from 6 a.m. to 6 p.m. in 7 days, Monday through Sunday.

Table 22 Carbon monoxide concentrations measured at the Warorod market for 7 days.

Day	Time (Hr)												Average
	6.00- 7.00	7.00- 8.00	8.00- 9.00	9.00- 10.00	10.00- 11.00	11.00- 12.00	12.00- 13.00	13.00- 14.00	14.00- 15.00	15.00- 16.00	16.00- 17.00	17.00- 18.00	
Monday	4.55	3.55	2.95	3.05	2.75	2.65	2.65	- *	- *	4.00	4.95	6.55	3.77
Tuesday	4.35	3.90	3.65	3.40	3.30	3.55	3.10	3.10	3.10	2.95	4.50	6.65	3.81
Wednesday **	-	-	-	-	-	-	-	-	-	-	-	-	-
Thursday	3.60	2.60	2.45	2.40	2.50	2.40	3.05	2.75	2.75	2.70	3.45	5.50	2.99
Friday	3.60	3.20	2.95	2.85	2.75	2.55	2.50	2.35	2.35	3.00	3.55	5.30	3.11
Saturday	5.25	4.35	4.15	3.65	3.50	3.80	3.80	4.00	4.00	6.00	6.75	7.30	4.67
Sunday **	-	-	-	-	-	-	-	-	-	-	-	-	-
Average/Day												3.67 ± 0.67	

* Not detected

** Hadn't measured

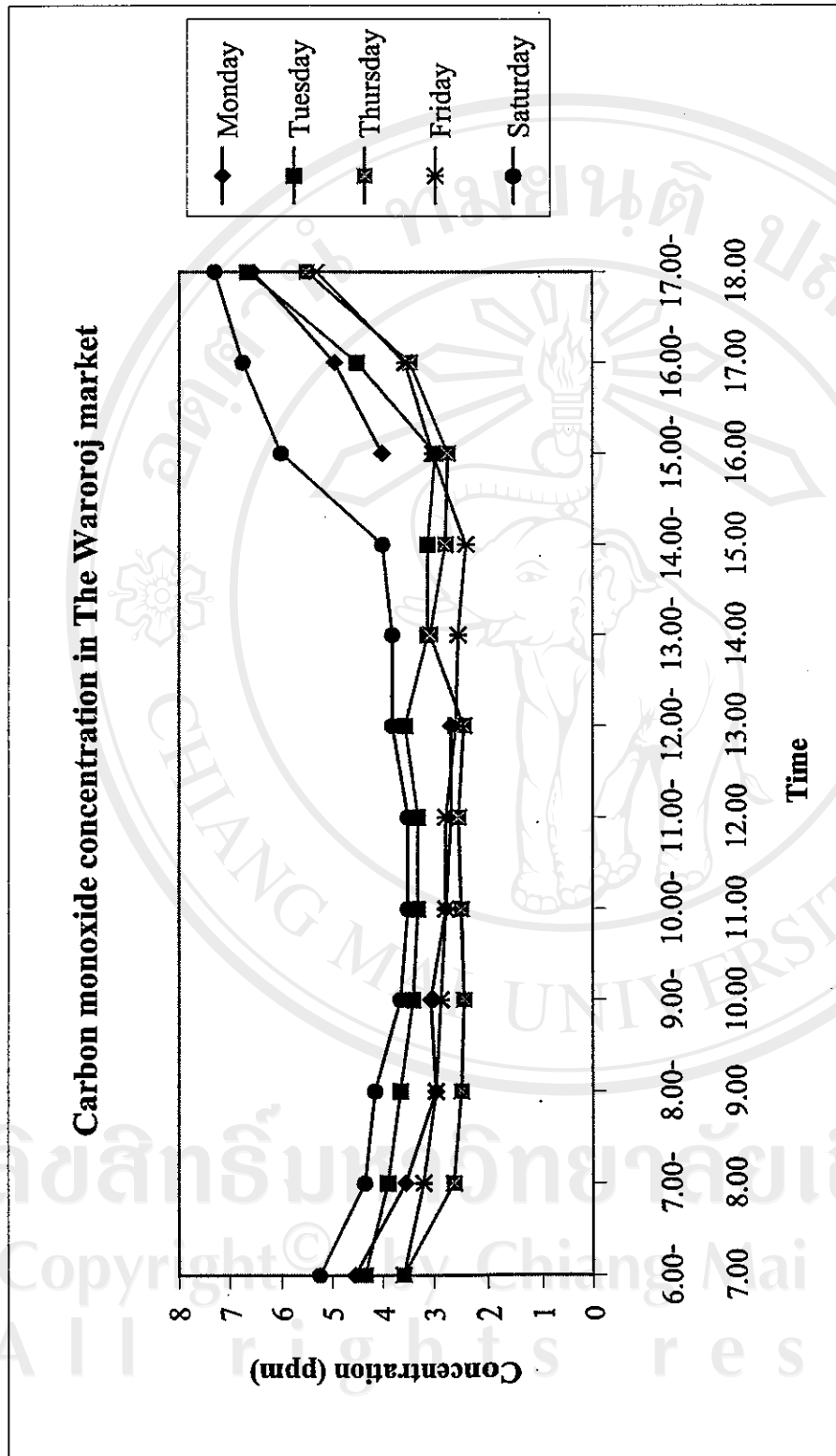


Figure 36 Carbon monoxide concentration in The Wararod market measured from 6 a.m. to 6 p.m. in 7 days, Monday through Sunday.

APPENDIX D

Table 23 Body weight of the male rats in the first month of carbon monoxide exposure.

Rat \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Control1	230	250	265	270	280	285	285	290	295	300	300	310	310	315	310	300	305	310	320	320	325	335	325	330	335	340	350	345	350	345	345
Control2	230	250	260	265	265	265	270	275	280	285	290	310	300	315	300	295	300	310	320	325	325	330	325	330	335	345	350	340	345	340	340
Control3	230	250	260	265	280	280	285	290	295	295	300	325	310	300	305	295	305	310	320	320	330	325	330	330	340	335	340	345	350	355	350
Control4	225	250	255	265	270	275	280	285	285	290	295	315	310	300	310	305	305	310	315	320	330	325	330	330	335	340	345	340	345	350	355
Control5	265	250	270	280	275	280	290	295	305	310	320	325	310	305	300	305	310	320	325	330	330	335	340	335	345	340	345	350	340	340	345
CO1	250	260	270	270	275	280	275	280	280	270	270	310	295	280	280	290	300	310	325	325	330	335	340	340	335	345	350	350	355	350	360
CO2	235	270	270	275	285	280	285	285	295	300	305	290	285	295	300	305	305	300	300	295	300	305	310	305	295	300	300	305	300	305	305
CO3	245	240	275	255	255	265	270	280	295	300	315	290	295	280	280	290	295	300	305	310	310	310	315	310	305	310	315	315	320	325	315
CO4	255	260	245	280	290	295	300	305	315	320	320	320	300	295	290	300	315	325	340	330	325	330	335	340	335	340	345	350	340	350	345
CO5	255	235	265	280	285	290	290	285	290	295	290	300	290	295	290	285	300	310	320	315	320	320	325	330	325	330	335	340	335	340	345
CO6	235	248	235	250	255	255	260	265	270	270	275	275	275	260	265	260	275	285	290	295	300	300	305	310	305	310	310	315	320	325	325
CO7	225	240	235	250	255	260	260	265	270	265	270	305	295	290	280	270	290	295	300	305	310	310	315	310	315	320	325	330	340	335	335

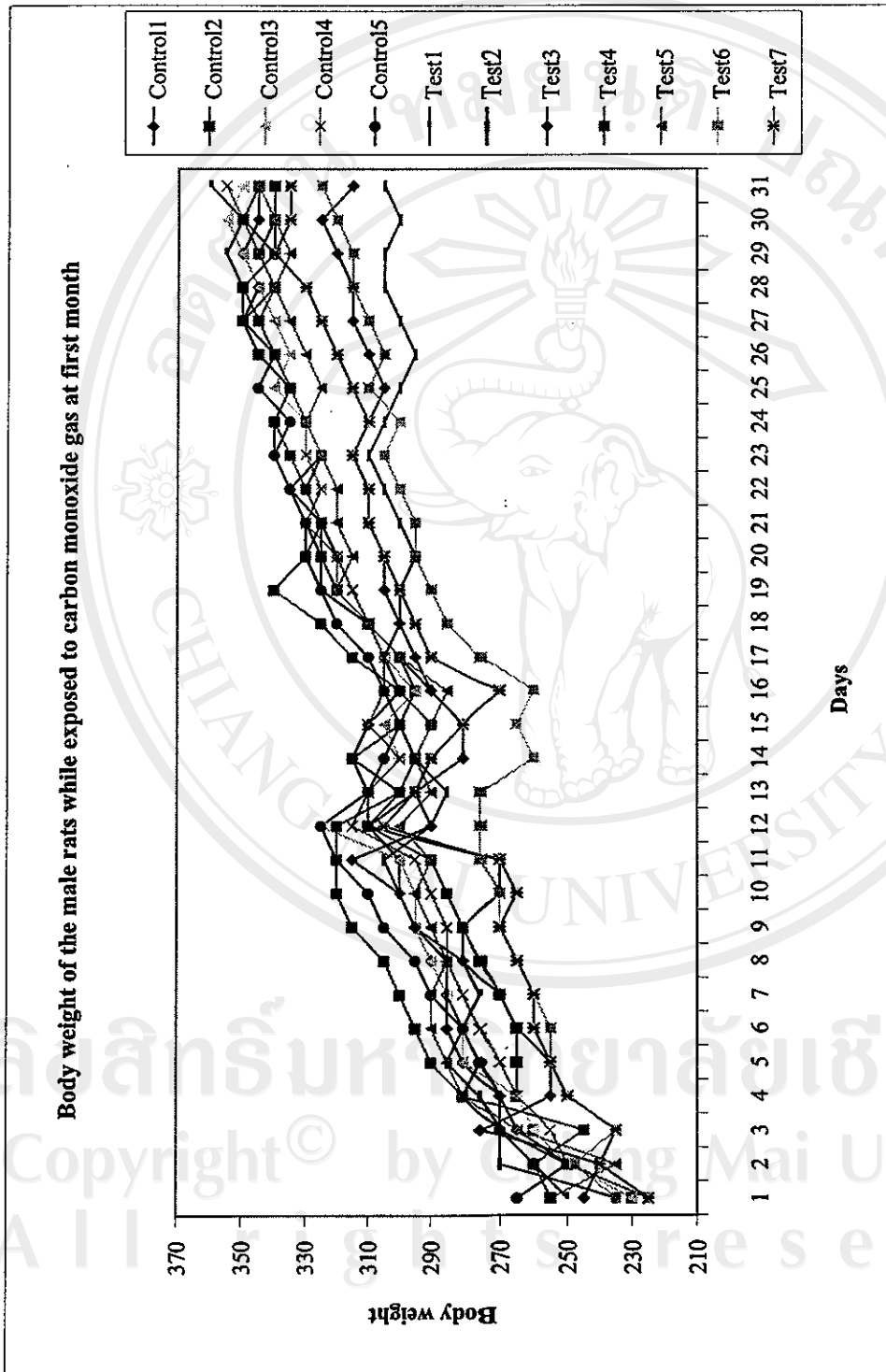


Figure 37 Graph of body weight of the male rats in the first month of carbon monoxide exposure.

Table 24 Body weight of the male rats in the second month of carbon monoxide exposure.

Rat \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Control1	345	350	345	345	350	350	355	360	365	370	380	390	385	385	395	390	395	395	395	400	390	395	395	400	405	410	410	405	400	410
Control2	330	330	330	330	335	340	335	340	345	350	355	350	345	330	340	330	340	335	330	325	320	320	325	330	330	330	345	355	360	380
Control3	340	335	335	320	330	335	330	325	320	320	325	365	345	340	330	325	320	320	325	330	325	325	320	320	325	325	330	335	345	355
Control4	345	335	330	325	330	335	335	340	340	345	350	325	335	345	350	365	365	360	360	370	365	360	365	370	375	380	375	380	385	390
Control5	340	335	330	335	320	330	335	330	330	340	345	365	360	365	370	365	370	370	375	375	370	375	380	375	385	380	385	380	385	395
CO1	350	345	350	355	350	345	355	360	355	370	380	385	375	380	375	380	390	390	395	405	400	395	400	410	405	400	390	385	385	390
CO2	315	320	330	335	325	330	345	350	365	370	385	385	385	380	370	380	380	395	400	385	395	385	400	405	405	405	400	395	380	385
CO3	320	330	335	340	350	345	350	355	360	365	375	390	380	385	390	390	380	385	390	385	375	380	385	390	385	360	375	380	395	395
CO4	345	350	345	345	350	355	360	355	355	365	370	380	375	380	375	375	390	395	385	395	390	385	380	385	385	380	385	390	400	410
CO5	350	345	340	340	345	340	350	345	355	350	360	385	380	385	375	370	385	390	400	400	405	400	395	400	405	395	385	390	380	375
CO6	335	335	340	340	345	350	345	345	350	360	375	365	370	375	385	390	395	375	340	345	360	365	375	385	395	380	385	390	385	395
CO7	320	335	325	315	320	330	320	315	320	310	315	320	320	325	330	340	355	375	390	395	375	360	350	345	340	340	350	365	370	365

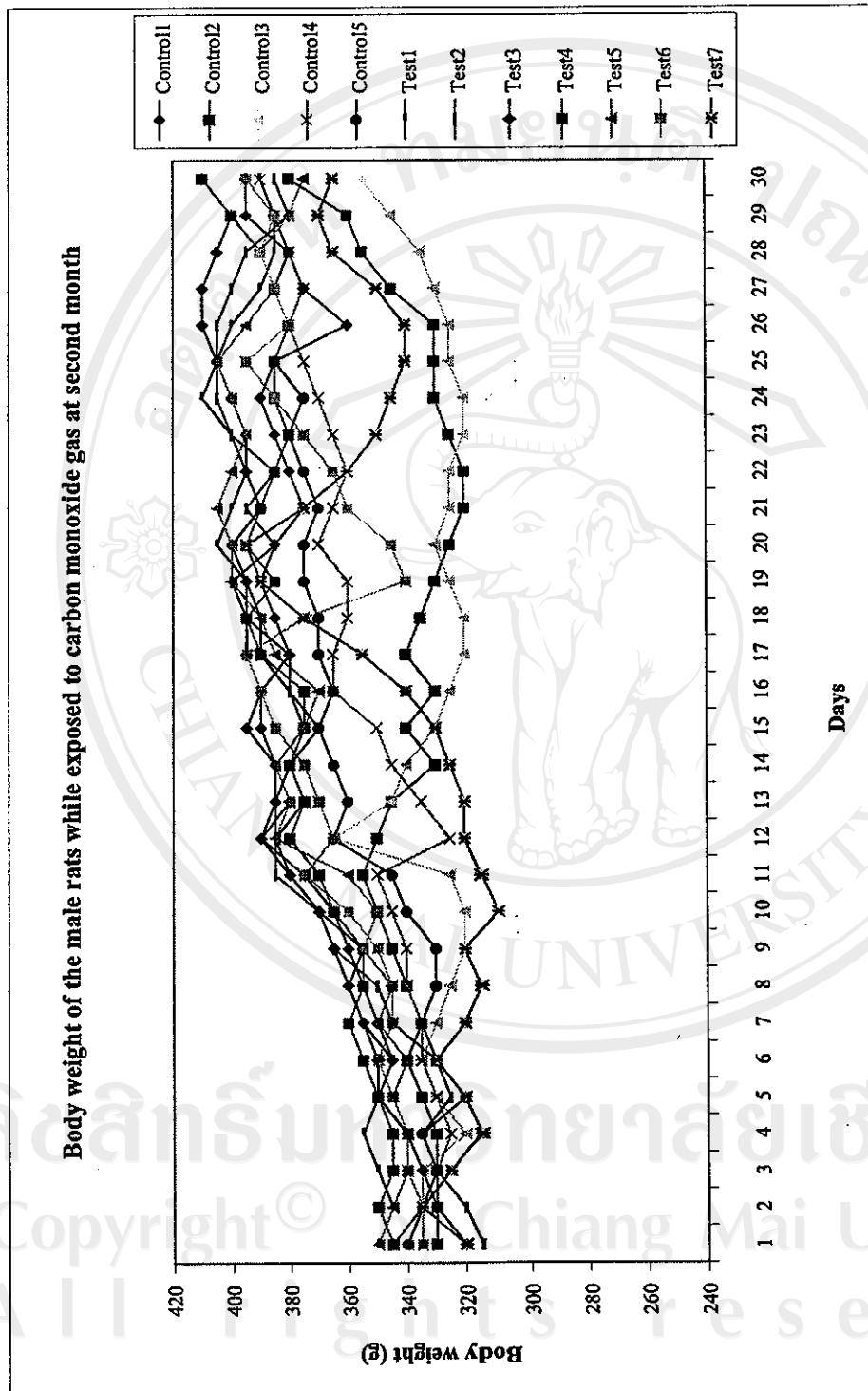


Figure 38 Graph of body weight of the male rats in the second month of carbon monoxide exposure.

Table 25 Body weight of the male rats in the third month of carbon monoxide exposure.

Rat \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Control1	395	400	410	415	410	415	425	430	440	445	440	445	440	445	450	450	460	460	455	460	460	460	470	465	470	470	470	470	440	440
Control2	385	380	385	390	395	390	395	400	410	415	420	420	405	410	415	420	420	430	435	430	425	430	430	430	445	440	450	450	430	430
Control3	340	335	340	345	350	355	360	355	350	360	365	360	370	380	380	385	380	385	390	400	400	395	395	395	410	415	420	415	410	410
Control4	385	390	385	390	400	400	400	395	400	415	410	410	410	415	420	425	415	435	430	430	430	430	425	440	430	435	440	440	420	420
Control6	390	395	395	400	410	415	410	415	420	425	420	420	430	430	435	435	435	440	445	445	445	450	440	450	450	455	455	455	450	450
CO1	390	390	395	395	400	400	405	410	410	415	410	410	410	415	420	420	415	415	420	420	430	420	420	415	410	420	420	420	420	420
CO2	390	385	390	395	390	400	405	410	420	425	420	425	425	430	430	435	430	430	435	440	450	440	440	440	430	455	450	455	440	440
CO3	390	395	400	410	415	420	415	420	425	430	440	440	450	445	440	440	450	460	460	465	465	465	470	460	455	460	470	475	450	450
CO4	400	410	420	415	425	430	425	430	435	440	445	450	440	445	450	460	430	440	450	445	445	435	440	435	440	445	450	450	425	425
CO5	375	375	385	370	360	370	375	380	365	375	380	380	385	390	390	390	380	395	400	400	390	390	400	390	390	400	400	400	395	395
CO6	400	395	405	410	420	425	420	425	435	435	430	435	440	445	450	450	435	445	450	450	450	445	450	440	430	445	450	450	430	430
CO7	375	365	380	390	400	415	420	425	430	430	425	425	430	435	440	445	440	450	450	450	450	440	440	440	435	455	460	455	440	440

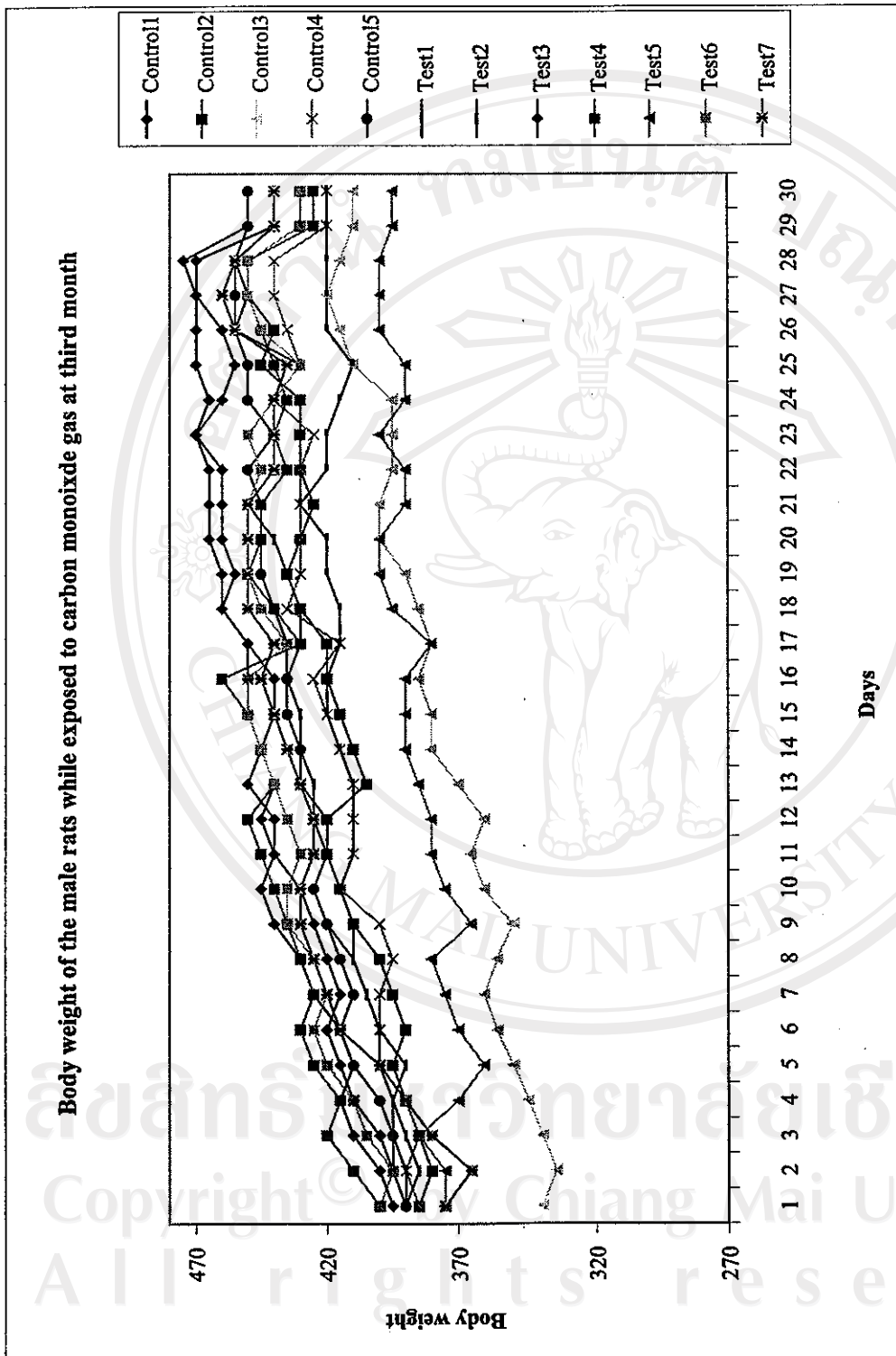


Figure 39 Graph of body weight of the male rats in the third month of carbon monoxide exposure.

Table 26 Body weight of the female rats in the first month of carbon monoxide exposure.

Rat \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
control1	205	210	215	220	210	215	215	220	230	230	235	235	235	235	240	240	245	240	240	240	245	245	240	245	250	250	250	255	260	260	265
control2	200	190	200	210	205	205	210	210	210	210	215	220	220	220	225	225	220	215	215	220	220	220	220	215	220	220	225	225	230	230	230
control3	205	200	200	200	200	205	205	210	210	215	220	220	220	220	220	220	220	220	215	215	215	210	210	215	220	220	215	215	220	215	215
control4	190	185	195	215	215	220	220	225	225	225	225	225	225	220	215	210	205	205	205	205	210	210	205	205	210	215	210	210	205	210	210
Control5	200	195	200	210	215	215	220	220	225	220	215	220	225	225	230	225	240	240	240	245	245	250	250	245	245	250	250	255	260	265	265
Control6	190	185	190	190	195	195	200	205	205	205	205	210	215	220	220	225	230	225	225	225	230	230	225	225	230	230	230	235	230	235	235
CO1	205	205	205	205	210	210	215	220	225	225	230	230	235	235	235	235	240	245	245	245	245	250	250	245	250	250	255	255	250	250	250
CO2	200	205	210	215	220	215	225	225	230	230	235	235	235	240	240	240	235	230	230	225	225	230	230	225	225	230	230	230	235	235	235
CO3	200	200	210	220	220	220	225	230	230	230	240	240	245	245	245	250	255	245	245	240	240	230	235	240	235	235	230	230	235	235	235
CO4	200	200	200	205	200	205	205	210	210	215	215	220	220	220	220	220	225	235	235	240	245	250	250	260	255	260	265	270	275	280	280
CO5	200	200	200	205	205	205	210	215	200	200	205	205	205	205	205	205	210	210	210	205	210	215	215	215	220	220	220	215	220	225	225
CO6	210	205	215	220	220	215	215	220	220	220	220	220	220	225	230	245	240	245	245	255	255	260	260	255	255	250	255	260	265	265	275

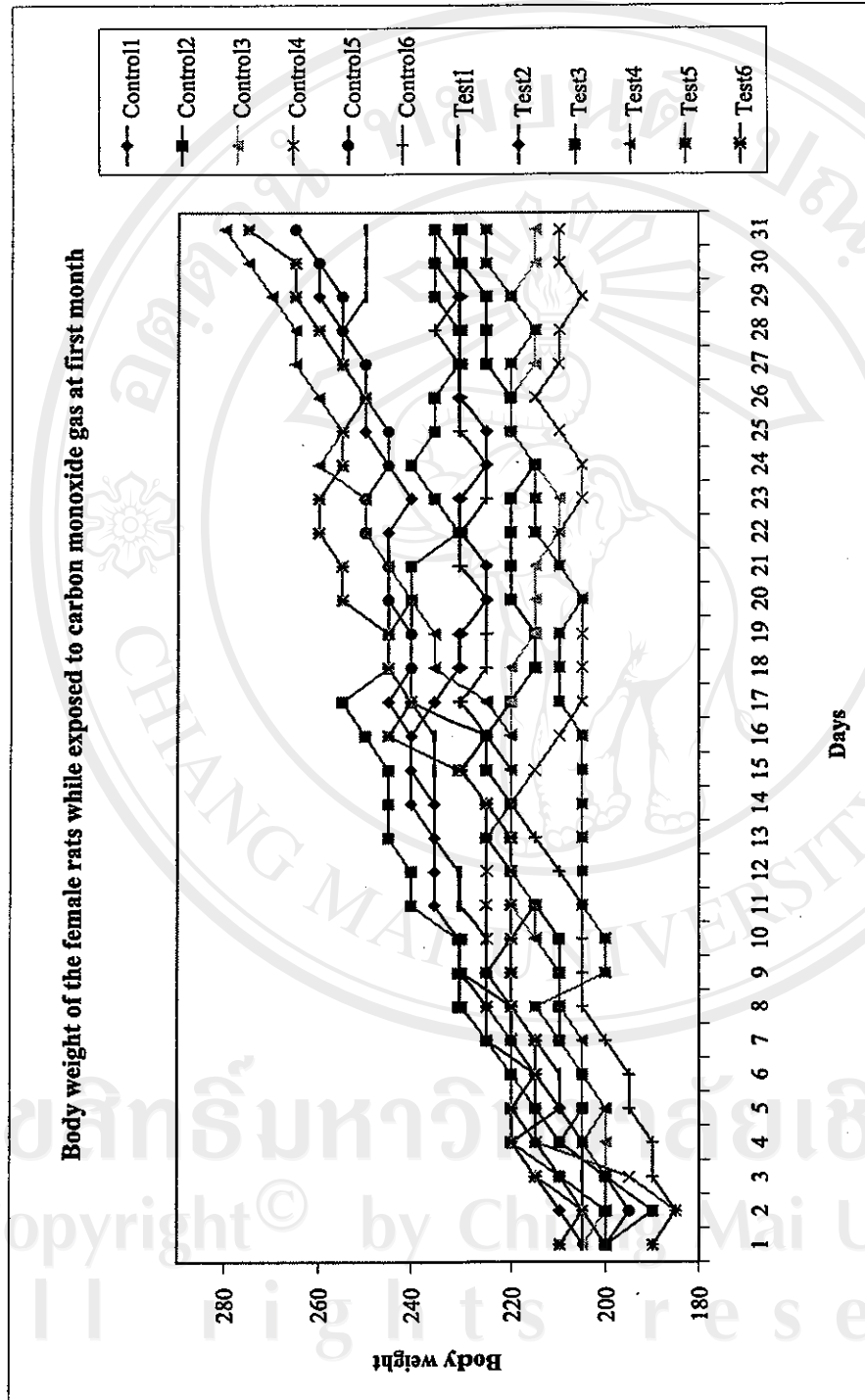


Figure 40 Graph of body weight of the female rats in the first month of carbon monoxide exposure.

Table 27 Body weight of the female rats in the second month of carbon monoxide exposure.

Rat \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
control1	260	260	265	265	270	280	275	270	265	275	280	290	295	295	290	285	290	290	295	290	295	295	290	285	290	290	290	295	295	290	300
control2	225	225	220	225	230	240	225	230	225	235	240	250	255	250	250	255	255	250	250	250	250	250	240	240	245	250	245	250	255	260	260
control3	220	215	215	220	225	230	225	220	215	220	235	240	240	235	235	240	240	250	255	250	240	235	240	245	245	250	260	265	270	275	280
control4	205	210	220	225	225	230	245	265	280	265	250	240	230	230	225	235	240	255	260	240	230	225	230	240	245	250	260	255	250	255	260
Control5	280	275	275	260	260	265	260	250	250	255	260	260	265	260	260	265	270	270	270	270	270	270	265	260	260	265	250	250	255	255	260
Control6	235	230	235	235	240	240	230	225	220	230	235	240	250	240	235	240	245	240	250	240	235	230	235	235	240	240	245	250	250	255	250
CO1	245	240	235	230	230	220	225	235	240	235	235	235	235	240	240	235	235	240	240	245	240	235	245	240	240	235	235	240	250	250	255
CO2	240	235	235	230	230	220	225	235	240	230	235	235	235	230	235	235	240	240	240	245	240	240	245	245	250	240	245	240	240	235	235
CO3	230	230	225	225	230	235	230	230	230	225	225	225	245	265	280	285	290	290	300	295	285	280	285	285	275	260	260	255	260	265	270
CO4	270	265	265	270	270	270	265	265	260	260	260	260	275	260	250	255	260	255	255	250	250	245	250	255	265	270	270	265	270	280	290
CO5	225	225	220	220	225	230	225	230	230	225	225	225	230	230	230	230	225	220	220	230	225	220	235	245	250	250	255	265	260	265	270
CO6	270	270	265	270	275	280	280	280	280	285	280	280	290	290	295	290	285	285	290	300	290	290	285	285	290	285	285	290	295	295	300

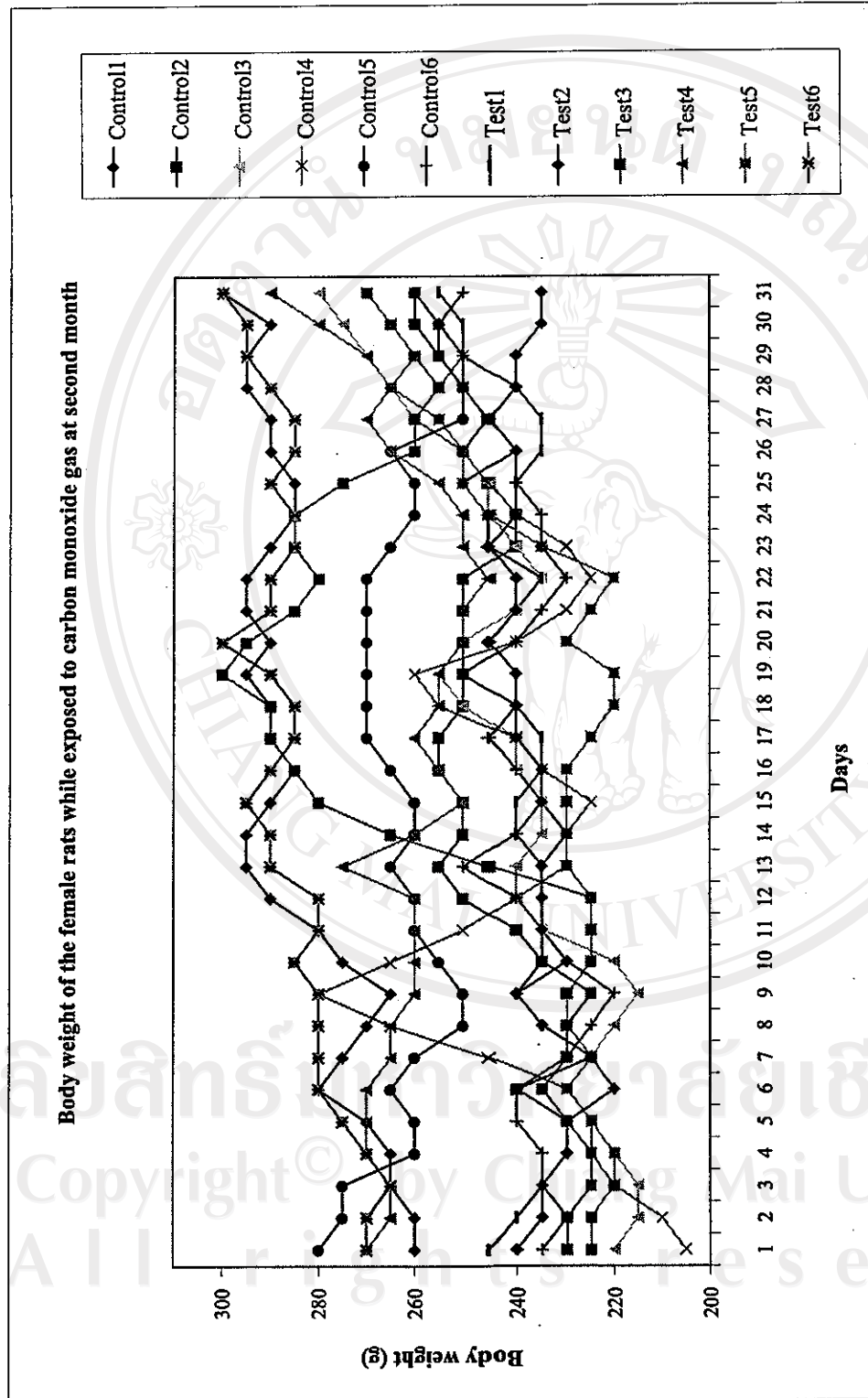


Figure 41 Graph of body weight of the female rats in the second month of carbon monoxide exposure.

Table 28 Body weight of the female rats in the third month of carbon monoxide exposure.

Rat \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
control1	300	300	300	295	290	295	300	305	310	310	305	305	300	300	305	305	310	315	310	300	300	305	315	310	315	315	310	310	310
control2	255	260	250	250	245	250	250	255	260	265	260	255	260	260	255	260	260	260	265	260	260	265	265	270	270	265	265	270	270
control3	280	280	280	280	275	280	280	285	290	280	280	275	280	280	285	290	290	290	285	280	280	275	280	285	285	290	290	285	290
control4	260	260	260	270	275	280	285	280	280	270	270	275	280	280	285	280	280	280	295	285	280	285	285	290	285	290	295	290	290
Control5	270	275	280	275	275	280	280	275	280	270	275	270	270	270	275	280	280	280	270	265	265	270	270	275	275	280	280	275	280
Control6	250	255	255	250	250	255	260	260	265	265	265	270	270	270	265	265	265	265	270	270	275	270	270	275	270	270	275	275	270
CO1	260	255	255	255	250	250	245	245	245	255	250	255	260	260	260	265	265	265	260	255	255	245	250	250	255	250	245	240	240
CO2	230	225	220	225	220	220	220	215	220	230	230	235	235	240	255	275	280	295	300	295	295	300	300	305	305	300	300	300	300
CO3	265	265	260	260	265	265	270	270	270	270	265	265	265	265	270	270	260	265	260	265	265	260	255	260	250	255	250	250	250
CO4	295	295	300	295	300	300	305	305	305	300	300	305	300	300	295	295	300	305	295	295	300	290	290	285	290	290	290	290	290
CO5	275	280	280	285	290	290	295	300	305	290	295	300	300	310	285	260	250	240	240	245	245	240	240	235	235	240	235	230	230
CO6	300	300	300	295	295	295	300	305	305	305	300	300	295	295	290	285	290	290	295	285	285	290	285	280	285	280	280	280	280

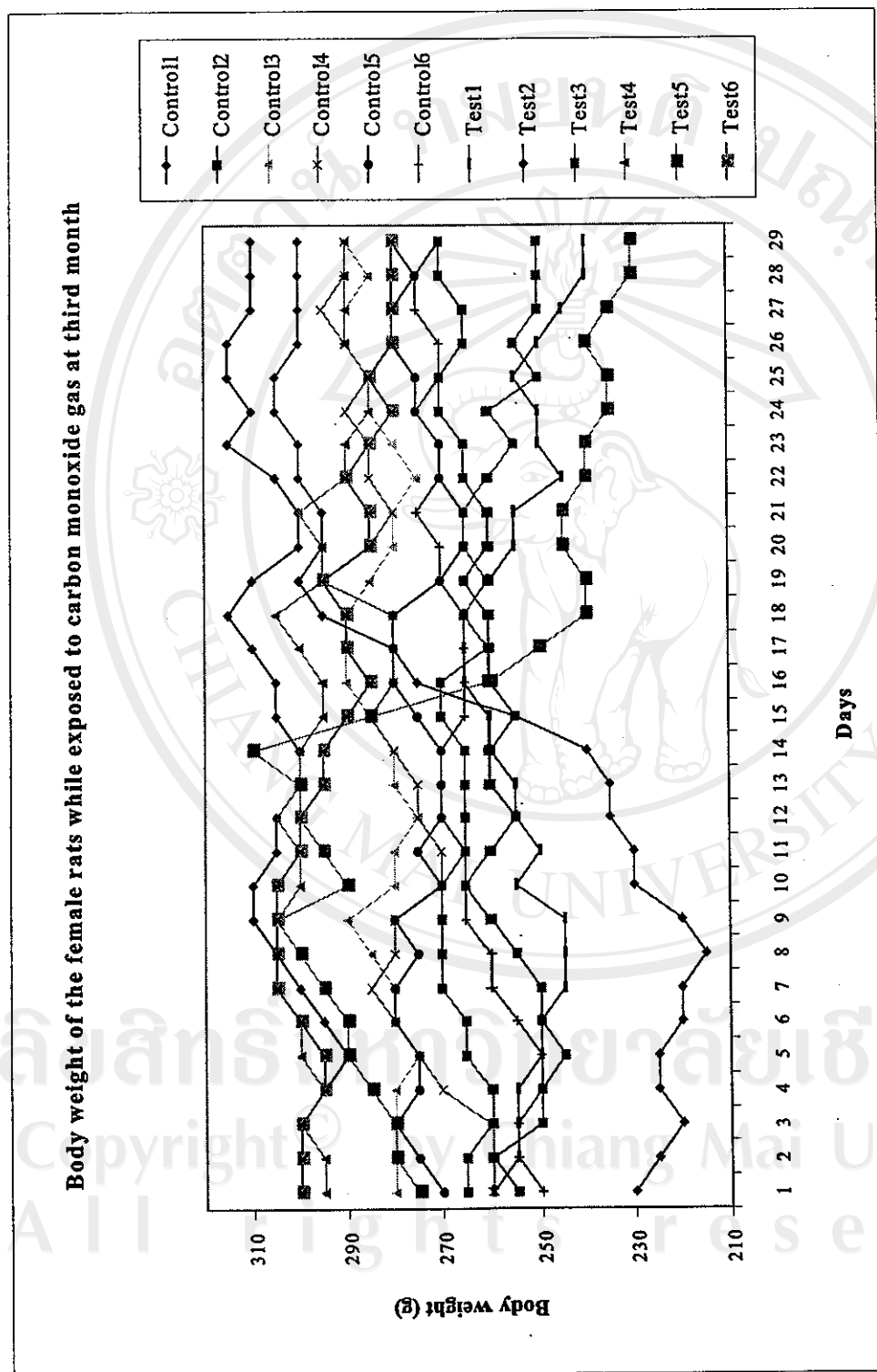


Figure 42 Graph of body weight of the female rats in the third month of carbon monoxide exposure.

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