CHAPTER 3

RESULTS

3.1. The mortality rates of male rats

The mortality rates of both male and female rats were recorded 168 hours after receiving acetaminophen. Mortality rates of male rats shown in Table 3. The combination of treatments and times were effected to the mortality rates ($P < 0.001$). Considering only treatments or times were affected to the mortality rates ($P<0.05$) and ($P<0.01$). The experiment was analyzed by two ways ANOVA found that:

1. The mortality rates in group 2 was significantly higher than group 1. The groups treated with disulfiram and NAC were not significantly different in group 3.
2. The mortality rate at 12 hours was the highest when compared with the other times.
3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the mortality rate:

   At 6 hours, in group 4 and 5 were the highest when compared with the other groups.

   At 12 hours, in group 2 was the highest but in group 5 was the lowest when compared with the other groups.

   At 24 hours, in group 2 and 3 were the highest when compared with the other groups.

   At 48 hours, in group 4 was the highest when compared with the other groups.

   At 72 hours did not have the death of animals.

   At 168 hours, in the group 6 was the only group which found dead.
4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the mortality rates in:

   Group 1 did not have the death of animals.

   Group 2, at 12 hours was the highest when compared with the others time.

   Group 3, at 24 hours was the highest when compared with the other times.

   Group 4, was not significant when compared with the other times.

Group 5, at 6 hours was the highest when compared with the other times.

Group6, at 48 hours was the highest when compared with the other times.

Table 3 The percentage of mortality rates of male after receiving acetaminophen overdose.

Groups	Time (hour)					
	6	12	24	48	72	168
Group 1	0.00	0.00	0.00	0.00	0.00	0.00
Group 2	2.88	13.89*	8.33*	2.88	0.00	0.00
Group 3	0.00	5.55	8.33*	2.88	0.00	0.00
Group 4	5.55	5.55	2.88	5.55	0.00	0.00
Group 5	2.88	2.88	2.88	2.88	0.00	0.00
Group 6	2.88	5.55	2.88	8.24*	0.00	2.88

* Significantly increased when compared with group1, $P < 0.05$.

3.2. The mortality rates of female rats

Mortality rates of male rats shown in Table 4. The combination of treatments and times were affected to the mortality rates ($P < 0.001$). Considering only treatments or times were affected to the mortality rates ($P<0.05$) and ($P<0.01$). The experiment was analyzed by two ways ANOVA found that:

1. The mortality rates in group 2 and 4 were significantly higher than group 1. The groups treated with disulfiram and NAC were not significantly different between groups 3.
2. The mortality rates at 24 hours were the highest when compared with the other times.
3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found the mortality rate:

   At 6 hours, in group 4 was the highest when compared with the other groups.

   At 12 hours, in group 2 and 4 were the highest when compared with the other groups.

   At 24 hours, in group 2 and 3 were the highest when compared with the other groups.

   At 48 hours, in group 4 was the highest when compared with the other groups.

   At 72 hours, in group 3 was the only group that found dead

   At 168 hours did not have the death of animals.

4. When the times were considered and the treatment were fixed and analyzed by one way ANOVA found that the mortality rates in:

   Group 1 did not have the death of animals.

   Group 2, at 12 and 24 hours were the highest when compared with the others time.

   Group 3, at 24 hours was the highest when compared with the other times.

   Group 4, at 12 to 48 hours was significantly higher when compared with the other times.

   Group 5, did not have the death animals after 48 hours

   Group6, at 12 and 48 hours were significantly higher when compared with the other times.

Table 4 The percentage of mortality rates of female rats after receiving acetaminophen overdose.

Groups	Time (hour)					
	6	12	24*	48	72	168
Group 1	0.00	0.00	0.00	0.00	0.00	0.00
Group 2*	0.00	11.11*	11.11*	2.88	0.00	0.00
Group 3*	2.88	5.55	11.11*	2.88	2.88	0.00
Group 4*	5.55	11.11*	8.33*	8.33*	0.00	0.00
Group 5	2.88	2.88	2.88	2.88	0.00	0.00
Group 6	0.00	2.88	2.88	2.88	0.00	0.00

* Significantly increased when compared with group1, $P < 0.05$

3.3. The ALT levels of male rats

The ALT levels of male rats is shown in Table 5 and figure 10 The combination of treatments and times were affected to the ALT level ($P<0.001$). Considering only treatments or times found that the treatments affected the ALT levels ($P<0.001$). In the experiment was analyzed by two ways ANOVA found that the ALT level(s):

1. In the group receiving acetaminophen, were significantly higher than group 1. In group 3 were significantly higher than group 1 and group 2 ($P<0.001$).
2. At 48 hours were the highest when compared with the other times ($P<0.01$)
3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the ALT levels:

At 6 hours, in groups 2, 3, 4, 5, and 6 were significantly higher than the level in group 1 but not significantly.

At 12 hours, in group 2 and group 4 were significantly higher than the level in group 1.

At 24 hours, in both group 2 and group 3 were significantly higher than the level in group 1. In groups 4, 5, and 6 were significantly lower than the levels in group2 and 3.

At 48 hours, in group 3 was significantly higher than group 1. Groups 4, 5 and 6 were significantly lower than the level in group 3.

At 72 hours, in group 3 and group 6 was significantly higher than group 1. Groups 4, 5, and 6 were significantly lower than the level in group 3.

At 168 hours, were not significantly different in group 1.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the ALT level(s):

In group 1, was not significantly different between the times.

In group 2, at 24 hours was significantly higher than the other time.

In group 3, at 48 hours was significantly higher than the other time.

In group 4, at 12 hours was significantly higher than at 6 and 168 hours.

In group 5, were not significantly different when compared between the times.

In group 6, at 48 and 72 hours were significantly higher than at 6 and 168 hours.

Table 5 The ALT levels of male rats (IU/L)

Groups	Times (hours)					
	6	12	24	48	72	168
Group 1	36.75 (10.99)	33.09 (4.96)	46.00 (9.82)	41.20 (7.05)	38.00 (5.88)	38.40 (5.81)
Group 2	49.66 (5.77)	89.33 (7.76)	405.66* (40.15)	102.66 (35.50)	67.00 (1.00)	41.33 (3.05)
Group 3	40.50 (5.19)	51.66 (4.61)	892.00* (46.03)	2377.33* (62.62)	131.00* (7.54)	46.00 (18.19)
Group 4	60.33 (20.52)	69.33 (5.68)	44.66 (2.52)	36.66 (6.11)	50.66 (11.84)	56.33 (4.72)
Group 5	40.00 (3.60)	51.00 (8.72)	68.66 (15.82)	51.66 (4.82)	58.66 (11.84)	36.00 (3.00)
Group 6	40.00 (6.24)	50.33 (14.50)	71.00 (14.42)	87.33 (3.05)	82.00 (24.87)	41.33 (10.59)

Data shown in mean (standard deviation)

* Significantly higher than the other times in each group.

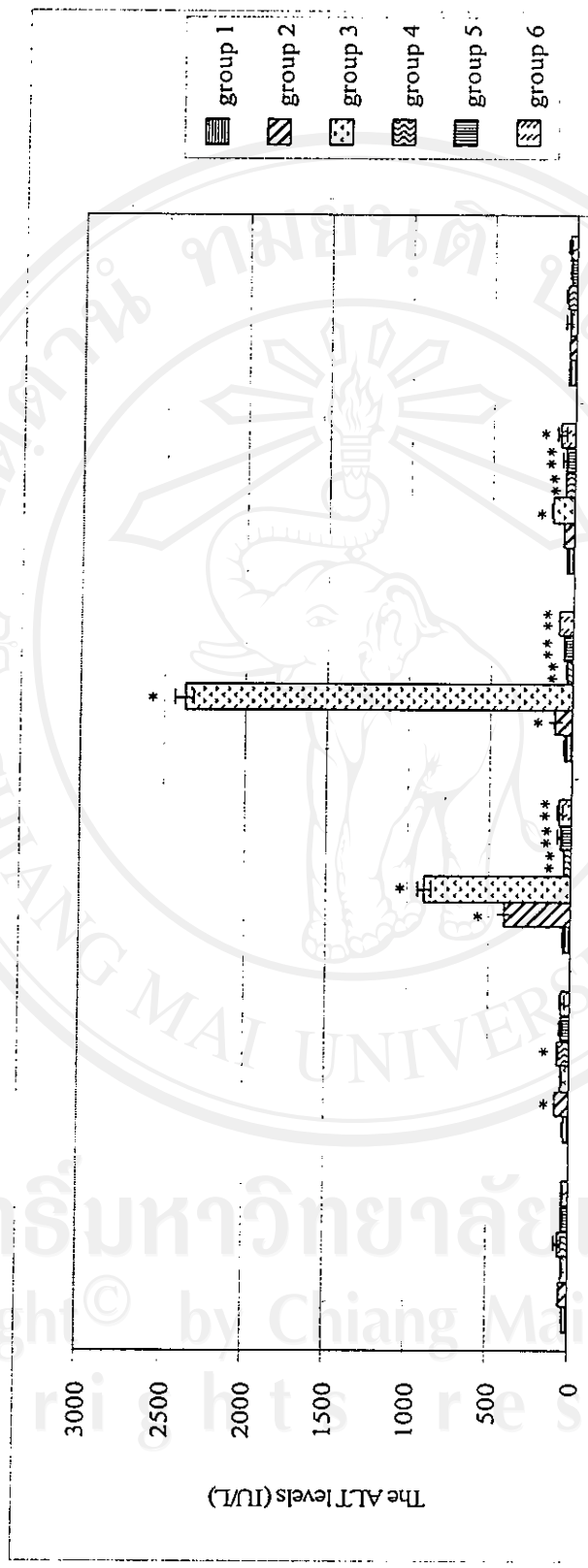

Figure 10 The ALT levels of male rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.4. The ALT levels of female rats

The ALT level of female rats is shown in Table 6 and Figure 11. The combination of treatments and times were effected to the ALT levels ($P<0.001$). Considering only the treatments or times was affected to the ALT levels ($P<0.001$) and ($P<0.01$). The experiment was analyzed by two ways ANOVA found that the ALT level(s):

1. In groups, receiving acetaminophen, were significantly higher than group 1 ($P<0.001$). And in group 3, 4, 5 and 6 were significantly lower than group 2 ($P<0.05$).

2. At 24 hours were significantly higher than the other times ($P<0.01$).

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the ALT level(s):

At 6 hours, in group 2 were significantly higher than group 1. In group 6 were significantly lower than group 2 and 3.

At 12 hours, in groups 3, 4, and 5 were significantly lower than group 2. And in the group 2 was significantly higher than group 1.

At 24 hours, in group 2 were significantly higher than the group 1. The levels in group 3, 4, 5, and 6 were significantly lower than group 2.

At 48 hours, in group 2 and 3 were significantly higher than group 1. The levels in group 4, 5 and 6 were significantly lower than group 2. And the level in group 3 was significantly higher than group2.

At 72 hours, in group 2, 3, and 5 were significantly higher than group 1. The levels in group 4 and 6 were significantly lower than group 2. The level in the group 4, 5, and 6 were significantly lower than group 3.

At 168 hours, were not significantly different in group 1.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the ALT level(s):

In group 1, were not significantly different between the times. Except in the time at 72 hours was lower than the time at 6 and 168 hours.

In group 2, at 24 hours was significantly higher than the other time.

In group 3, at 48 and 72 hours were significantly higher than the time at 6 and 168 hours.

In group 4, at 24 hours was significantly higher than the time at 6 and 168 hours.

In group 5, were not significantly different between the other times.

In group 6, at 12, 24, and 48 hours were significantly higher than the time at 6 and 168 hours.

Table 6 The ALT levels of female rats. (IU/L)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	33.00 (8.20)	33.25 (5.91)	32.00 (5.47)	32.50 (9.32)	23.50 (3.69)	38.75 (5.90)
Group 2	63.00 (19.4)	177.3 (98.7)	1609.66* (255.2)	170.66 (16.04)	66.00 (19.15)	32.33 (0.57)
Group 3	48.00 (6.00)	46.00 (10.14)	72.33 (3.78)	370.66* (107.0)	152.00 (11.53)	29.33 (8.38)
Group 4	40.66 (4.04)	42.00 (7.00)	60.00* (9.84)	37.00 (2.00)	32.33 (4.50)	27.00 (4.58)
Group 5	37.33 (11.01)	47.00 (6.93)	35.66 (7.37)	34.66 (4.04)	56.66* (10.01)	37.33 (2.88)
Group 6	31.33 (0.57)	72.66 (19.52)	86.00* (2.64)	65.33 (10.06)	34.33 (4.61)	27.00 (2.64)

Data shown in mean (standard deviation)

* Significantly higher than the other times ($P<0.01$) in each group.

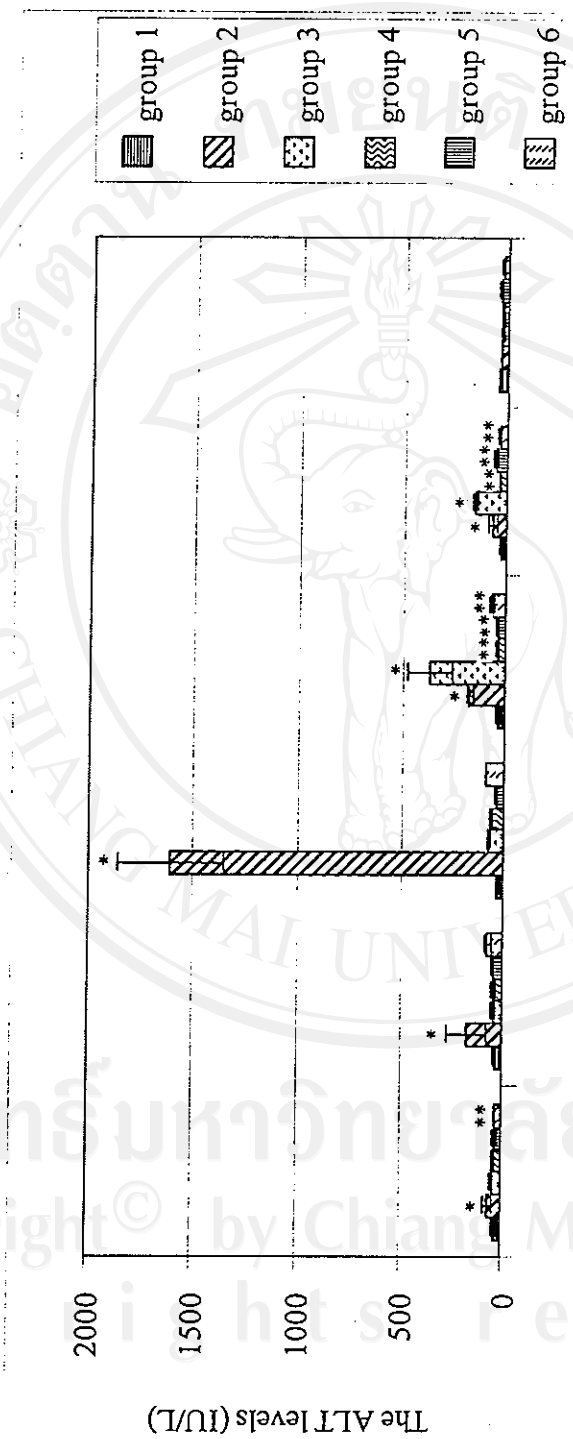

Figure 11 The ALT levels of female rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.5. The AST levels in male rats

The AST level of male rats is shown in Table 7 and Figure 12. The combination of treatments and times effected to the AST levels ($P<0.001$). Considering only the treatments or the times were affected to the AST levels ($P<0.01$) and ($P<0.01$). The experiment was analyzed by two ways ANOVA found that the AST level (s):

1. In groups receiving acetaminophen, were significantly higher than the levels in group1 ($P<0.001$) and at the time after 24 hours in group 3 were significantly higher than the other groups ($P<0.001$).

2. At 24 hours in all groups were significantly higher than the other times ($P<0.05$).

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the AST level(s):

At 6 hours, in group2, 4 and 5 were significantly higher than group 1.The levels in group 3 and 6 were significantly lower than group 2.

At 12 hours, in group 2 were significantly higher than the group 1.

At 24 hours, in group 2 and 3 were significantly higher than group 1. The levels in group 3, 4, 5 and 6 were significantly lower than in group 2.

At 48 hours, in group 3 were significantly higher than group 1, 2, 3, 4, 5 and 6.

At 72 hours, in group 3 were significantly higher than group 1, 2,4,5 and 6.

At 168 hours, were not significantly different in groups.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA fund that the AST leve(s):

In group 1, 4 and 6 were not significantly different between the times.

In group 2, at 24 hours were the highest and significantly increased when compared with the other times.

In group 3, at 24 and 48 hours were significantly higher than the level at 6 and 168 hours.

In group 5, at 24 hours were the highest when compared with the other times.

Table 7 The AST levels of male rats (IU/L)

Group	Time (hours)					
	6	12	24	48	72	168
Group1	183.75 (47.90)	170.66 (20.40)	205.00 (56.19)	195.60 (39.04)	207.00 (47.72)	231.60 (84.41)
Group 2	300.66 (54.28)	302.23 (67.26)	1927.66* (653.40)	273.33 (51.32)	201.50 (58.68)	185.50 (79.90)
Group 3	177.33 (20.84)	183.66 (24.78)	352.00 (81.19)	1494.00* (156.00)	362.66 (76.69)	247.66 (50.01)
Group 4	238.00 (17.43)	240.00 (57.55)	264.33 (26.68)	156.33 (31.56)	184.66 (19.55)	180.66 (66.56)
Group 5	220.33 (26.95)	279.66 (55.80)	317.66 (11.67)	180.66 (20.08)	160.33 (20.11)	231.00 (63.31)
Group 6	192.66 (34.58)	195.66 (30.59)	219.6 (73.65)	213.00 (72.02)	149.6 (41.06)	228.66 (47.05)

Data shown in mean (standard deviation)

* Significantly higher than the other times in each groups.

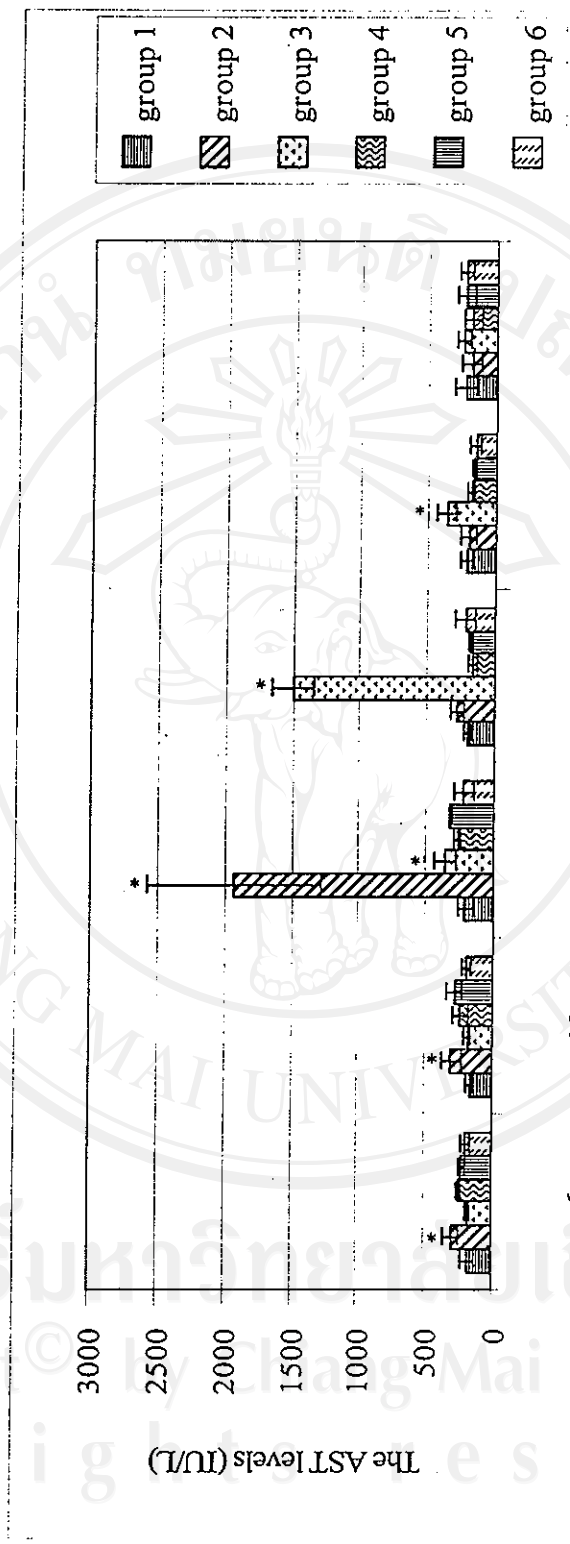

Figure 12 The AST levels of male rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.6. The AST levels of female rats

The AST level of female rats is shown in Table 8 and Figure 13. The combination of treatments and times effected to the AST levels at ($P<0.001$). Considering only the treatments or the times were affected to the AST levels at ($P<0.001$) and ($P<0.001$). The experiment was analyzed by two ways ANOVA found that the AST level(s):

1. In the groups receiving acetaminophen, were significantly higher than group 1 ($P<0.001$). The levels in groups 4, 5, and 6 were not significantly different than group 2.

2. At 24 and 48 hours were significantly higher than the other times ($P<0.05$).

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the AST levels:

At 6 hours, was not significantly different in groups.

At 12 hours, in group 2 was significantly higher than group 1. The levels in the groups 3, 4, 5, and 6 were significantly lower than group 2.

At 24 hours, in group 2 was significantly higher than group 1. The levels in groups 3, 4, 5, and 6 were significantly lower than group 2.

At 48 hours, in group 2 was significantly higher than group 1. The levels in groups 4, 5, and 6 were significantly lower than group 2 and 3.

At 72 hours, in group 3 was significantly higher than group 1.

At 168 hours, were not significantly different in groups.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the AST levels:

In group 1, 4 and 5 were not significantly different between the times.

In group 2, at 24 hours was significantly higher than the other times

. The level at the time 12 and 48 were significantly higher than at 168 hours.

In group 3, at 48 hours were the highest when compared with the other times.

In group 6, the AST levels at 12 and 24 hours were significantly higher than at 6 hours. The level at 24 hours was significantly higher than 168 hours.

Table 8 The AST levels of female rats. (IU/L)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	185.75 (33.01)	167.00 (34.61)	208.60 (53.98)	211.80 (33.04)	143.00 (33.94)	200.50 (25.99)
Group 2	212.00 (86.37)	513.00 (212.1)	2299.66* (162.10)	1304.66* (32.51)	194.33 (37.81)	152.50 (61.24)
Group 3	188.66 (18.23)	158.00 (21.37)	355.00 (56.55)	1591.00* (394.74)	298.66 (68.24)	203.33 (29.36)
Group 4	213.33 (22.24)	181.33 (65.01)	341.33* (155.05)	193.33 (8.62)	178.33 (37.07)	148.00 (4.58)
Group 5	193.0 (22.64)	210.33 (4.16)	196.66 (6.66)	184.00 (28.05)	181.66 (50.96)	174.00 (26.90)
Group 6	163.33 (15.04)	270.66 (27.59)	372.00 (6.00)	218.33 (31.26)	180.33 (24.66)	228.66 (47.05)

Data shown in mean (standard deviation)

* Significantly higher than at the other times in each group

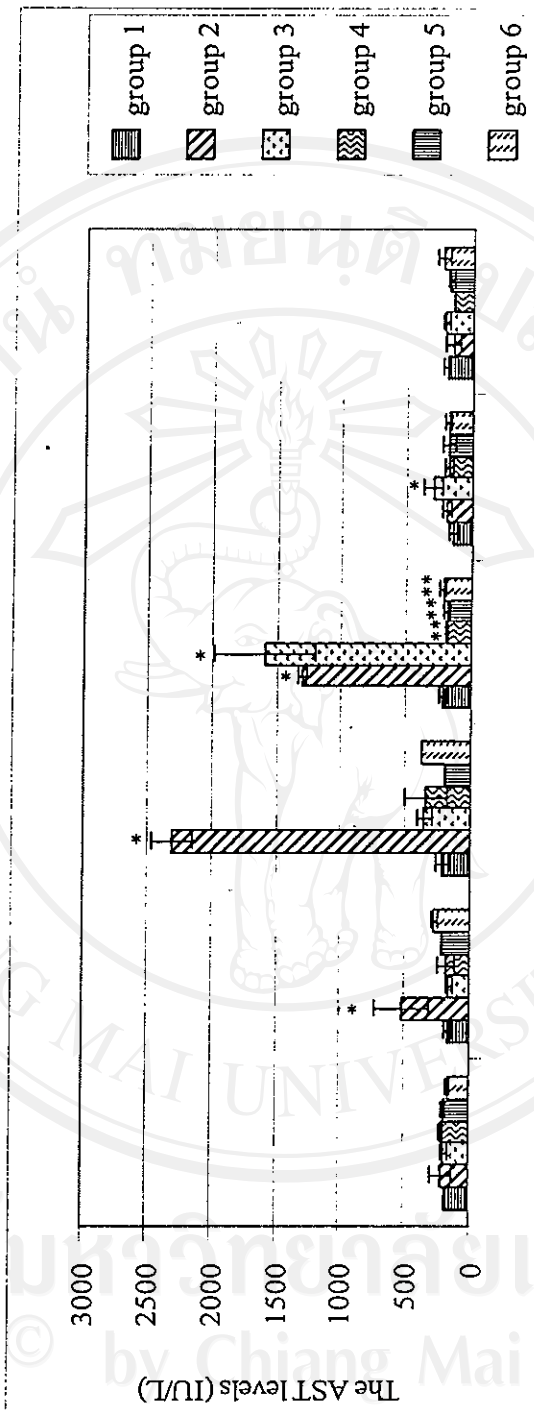

Figure 13 The AST levels of female rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.7. The reduced glutathione levels in the liver of male rats

The reduced glutathione (GSH) level in the liver of male rats is shown in Table 9 and Figure 14. The combination of treatments and time effected to the reduced GSH levels in the liver. Considering only the treatments or the times was not affected to the reduced GSH levels in the liver ($P<0.001$). The experiment was analyzed by two ways ANOVA found that the reduced glutathione levels in the liver:

1. In groups receiving acetaminophen overdose and group 3 were significantly lower than group 1 ($P<0.05$).

2. In each time were not significantly different between the groups.

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the reduced glutathione level(s) in the liver:

At 6, 12 48 and 72 hours, were not significantly different in groups.

At 24 hours, in group 3 were significantly lower than group 1. The levels in groups 4, 5 and 6 were significantly higher than group 3.

At 168 hours, of the group 6 were significantly lower than group 1.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the reduced glutathione level(s) in the liver:

In group 1, 2 and 4, were not significantly different between the times.

In group 3, at 72 hours were significantly different higher than at 6 hours.

In group 5, at 12, 24, 48 and 72 hours were significantly lower than at 6 hours.

In group 6, at 168 hours were significantly lower than at 6 hours.

Table 9 The reduced glutathione levels in liver of male rat. (ng/ mg tissue)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	6.64±0.36	6.72±0.39	6.87±0.10	6.83±0.41	6.80±0.48	6.74±0.40
Group 2	6.77±0.26	6.54±0.36	6.52±0.12	6.54±0.33	6.42±0.18	6.54±0.11
Group 3	6.47±0.34	6.13±0.32	6.18±0.13	6.41±0.29	6.86±0.25	6.69±0.37
Group 4	6.48±0.41	6.60±0.30	6.83±0.25	6.66±0.44	6.39±0.10	7.03±0.19
Group 5	6.98±0.26	6.48±0.52	6.57±0.18	6.28±0.22	6.29±0.10	6.89±0.36
Group 6	6.72±0.21	6.88±0.09	6.50±0.17	6.73±0.31	6.78±0.32	6.16±0.02

Data shown in mean ±standard deviation

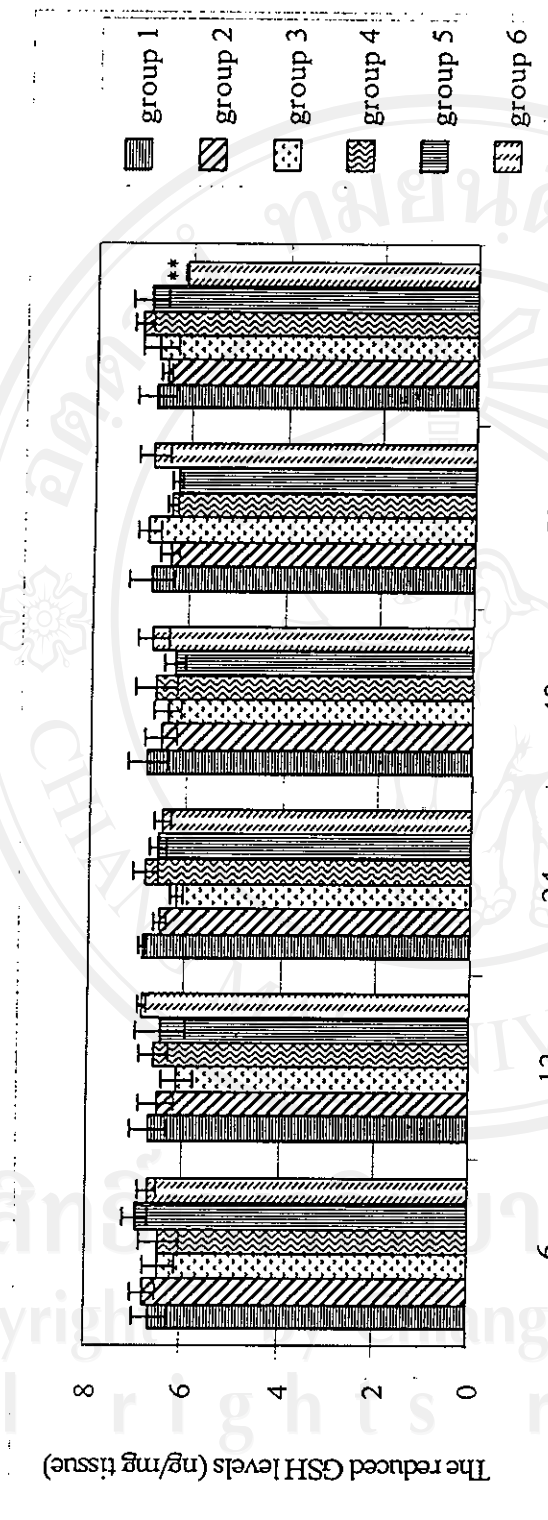

Figure 14 The reduced GSH levels of male rats.

** Significantly decreased when compared with group 2 and 3 P<0.001.

3.8. The reduced glutathione levels in the liver of female rats

The reduced GSH levels in the liver of female rats were shown in table 10 and Figure 15. The combination of treatments and times effected to the reduced GSH levels in the liver at ($P<0.001$). Considering only the treatments or times found that neither the treatments nor the time effected to the reduced GSH levels in the liver at ($P<0.001$) except in group 3, 4 and 6. The experiment was analyzed by two ways ANOVA found that the reduced glutathione level(s) in the liver:

1. In the groups which receiving acetaminophen overdose was lower than group 1 but not significanly.

2. In each time and group were not significantly difference.

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the reduced glutathione levels in the liver:

At 6, 12 and 72 hours, were not significantly different in groups.

At 24 hours, in the group 3 were significantly higher than group 1 and group 3.

At 48 hours, in the group 4 were significantly higher than group 2.

At 168 hours, in group 6 were significantly lower than group 1.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the reduced GSH levels in liver of the groups 1-6 were not significantly different between times when analyzed by one way ANOVA.

Table 10 The reduced Glutathione levels in the liver of female rats. (ng/ mg tissue).

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	6.37±0.26	6.69±0.32	6.57±0.25	6.67±0.38	6.70±0.18	6.54±0.16
Group 2	6.89±0.13	6.72±0.28	6.37±0.25	6.36±0.16	6.69±0.29	6.42±0.26
Group 3	6.99±0.40	6.64±0.25	6.92±0.13	6.57±0.21	6.52±0.03	6.80±0.43
Group 4	7.01±0.13	6.69±0.38	6.76±0.30	6.95±0.19	6.35±0.19	6.77±0.06
Group 5	6.66±0.44	6.77±0.54	6.68±0.52	6.23±0.18	6.40±0.19	7.01±0.17
Group 6	6.84±0.29	6.73±0.26	6.50±0.52	6.39±0.10	6.72±0.39	6.24±0.39

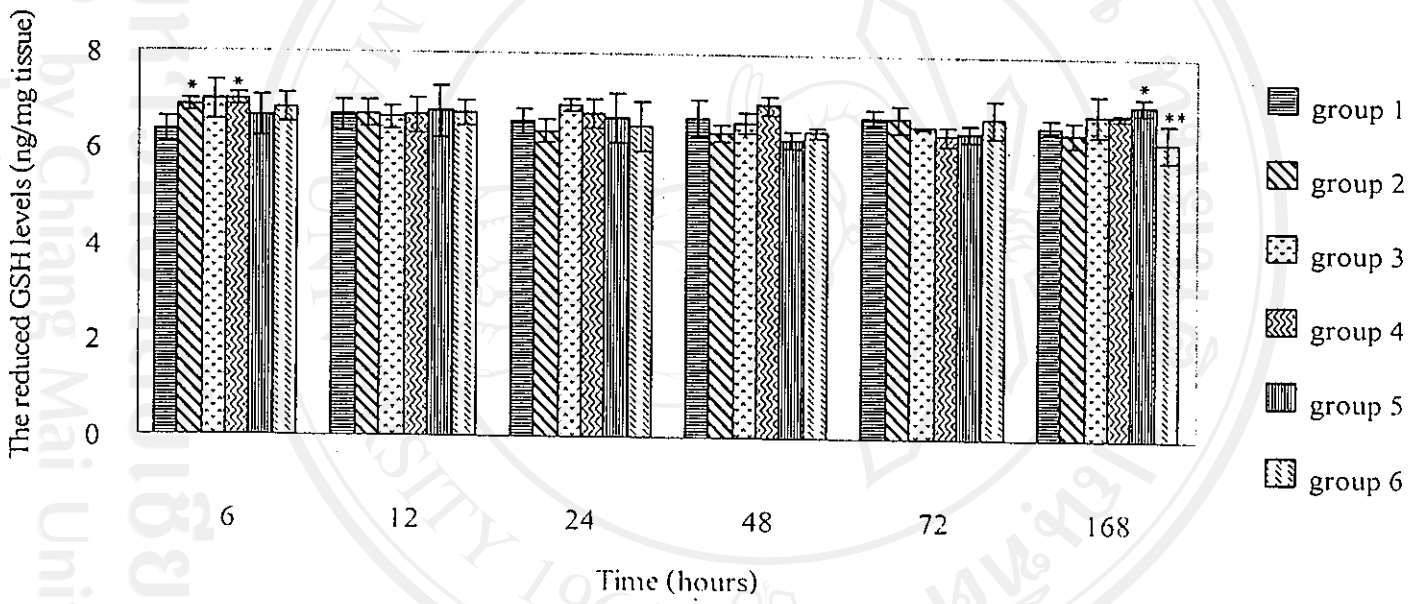

Figure 15 The reduced GSH levels of female rats.

* Significantly increased when compared with group 1 P<0.01. ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.9. The glutathione in blood of male rats

The GSH levels in blood of male rats were shown in Table 11 and Figure 16. The combination of treatments and times effected to the GSH levels in blood ($P<0.001$). Considering only the treatments or the time were affected to the GSH levels in blood ($P<0.01$) and ($P<0.05$).

The experiment was analyzed by two ways ANOVA found that the GSH level(s) in blood:

1. In groups which receiving acetaminophen overdose were significantly lower than group 1 ($P<0.001$). In group 6 were significantly lower than group 1, 2 and 3.

2. At 168 hours were significantly lower than the other times ($P<0.01$).

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the GSH level(s) in blood:

At 6 hours, in groups 2 to 6 were significantly lower than group 1. The levels of group 4 were significantly higher than groups 2, 3, 5 and 6.

At 12 hours, in groups 2 to 6 were significantly lower than group 1. The levels of group 4 were significantly lower than groups 2, 3, 5 and 6.

At 24 hours, in groups 2 to 6 were significantly lower than group 1. The levels of group 3 and 5 were significantly higher than group 2. The levels of groups 4 and 6 were significantly higher than groups 3.

At 48 hours, in groups 2 to 6 were significantly lower than group 1. The levels of groups 3 and 4 were significantly higher than groups 2. The levels of groups 4, 5 and 6 were significantly lower than groups 3.

At 72 hours, in groups 2 to 6 were significantly lower than group 1. The levels in of group 4 were higher than group 2 to 6.

At 168 hours, in groups 3 to 6 were significantly lower than groups 1 and 2. The levels of group 2 were higher than group 1. The levels of groups 4 to 6 were lower than group 3.

4. When the times were considered and the times were fixed and analyzed by one way ANOVA found that the GSH level(s) in blood:

In group 1, at 6, 12, 48 and 72 hours were significantly lower than at 168 hours.

In group 2, at 24 hours were the lowest when compared with the other times. At 12, 24, 48, 72 hours the levels were significantly lower than 168 hours.

In group 3, at 12, 48 and 168 hours were significantly higher than at 6 hours. The levels at 12, 24, 72 hours were significantly lower than at 168 hours.

In group 4, at 24, 48, 72 and 168 hours were significantly the lower than at 6 hours. The levels at 12, 48, 72 hours were significantly higher than at 168 hours.

In group 5, at 12, 24 hours were the lower than at 6 hours. The levels at 12, 24, 48 hours were significantly lower than at 168 hours.

In group 6, at 12, 24, 48, 72 hours were significantly lower than at 6 and 168 hours.

Table 11 The glutathione levels in blood of male rats (ng/ ml)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	23.67±0.09	23.19±0.29	25.06±1.19	24.27±1.05	24.07±1.48	26.66±0.56
Group 2	12.73±1.46	14.56±0.21	12.06±0.77*	13.26±0.12	14.34±0.33	34.32±0.34
Group 3	9.26±0.14	11.60±0.24	8.03±0.38*	21.38±0.11	14.55±0.39	21.35±0.31
Group 4	20.23±0.34	20.36±0.12	12.27±0.48*	18.83±0.20	18.35±0.30	14.60±0.37
Group 5	14.66±0.36	12.23±0.24	8.61±0.11*	13.55±0.28	15.53±1.34	15.35±0.43
Group 6	7.47±0.31	9.37±0.34*	11.50±0.25	12.29±0.20	9.69±0.35*	4.57±0.24*

Data shown in mean± standard deviation.

* Significance lower than the other times $P<0.01$

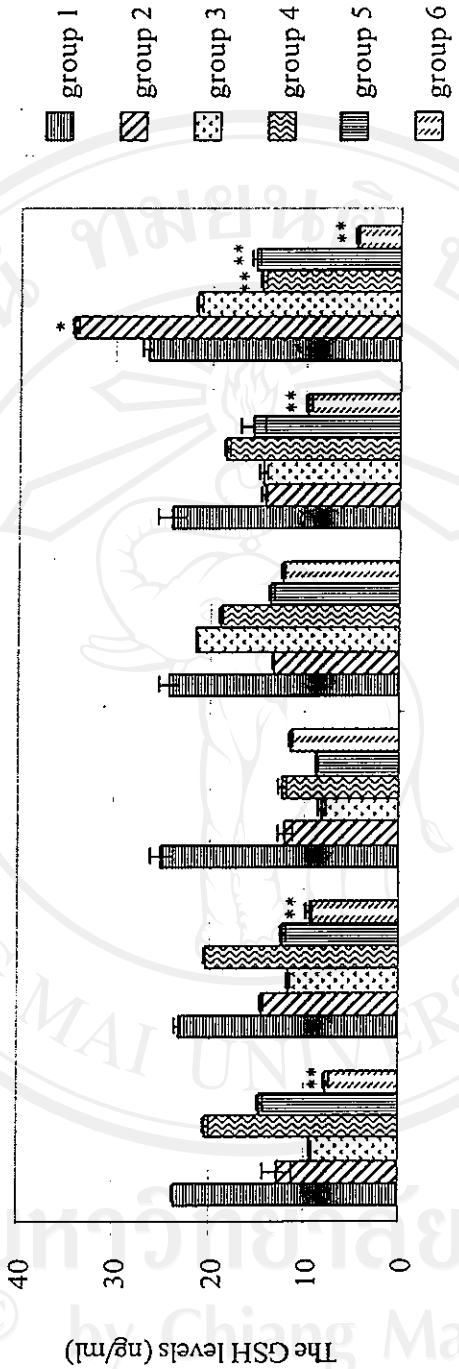

Figure 16 The GSH levels in blood of male rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.7 The glutathione levels in blood of female rats

The GSH level in blood of female rats is shown in Table 12 and Figure 17. The combination of treatments and times affected to the GSH levels in blood ($P<0.001$). Considering only the treatments or times were affected to the GSH levels ($P<0.01$) and ($P<0.01$). The experiment was analyzed by two ways ANOVA found that the GSH level(s) in blood:

1. In groups which receiving acetaminophen overdose were significantly lower than group 1. The levels in groups 5 and 6 were significantly lower than groups 2 ($P<0.01$).

2. At 6 and 168 hour were significantly higher than the other times.

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the GSH level(s) in blood:

At 6 hours, in groups 2 to 6 were significantly lower than group 1. The levels in groups 3, 5 and 6 were significantly lower than group 2. The levels in group 4 was significantly higher than group 3.

At 12 hours, in groups 2 to 6 except group 4 were significantly lower than group 1. The levels in groups 3, 4, and 5 were significantly higher than group 2. The levels in groups 5 and 6 were significantly lower but in group 4 were significantly higher than group 3.

At 24 hours, in groups 2, 3, 4 and 6 were significantly lower than group 1. The levels in groups 3 and 6 were significantly lower than group 2. The levels in groups 4, 5, and 6 were significantly higher than group 3.

At 48 hours, in groups 2 to 6 were significantly lower than group1. The levels of groups 3 to 6 were significantly higher than the group 2. The levels of groups 4 to 6 were significantly lower than group 3.

At 72 hours, in groups 2 and 6 were significantly lower than group 1. The levels in groups 3, 4, and 5 were significantly higher than group 2. The levels of group 6 were lower than group 3.

At 168 hour, in groups 3 to 6 were significantly lower than groups 1 and 2. The levels of the groups 4 to 6 were significantly lower than group 3.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the GSH level(s) in blood:

In group 1, at 24, 48, 72, 168 hours were higher than at 6 hours. The GSH levels in blood in the time at 48 were significantly higher than at 168 hours.

In group 2, at 12, 48, 72 hours were significantly lower than at 6 and 168 hours.

In group 3, at 12, 48, 72, 168 hours were significantly higher than at 6 hours. The levels at 6, 12, 24 were significantly lower than at 168 hours.

In group 4, at 12, 24, 168 hours were significantly higher than at 6 hours. The levels at 48 and 72 were significantly lower than at 168 hours.

In group 5, at 12, 24, 48, 72 and 168 hours were increased significantly higher than at 6 hours. The levels at 12, 48 were lower than at 168 hours. In group 6, the levels in blood at 12, 24, 48, 72 and 168 hours were significantly higher than at 6 hours.

Table 12 The Glutathione levels in blood of female rats. (ng/ ml)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	22.52±0.34	21.51±0.31	23.61±0.14	26.65±0.28	23.48±0.38	26.45±0.03
Group 2	18.97±4.79	7.55±0.29*	13.51±0.36	10.51±0.36	10.56±0.32	29.66±0.20
Group 3	9.46±0.26*	12.28±0.25	9.64±0.22	22.53±0.42	22.72±4.83	21.49±0.28
Group 4	18.37±0.19	22.51±0.30	21.46±0.30	17.57±0.42*	19.36±0.23	20.48±0.31
Group 5	9.45±0.16*	11.51±0.30	23.73±0.28	16.31±0.22	21.48±0.18	19.53±0.34
Group 6	7.24±0.08*	8.25±0.22	11.26±0.34	13.44±0.27	8.29±0.22	8.42±0.05

Data shown in mean± standard deviation

* Significantly lower than the other time in each group.

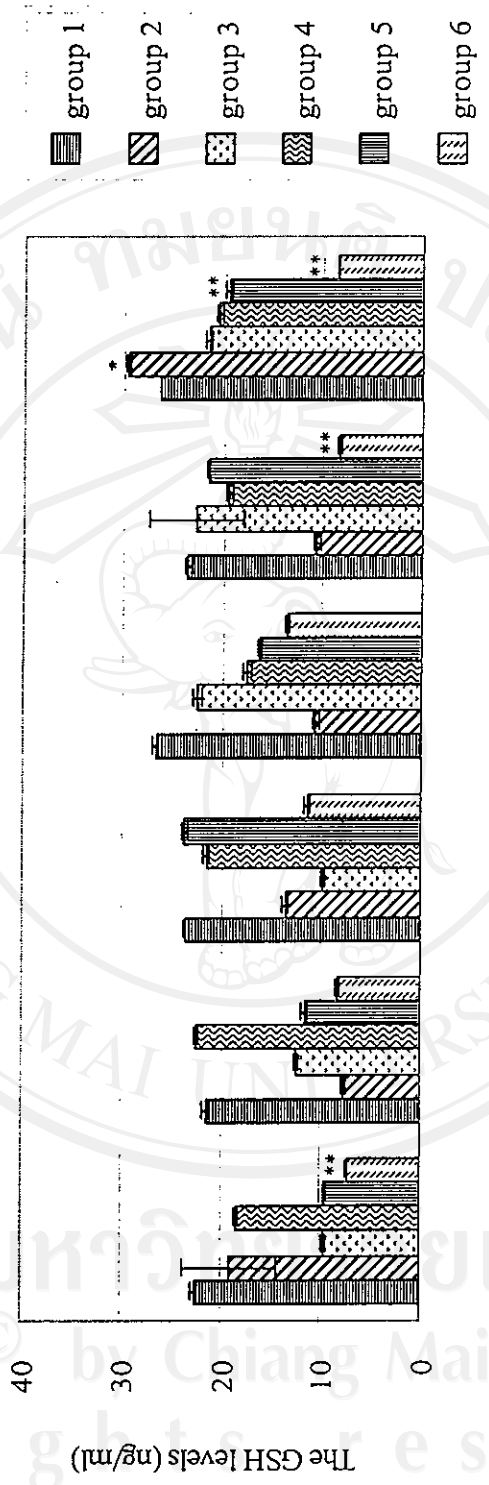

Figure 17 The GSH levels in blood of female rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.11. The CYP2E1 activities of male rats

The CYP2E1 activity of male rats is shown in Table 13 and Figure 18. The combination of treatments and times effected to the CYP2E1 activities ($P<0.001$). Considering only the treatments or times were affected to the CYP2E1 activities ($P<0.001$) and ($P<0.01$). The experiment was analyzed by two ways ANOVA found that the CYP2E1 activities:

1. In groups receiving disulfiram, were significantly lower than group 1 and group 2 ($P<0.001$).

2. At 6 hours in the groups 4 to 6 were the highest when compared with the other groups ($P<0.05$).

3. When the treatments were considered and the time were fixed and analyzed by one way ANOVA found that the CYP2E1 activities:

At 6 hours, in groups 2 to 6 were significantly higher than group 1.

At 12 hours, in groups 2 and 3 were significantly higher than group 1. In groups 4 to 6 were significantly lower than group1, 2 and 3. In group 3 were significantly higher than group 2.

At 24 hours, in group 2 and group 3 were significantly higher than group 1. In groups 4 to 6 were significantly lower than group 1, 2 and 3.

At 48 hours, in group 2 and group 3 were significantly higher than group 1. In groups 4 to 6 were significantly lower than group 1, 2 and 3.

At 72 hours, in group2 and group 3 were significantly higher than group 1. But in groups 4 to 6 were significantly lower than group 1, 2 and 3. In group 3 were significantly higher than group 2

At 168 hours, in group 2 and 3 were significantly higher than group 1. But in group 4 to 6 were significantly lower than group 1. In group 3 were significantly higher than group 2. In group 4 to 6 were significantly lower than groups 2 and 3.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the CYP2E1 activities:

In group 1, at 12 and 48 hours were higher than the time at 6 hours.

In group 2, at 12, 24, 48 and 72 hours were significantly higher than the time at 6 hours. At 12, 24, 48 and 72 hours were low than the time at 168 hours.

In group 3, at 12 and 168 hours were significantly higher than at 6 hours. At 24, 48 and 72 hours were lower than at 168 hours.

In group 4, 5 and 6, at 12-168 hours were significantly lower than at 6 hours.

Table 13 The CYP2E1 activities of male rats (nmol/mg/min)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	1.54±0.02	1.75±0.02	0.91±0.01*	1.70±0.01	0.82±0.01	0.75±0.01
Group 2	2.34±0.01	2.95±0.06	2.92±0.02	2.62±0.01	2.74±0.03	1.55±0.02
Group 3	3.11±0.02	3.95±0.02	2.36±0.05	2.63±0.02	2.84±0.01	4.23±0.02
Group 4	3.34±0.02	1.24±0.01	0.62±0.01	0.77±0.01	0.74±0.01	0.26±0.01*
Group 5	3.49±0.01	0.76±0.01	0.40±0.01	0.12±0.01	0.01±0.01*	0.05±0.01
Group 6	3.58±0.01	1.05±0.01	0.14±0.01*	0.10±0.01	0.37±0.01	0.40±0.01

Data shown in mean± standard deviation

* Significantly lower than the other time in each group.

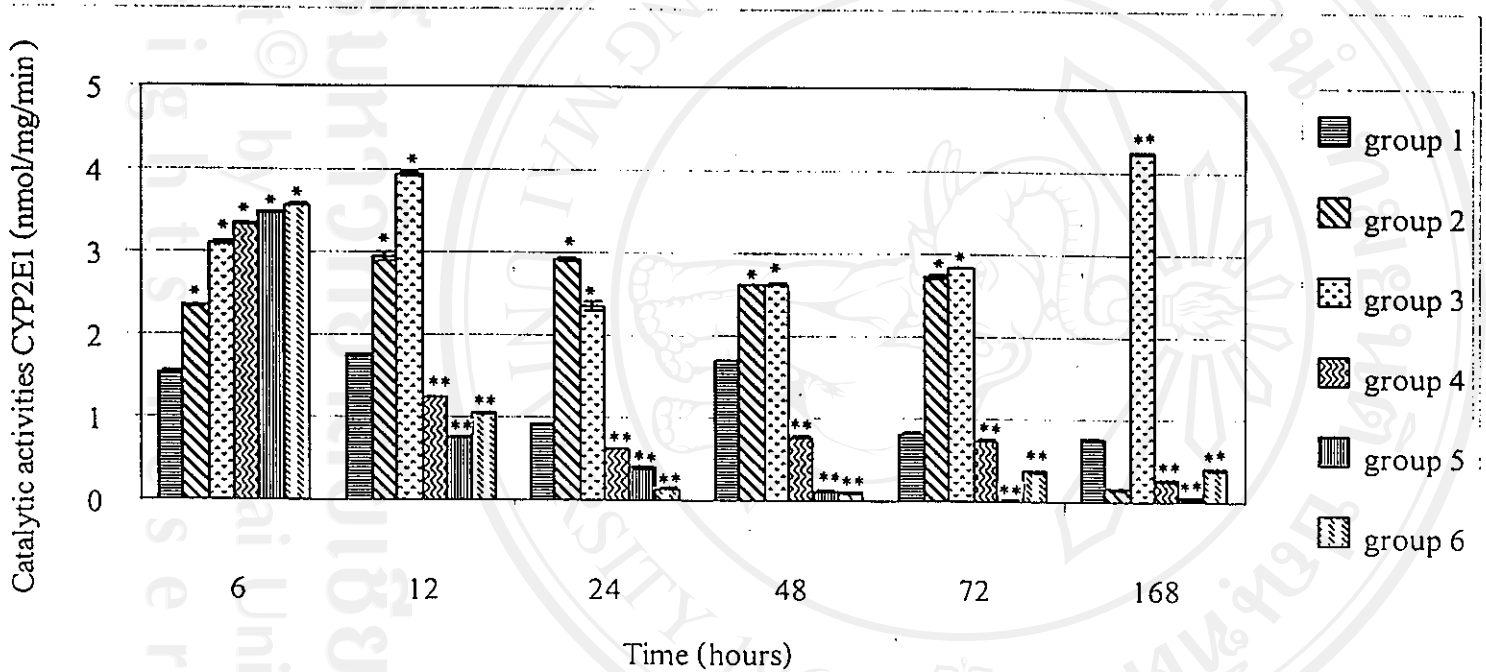

Figure 18 The catalytic activities CYP2E1 of male rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.12. The CYP2E1 activities of female rats

The CYP2E1 activity of female rats is shown in Table 14 and Figure 19.The combination of treatments and times effected to the CYP2E1 activities ($P<0.001$). Considering only the treatments or the times were affected to the CYP2E1 activities at ($P<0.01$). But the times were no affected to the CYP2E1 activities. The experiment was analyzed by two ways ANOVA found that the CYP2E1 activities:

1. In groups receiving disulfiram, were significantly lower than group 1 and 2 ($P<0.01$).

2. In each time were not significantly different when compared with the other times.

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the CYP2E1 activities:

At 6 hours, in group 3 were significantly higher than group 1. In groups 4 to 6 were significantly lower than group 1, 2 and 3.

At 12 hours, in group 2 were significantly higher than group 1. In group 3 were significantly lower than group 2. In groups 4 to 6 were significantly lower than group 3.

At 24 hours, in group 2 and 3 were significantly higher than group 1. In groups 4 to 6 were significantly lower than group 1, 2, and 3.

At 48 hours, in group 3 were significantly higher than group 1 and 2. In groups 4 to 6 were significantly lower than group 1, 2, and 3.

At 72 hours, in group 2 and 3 were significantly higher than group 1. In group 4 to 6 were significantly lower than group 1, 2, and 3.

At 168 hours, in group 2 were significantly higher than group 1. In group 3 were significantly lower than group 1 and 2. In groups 4 to 6 were significantly lower than group 1, 2 and 3.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the CYP2E1 activities:

In group 1, at 12, 48, 72, 168 hours were significantly lower than the time at 6 hours. At 72 hours were significantly lower than the time at 168 hours.

In group 2, at 24, 72, 168 hours were significantly higher than the time at 6 hours. At 12 and 48 hours were lower than the time at 168 hours

In group 3, at 24 and 48 hours were significantly higher than the group 6.

In group 4, at 12 and 48 hours were significantly higher than the time at 6 hours. At 6 and 72 hours were lower than the time at 168 hours

In group 5, at 24, 48, 72 and 168 hours were significantly lower than the time at 6 hours. At 72 hours were lower than the time at 168 hours.

In group 6, at 12, 24, 48, 72, 168 hours were significantly lower than the time at 6 hours. At 12, 24 and 72 hours were significantly lower than the time at 168 hours.

Table 14 The CYP2E1 activities of female rats. (nmol/mg/min)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	2.42±0.01	1.86±0.01	2.39±0.01	1.88±0.01	0.57±0.01*	1.42±0.01
Group 2	2.15±0.57	2.21±0.01	3.71±0.01	1.90±0.06*	3.86±0.02	3.41±0.01
Group 3	2.86±0.02	1.90±0.01*	5.12±0.01	4.09±0.08	2.40±0.01	1.47±0.02
Group 4	0.69±0.01*	1.73±0.01	0.78±0.01	1.08±0.01	0.69±0.01*	0.76±0.01
Group 5	1.45±0.01	1.03±0.01	0.56±0.01	0.27±0.01	0.04±0.01*	0.24±0.01
Group 6	0.71±0.01	0.18±0.01*	0.48±0.01	0.52±0.01	0.25±0.01	0.50±0.01

Data shown in mean± standard deviation

* Significantly lower than the other time in each group.

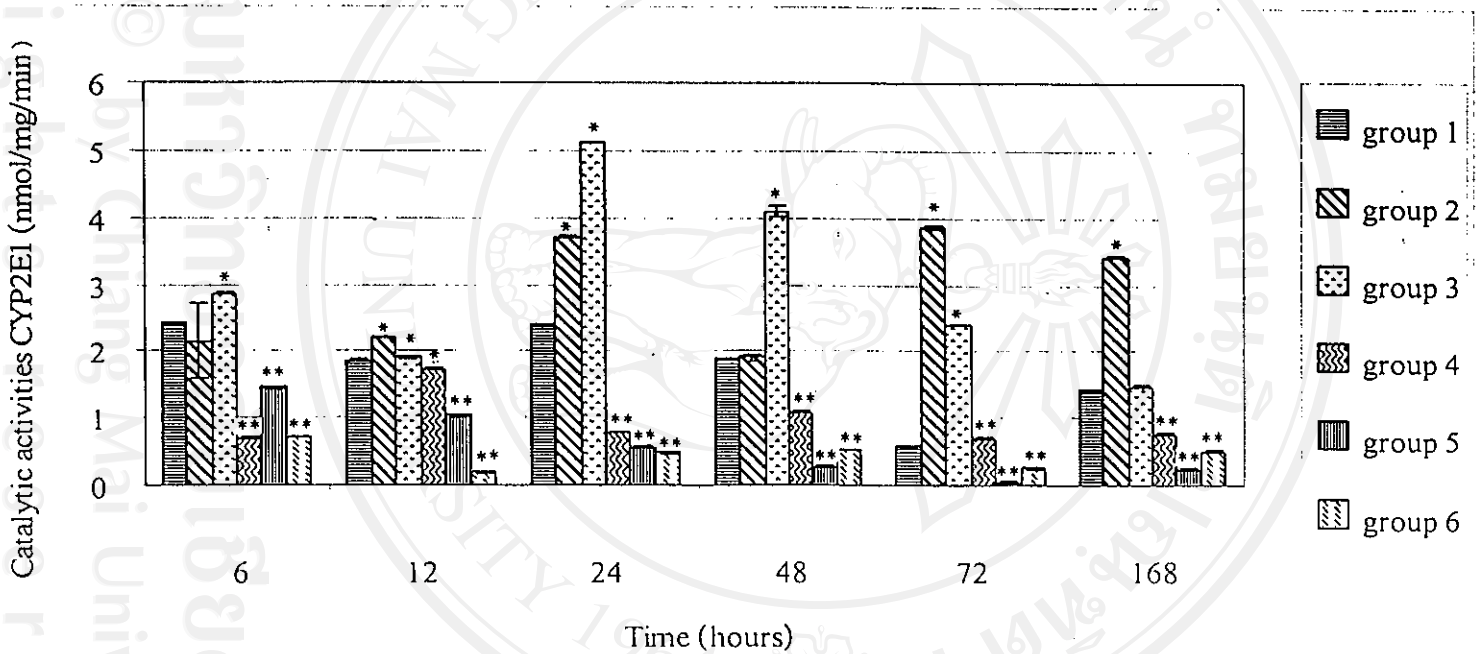

Figure 19 The catalytic activities CYP2E1 of female rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.13 The CYP 2A6 activities of male rats

The CYP 2A6 activity of male rats is shown in Table 15 and Figure 20. The combination of treatments and times effected to the CYP 2A6 activities ($P<0.001$). Considering only the treatments or the times were affected to the CYP 2A6 activities ($P<0.01$). But the times were not affected to the CYP 2A6 activities. The experiment was analyzed by two ways ANOVA found that the CYP 2A6 activities:

1. In group 4 were the lowest when compared with the other groups ($P<0.001$).

2. In each time were not significantly different between the times.

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the CYP 2A6 activities:

At 6 hours, in groups 2, 3 and 5 were significantly lower than group 1. The activities in groups 4 and 6 were higher than group 1. The activities in groups 3 to 6 were significantly higher than group 2. The activities in groups 4 to 6 were significantly higher than group 3.

At 12 hours, in groups 3, 4 and 6 were significantly lower than groups 1 and 2. The activities in groups 2 and 5 were significantly higher than group 1. The activities in group 5 were significantly higher than group 2. But in group 4 were significantly lower than group 2. The activities in groups 5 and 6 were significantly higher than group 3.

At 24 hours, in groups 2, 4, and 5 were significantly higher than group 1. But in groups 3, 4 and 6 were significantly lower than group 2. The activities in group 5 were significantly higher than group 2. The activities in groups 4 and 5 were significantly higher than group 3. But in group 6 were significantly lower than group 3.

At 48 hours, in groups 3 to 6 were significantly lower than groups 1 and 2. The activities in groups 4 and 6 were significantly lower than group 3. The activities in group 6 were significantly higher than group 3.

At 72 hours, in groups 2 and 6 were significantly higher than group 1. But in groups 3 and 4 were significantly lower than group 1. The activities in groups 3, 4, and 5 were significantly lower than group 2. The activities in groups 5 and 6 were significantly higher than group 3.

At 168 hours, in groups 2, 5 and 6 were significantly higher than group 1. But in group 3 and 4 were significantly lower than group 1. The activities in groups 3 to 6 were significantly

lower than group 2. The activities in group 5 and 6 were significantly higher than group 3. But in group 4 were significantly lower than group 3.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the CYP 2A6 activities:

In group 1, at 24, 72 and 168 hours were significantly lower than at 6 hours.

In group 2, at 24, 48 and 72 hours were significantly lower than at 168 hours.

In group 3, at 24, 72 and 168 hours were significantly lower than at 6 hours.

In group 4, at 12-168 hours were significantly lower than at 6 hours.

In group 5, at 12, 24, 72 and 168 hours were significantly higher than the 6 hours. The activities at 72 hours were significantly lower than at 168 hours.

In group 6, at 12, 24, 48, 72 and 168 hours were significantly lower than at 6 hours. The activities at 24, and 48 hours were significantly lower than at 168 hours.

Table 15 The CYP2A6 activities of male rat (pmol/ng/min)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	51.00±0.20	69.10±0.60	41.40±0.20	67.20±0.20	47.10±0.20	41.30±0.90
Group 2	35.60±0.10*	74.60±4.20	56.50±0.80	65.10±3.60	66.90±2.80	83.60±1.30
Group 3	40.50±0.70	53.70±1.80	35.40±2.50	42.90±3.10	34.40±3.50*	35.30±1.10
Group 4	64.60±0.80	47.90±0.20	48.90±0.10	35.30±0.70	39.00±0.80	22.40±0.20*
Group 5	44.80±1.80	73.40±1.90	68.30±0.10	42.00±1.10*	51.00±1.10	48.70±0.40
Group 6	107.70±0.30	57.90±1.60	26.40±1.20	15.30±1.10*	62.10±0.50	57.40±1.10

Data shown in mean± standard deviation

* Significantly lower than the other times in each group.

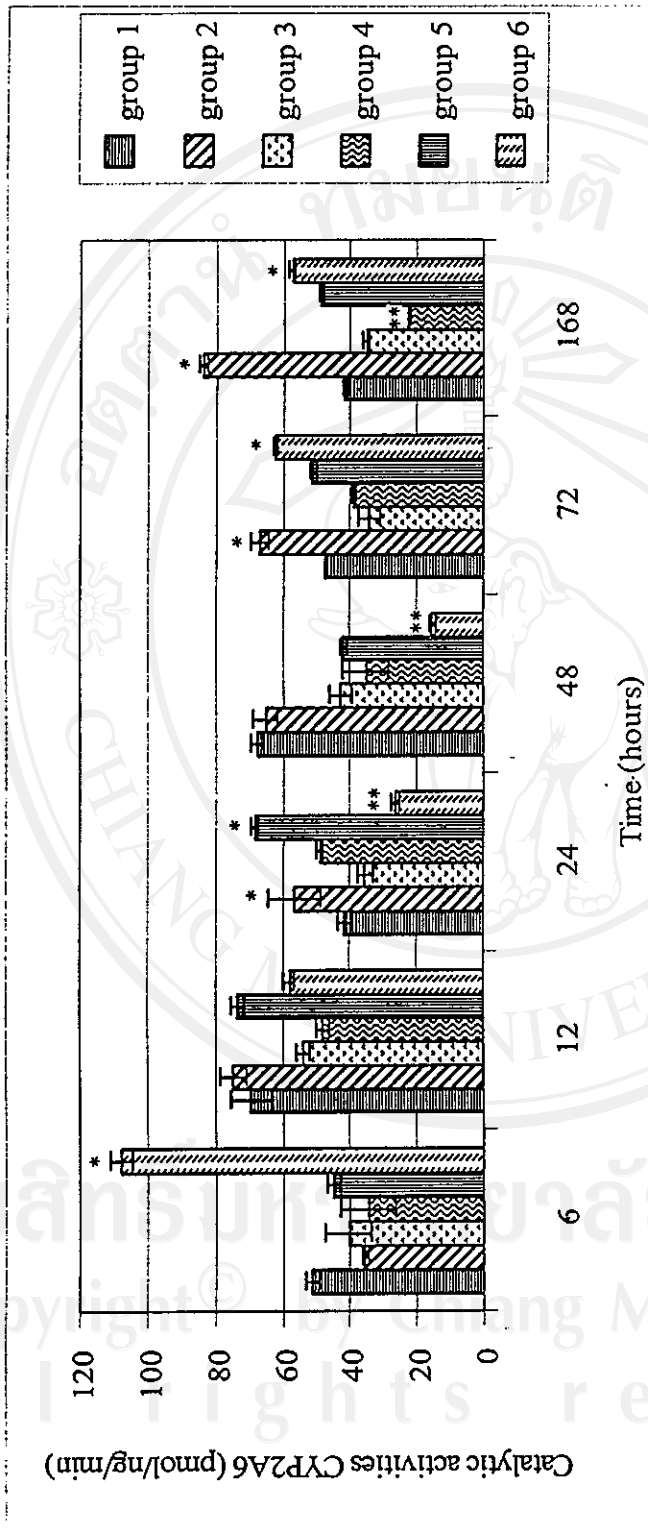

Figure 20 The catalytic activities CYP2A6 of male rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.14 The CYP2A6 activities of female rats.

The CYP2A6 activities of female rats were shown in Table 16 and Figure 21. The combination of treatments and times effected to the CYP2A6 activities ($P<0.001$). Considering only the treatments or time were affected to the activities ($P<0.01$) and ($P<0.01$). The experiment was analyzed by two ways ANOVA found that the CYP2A6 activities:

1. In group 5 were significantly higher than groups 1, 2, and 3 ($P<0.001$).

2. At 6 hours were the highest when compared with the other times ($P<0.01$).

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the CYP2A6 activities:

At 6 hours, in groups 2, 3, 5 and 6 were significantly higher than group 1. But in group 4 were lower than group 1. The activities in groups 3 and 5 were significantly higher than group 2. But in groups 4 and 6 were significantly lower than group 2. The activities in group 4 to 6 were significantly lower than group 3.

At 12 hours, in group 2-6 were significantly lower than group 1. The activities in groups 4 and 5 were significantly higher than group 2. But in groups 3 and 6 were significantly lower than group 2. The activities in groups 4 and 5 were significantly higher than group 3. But in group 6 were significantly lower than group 6.

At 24 hours, in group 2 and 3 were significantly higher than group 1. But in groups 4 to 6 were significantly lower than group 1. The activities in group 3 to 6 were significantly lower than group 2. The activities in groups 4 to 6 were significantly lower than group 3. .

At 48 hours, in group 5 were significantly higher than group 1. But in groups 2, 3 and 4 were significantly lower than group 1. The activities in group 5 and 6 were significantly higher than group 2. But in groups 3 and 4 were significantly lower than group 2. The activities in groups 5 and 6 were significantly higher than group 3. But in group 4 were lower than group 3.

At 72 hours, in group 2-6 were significantly lower than group 1. The activities in group 4 to 6 were significantly lower than group 2 and 3.

At 168 hours, in group 4 to 6 were significantly lower than groups 1, 2 and 3.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the CYP2A6 activities:

In group 1, at 12, 24, 48 and 72 hours were significantly lower than at 6 and 168 hours with the other times.

In group 2, at 72 hours were significantly lower than at 168 hours. The activities at 12, 48 and 72 hours were significantly lower than at 168 hours.

In group 3, at 12, 48 and 72 hours were significantly lower than at 6 and 168 hours.

In group 4, at 12 and 48 hours were significantly higher than at 6 hours. The activities at 72 hours were significantly lower than at 168 hours.

In group 5, at 24, 72 and 168 hours were significantly lower than at 6 hours.

In group 6, at 12, 24 and 72 hours were significantly lower than at 168 hours.

Table 16 The CYP2A6 activities of female rat (pmol/ng/min)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	46.70±0.30	38.20±0.70	73.10±2.10	67.70±0.80	58.30±0.70	78.30±0.90
Group 2	58.01±1.00	66.50±0.60	109.00±0.9	63.50±2.60	52.20±1.80*	82.80±1.10
Group 3	71.20±0.40	56.30±0.60	82.90±1.40	57.70±0.40	50.70±0.40*	74.80±3.20
Group 4	37.40±1.70	96.90±1.20	37.70±2.30	46.20±1.40	31.90±1.40*	38.00±1.10
Group 5	69.60±2.90	95.60±1.90	63.80±2.20	84.60±1.10	36.30±0.40	24.80±0.80*
Group 6	51.70±1.00	42.30±0.40	38.10±0.20	68.30±0.20	31.60±1.40*	46.40±1.30

Data shown in mean± standard deviation

* Significantly lower than the other time in each groups.

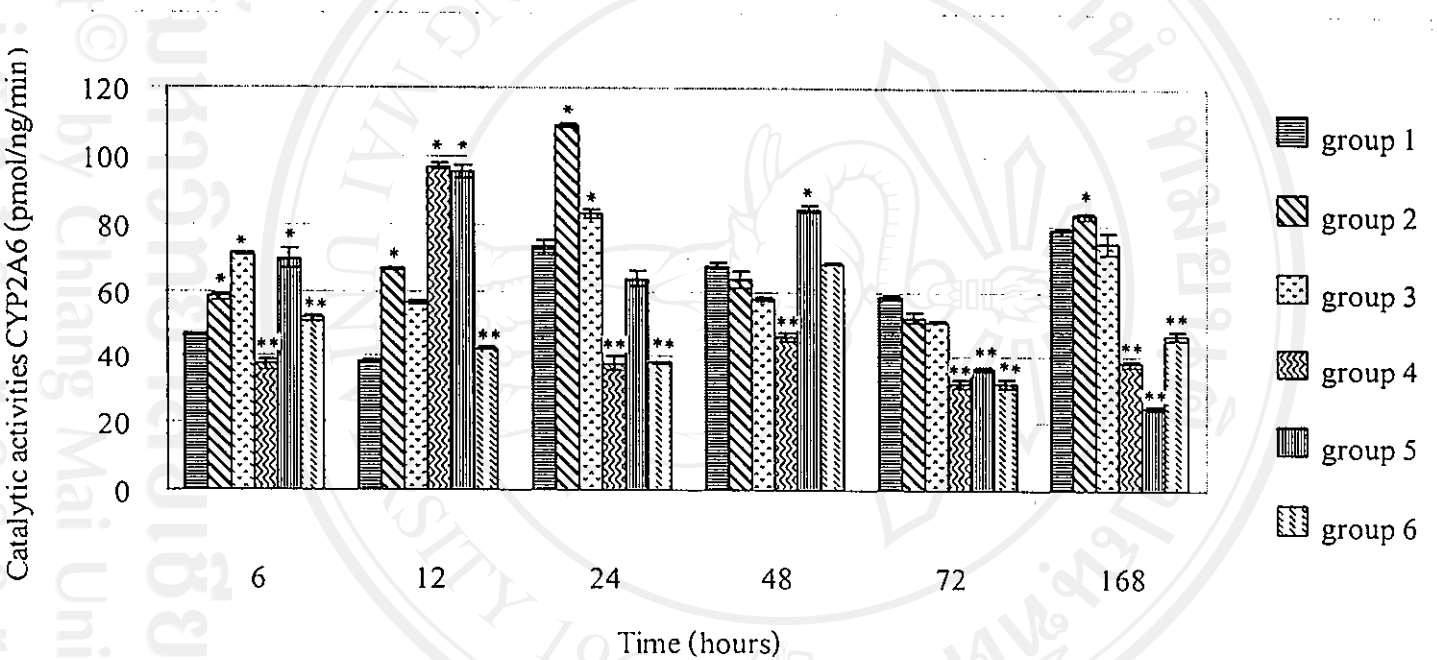

Figure 21 The catalytic activities CYP2A6 of female rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.15 The CYP 2D6 activities of male rats.

The CYP2D6 activities of male rats were shown in table 17 and Figure 22. The combination of treatments and times effected to the CYP2D6 activities at ($P<0.001$). Considering only the treatments or times were affected to the CYP2D6 activities at ($P<0.001$). But the times no affected to the CYP2D6 activities. The experiment was analyzed by two ways ANOVA found that the CYP2D6 activities:

1. In group 6 were significantly lower than the other groups ($P<0.01$).

2. In each time were not significantly different when compared with the other times.

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the CYP2D6 activities:

At 6 hours, in group 6 were significantly lower than groups 1, 2 and 3.

At 12 hours, in group 6 were significantly lower than groups 1, 2 and 3.

At 24 hours, in groups 2, 3 and 6 were significantly lower than group 1.

At 48 hours, in group 2 were significantly lower than group 1.

At 72 hours, in groups 4, 5 and 6 were significantly higher than groups 1 and 2. The activities in group 3 were lower than group 2.

At 168 hours, in groups 5 and 6 were significantly higher than groups 1 and 3. The activities in group 3 were lower than groups1 and 2.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the CYP2D6 activities:

In group 1, 2, 3 and 4 were not significantly between the other times.

In group 5, at 12 hours were significantly lower than the time at 6 and 168 hours.

In group 6, at 12 hours were the lowest when compared with the time at 6 and 168 hours.

Table 17 The CYP2D6 activities of male rats (pmol/mg/min)

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	346.17 (24.18)	339.96 (1.55)	350.29 (6.84)	357.71 (11.95)	342.87 (6.68)	340.24 (0.99)
Group 2	336.46 (35.21)	333.77 (1.16)	328.58 (6.25)	326.39 (10.73)	332.07 (1.06)	343.65 (16.45)
Group 3	349.83 (19.61)	353.04 (10.12)	336.49 (2.27)	350.52 (16.11)	325.31 (0.56)	327.91 (0.63)
Group 4	348.69 (21.55)	338.98 (0.12)	350.65 (25.19)	341.20 (6.40)	346.47 (23.85)	350.26 (14.13)
Group 5	357.17 (3.56)	372.53 (5.76)	358.33 (2.11)	351.89 (9.88)	366.42 (2.88)	362.62 (4.12)
Group 6	245.82 (0.29)	206.97* (24.24)	338.55 (3.22)	339.27 (5.74)	354.75 (6.75)	361.93 (4.84)

Data shown in mean (standard deviation)

* Significantly lower than the other time in each group.

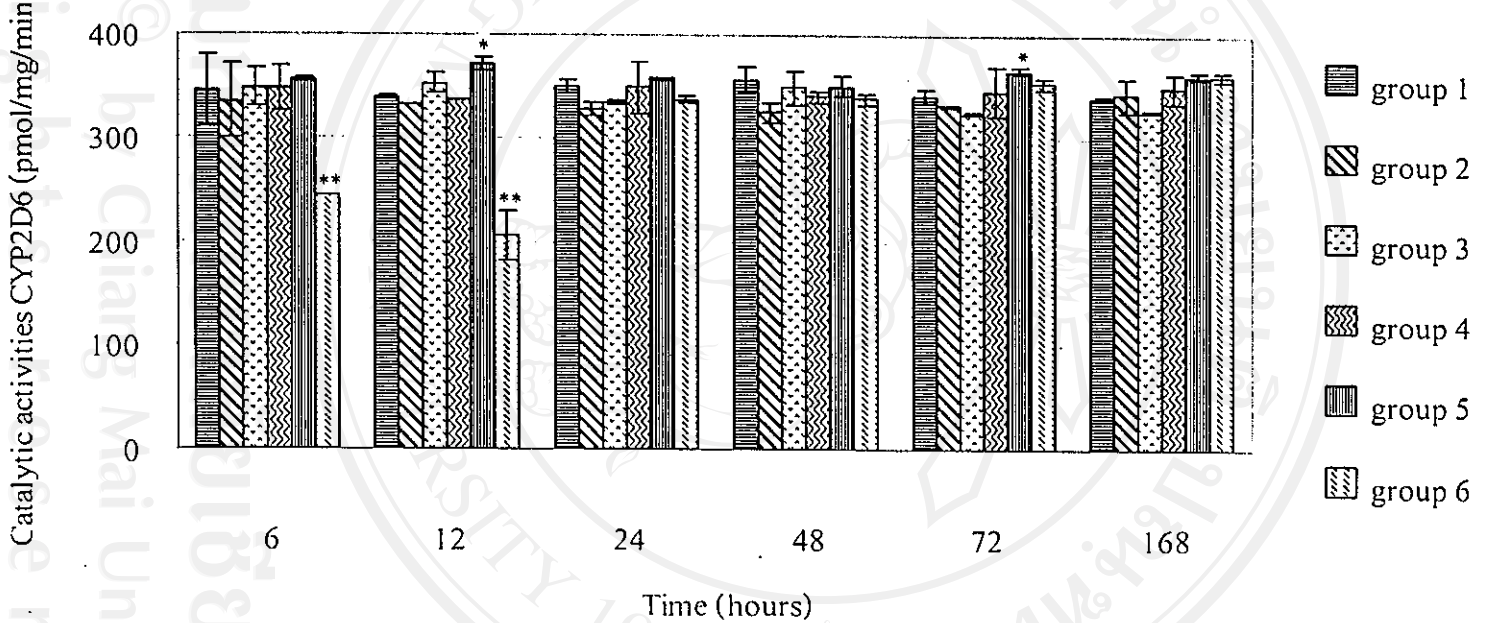

Figure 22 The catalytic activities CYP2D6 of male rats.

* Significantly increased when compared with group 1 P<0.01, ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.16. The CYP 2D6 activities of female rats.

The CYP 2D6 activities of female rats were shown in Table 18 and Figure 23. The combination of treatments and times affected to the CYP 2D6 activities ($P<0.001$). Considering only the treatments or the times found that the treatments affected to the activities ($P<0.05$). But the times no effected to the CYP 2D6 activities. The experiment was analyzed by two ways ANOVA found that the CYP 2D6 activities:

1. In group 6 were the lowest than groups 1, 2 and 3 ($P<0.01$).

2. In each time were not significantly different when compared with the other groups.

3. When the treatments were considered and the times were fixed and analyzed by one way ANOVA found that the CYP 2D6 activities:

At 6 hours, in group 6 were lower than groups 1, 2 and 3.

At 12, 24, 48, 72 and 168 hours, were not significantly different in groups.

4. When the times were considered and the treatments were fixed and analyzed by one way ANOVA found that the CYP 2D6 activities:

In group 1, 2, 3, 4 and 5 were not significantly different when compared with the other times.

In group 6, the CYP 2D6 activities at 6 hours were the lower than the time at 168 hours.

Table 18 The CYP2D6 activities of female rats. (pmol/mg/min)

Groups	Time (hours)					
	6	12	24	48	72	168
Group 1	346.19 (22.52)	341.29 (3.95)	341.33 (11.66)	326.43 (59.43)	359.45 (2.34)	335.86 (5.99)
Group 2	333.87 (4.46)	330.86 (4.14)	337.59 (13.81)	332.43 (12.34)	330.39 (4.54)	345.76 (21.66)
Group 3	347.24 (9.45)	328.69 (25.81)	344.71 (25.81)	329.25 (2.64)	344.21 (24.99)	330.01 (5.36)
Group 4	340.22 (1.90)	347.15 (18.16)	331.08 (0.07)	352.72 (17.13)	353.31 (14.17)	350.09 (17.19)
Group 5	357.58 (9.60)	352.91 (4.08)	363.34 (7.24)	368.06 (5.83)	361.72 (3.54)	356.13 (1.49)
Group 6	182.32* (38.84)	334.23 (3.81)	342.80 (24.38)	331.18 (0.73)	328.47 (1.18)	336.06 (8.32)

Data shown in mean (standard deviation)

* Significantly lower than the other time in each group.

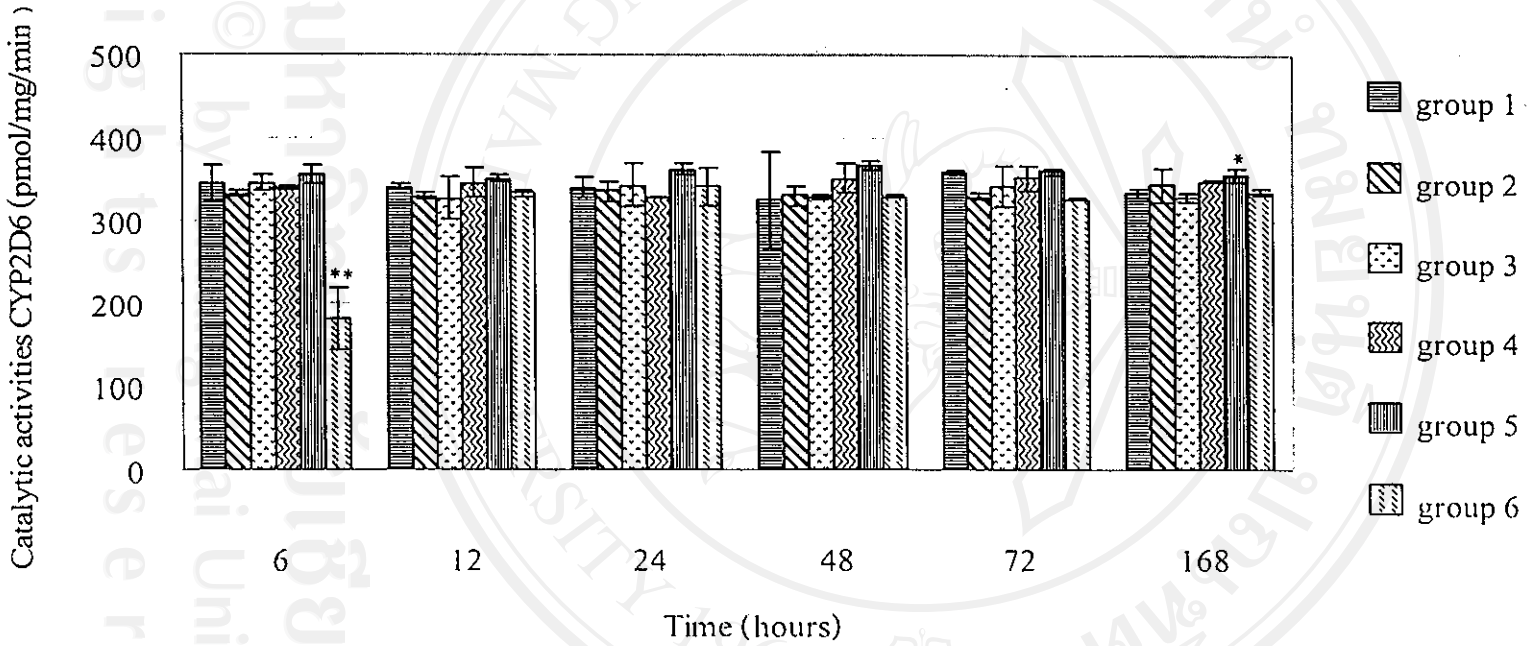

Figure 23 The catalytic activities CYP2D6 of female rats.

* Significantly increased when compared with group 1 P<0.01. ** Significantly decreased when compared with group 2 and 3 P<0.001.

3.17. The values of plasma acetaminophen half life of male rats

The values of plasma acetaminophen half life of male rats were shown in Table 19. Treatments were effect to the half life ($P<0.001$). The acetaminophen half life in groups 3 and 6 were significantly increased but in groups 4 and 5 decreased when compared with group 2. And in group 2 was significantly increased when compared with group 3.

3.18. The values of plasma acetaminophen half life of female rats.

The values of plasma acetaminophen half life of female rats were shown in Table 19. Treatments were effect to the half life ($P<0.001$). The acetaminophen half life in group which receiving disulfiram and group 4 were significantly increased when compared with group 2 and 3 respectively.

3.19 The value of acetaminophen clearance of male rats

The values of plasma acetaminophen clearance of male rats were shown in table 19. Treatments were effect to the clearance ($P<0.001$). The acetaminophen clearance in the group 3 and 6 were significantly decreased but in the group 4 and 5when compared the group 2. And in group 4 and 5 were significantly increased when compared with group 3.

3.20 The value of acetaminophen clearance of female rats

The values of plasma acetaminophen clearance of female rats were shown in Table 19. Treatments were effect to the clearance ($P<0.001$). The acetaminophen clearance in groups which receiving disulfiram were significantly decreased but group 6 increased when compared with group 2 and 3 respectively.

Table 19 The value of plasma acetaminophen half life and acetaminophen clearance of male and female rats.

Group	Male		Female	
	Half life (hour)	Clearance(ml/hr)	Half life (hour)	Clearance (ml/hr)
2	38.09±0.02	2.36±0.04	14.60±0.01	5.66±0.05
3	50.18±0.05*	1.88±0.06	31.67±0.02*	2.66±0.04
4	26.39±0.03	3.18±0.01*,**	88.50±0.03*,**	0.92±0.04
5	30.70±0.03	2.97±0.05*,**	66.86±0.04*	1.26±0.02
6	64.02±0.05*,**	1.34±0.01	28.65±0.03*	2.98±0.01**

* Significantly increased when compared with the group 2 $P<0.001$.

** Significantly increased when compared with the group 3 $P<0.001$

3.21 Histological studies of male rats.

Hepatic necrosis score (HNS) were used to study hepatotoxicity of male rats after received acetaminophen overdose or received treatments and data shown in Table 20. The character of hepatic necrosis score grades 0-3 are shown in figure. The combination of treatments and times were effect to the HNS ($P<0.01$). Considering only the treatments or times found that the treatments were effect to the HNS ($P<0.01$). But, times were not effect to the HNS.

In the experiment found that

1. The HNS in the group 2 and 3 were significantly increased when compared with the group 4-6 ($P<0.01$).

2. The HNS were the highest at 72 hours when compared with the other times.

3.22 Histological studies of female rats.

Hepatic necrosis score (HNS) were used to study hepatotoxicity of male rats after received acetaminophen overdose or received treatments and data are shown in Table 21. The combination of treatments and times were effect to HNS ($P<0.01$). Considering only the treatments or times found that the treatments were effect to the HNS ($P<0.01$). But times were not effect to HNS ($P<0.05$).

The experiment found that:

1. The HNS in group 2, 4 and 6 were significantly increased when compared with group 1 ($P<0.01$). The HNS in groups 3, 5 and 6 were decreased than group 2.

2. The HNS were the highest at 72 hours when compared with the other time ($P<0.05$).

Table 20 The % HNS of male rats.

Groups	Time (hours)					
	6	12	24	48	72*	168
Group1	0	0	0	0	0	0
Group 2**	33	0	100*	83*	50	83*
Group 3	16	50*	66*	100*	83*	33
Group 4	16	33	16	50*	33	33
Group 5	33	0	66*	50*	50*	33
Group 6	50*	0	0	0	83*	66*

*Significantly increased when compared with the other times P<0.05

** Significantly increased when compared with group 4 to 6 P<0.05

Table 21 The % HNS of female rats

Groups	Time (hours)					
	6	12	24	48	72	168
Group1	0	0	0	0	0	0
Group 2***	66*	100*	100*	100*	50	50
Group 3	0	16	33	16	50*	16
Group 4***	33	66*	33	6*6	50*	50*
Group 5	0	16	33	66*	16	33
Group 6	33	33	33	33	33	33

* Significantly increased when compared with the other times P<0.05

* *Significantly increased when compared with group 1 P<0.05

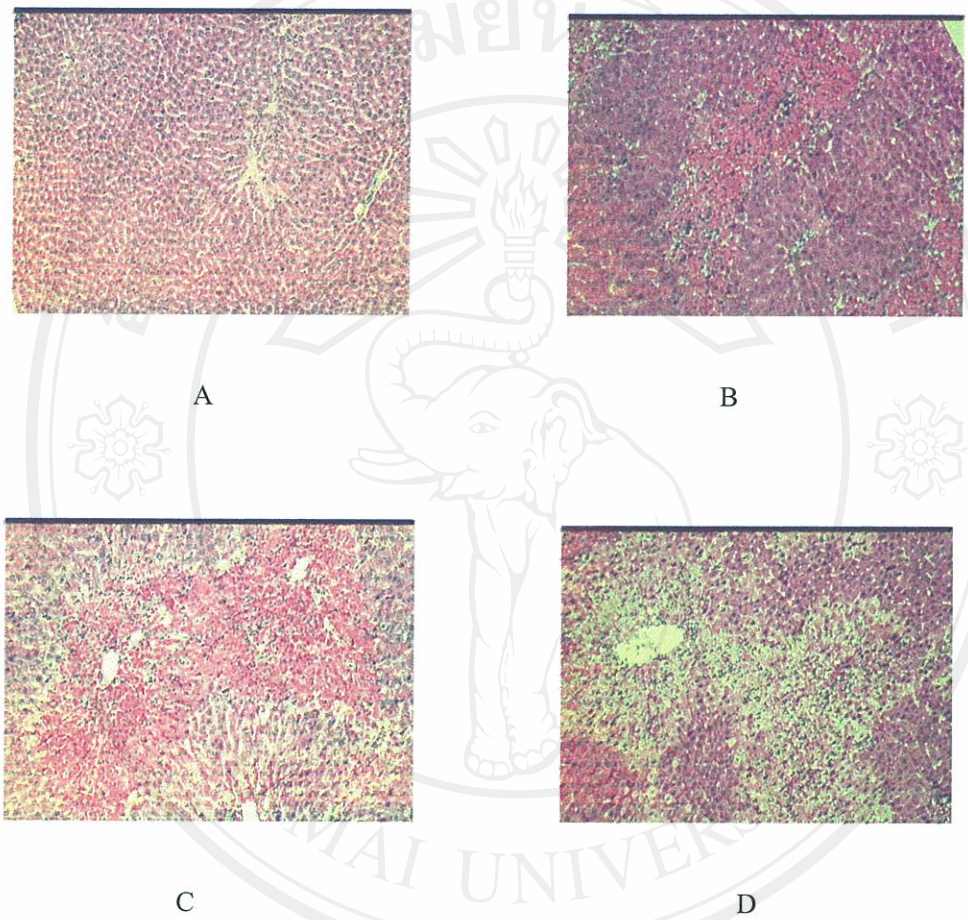

Figure 24 The hepatic necrosis score, A = HNS grade 0, no evidence of cellular necrosis, B = HNS grade 1, necrosis limited to the region surrounding the central vein, C = HNS grade 2, necrosis extending beyond the central vein but not to the portal traids, D = HNS grade 3, necrosis extending to the portal traids in some region.