

Table 1. Food consumption and total intake of Asparagine

Asparagine dose level (%)	Number of rats	Food consumption				Intake of Asparagine				Total intake of Asparagine	
		(g/rat/day)		(mg/kg/day)		(mg/rat/day)		(g/rat)		Male	Female
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0.00	10	12.4	8.4	—	—	—	—	—	—	—	—
1.25	10	12.1	8.3	171	118	862	874	15.4	10.6		
2.50	10	12.0	8.1	340	231	1654	1727	30.6	20.8		
5.00	10	12.5	8.4	710	475	3555	3511	63.9	42.7		

Table 2. Hematological data for F344 male rats given Asparagine for 90 days

Item	Asparagine level (%)	Dose level (%)			
		0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=9)
RBC	(x10 <sup>4</sup> /μL)	856E19a)	880 ± 52	890 ± 46	907 ± 34
Hb	(g/dL)	15.7 ± 0.5	15.9 ± 0.9	15.9 ± 0.7	16.0 ± 0.6
Ht	(%)	45.5 ± 1.6	46.4 ± 3.3	46.9 ± 2.8	47.2 ± 2.2
MCV	(fL)	53.2 ± 0.8	52.7 ± 1.3	52.7 ± 0.7	52.1 ± 0.6
MCH	(pg)	18.2 ± 0.4	18.0 ± 0.5	18.0 ± 0.5	17.7 ± 0.5
MCHC	(g/dL)	34.4 ± 0.5	34.3 ± 1.2	34.2 ± 0.8	33.8 ± 0.4
PLT	(x10 <sup>4</sup> /μL)	62.5 ± 3.9	58.0 ± 8.7	61.5 ± 8.7	62.8 ± 7.2
WBC	(x10 <sup>2</sup> /μL)	60.1 ± 5.8	58.2 ± 12.6	64.8 ± 10.8	70.8 ± 11.6

a): MeanES.D.

Table 2. Hematological data for F344 male rats given Asparagine for 90 days

Item	Asparagine level (%)	Dose level (%)			
		0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=9)
RBC	(x10 <sup>4</sup> /μL)	856E19a)	880 ± 52	890 ± 46	907 ± 34
Hb	(g/dL)	15.7 ± 0.5	15.9 ± 0.9	15.9 ± 0.7	16.0 ± 0.6
Ht	(%)	45.5 ± 1.6	46.4 ± 3.3	46.9 ± 2.8	47.2 ± 2.2
MCV	(fL)	53.2 ± 0.8	52.7 ± 1.3	52.7 ± 0.7	52.1 ± 0.6
MCH	(pg)	18.2 ± 0.4	18.0 ± 0.5	18.0 ± 0.5	17.7 ± 0.5
MCHC	(g/dL)	34.4 ± 0.5	34.3 ± 1.2	34.2 ± 0.8	33.8 ± 0.4
PLT	(x10 <sup>4</sup> /μL)	62.5 ± 3.9	58.0 ± 8.7	61.5 ± 8.7	62.8 ± 7.2
WBC	(x10 <sup>2</sup> /μL)	60.1 ± 5.8	58.2 ± 12.6	64.8 ± 10.8	70.8 ± 11.6

a): MeanES.D.

Table 3. Hematological data for F344 female rats given Asparagine for 90 days

Item	Asparagine level (%)	Dose level (%)			
		0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=9)
RBC	(x10 <sup>4</sup> /μL)	836E19a)	839 ± 22	856 ± 25	855 ± 47
Hb	(g/dL)	16.2 ± 0.3	16.1 ± 0.3	16.3 ± 0.4	16.4 ± 0.4
Ht	(%)	46.5 ± 1.3	46.8 ± 1.6	48.1 ± 1.6	47.1 ± 3.0
MCV	(fL)	55.8 ± 0.8	55.7 ± 0.9	56.1 ± 0.6	55.1 ± 0.7
MCH	(pg)	19.1 ± 0.3	19.0 ± 0.	19.1 ± 0.3	19.0 ± 1.2
MCHC	(g/dL)	35.0 ± 0.7	34.4 ± 0.8	33.8 ± 0.6	34.8 ± 2.9
PLT	(x10 <sup>4</sup> /μL)	63.2 ± 5.3	57.2 ± 14.5	64.6 ± 8.0	61.5 ± 5.6
WBC	(x10 <sup>2</sup> /μL)	46.8 ± 13.1	53.7 ± 8.3	51.4 ± 15.2	54.6 ± 13.5

a): MeanES.D.

Table 4. Serum biochemical data for F344 male rats given Asparagine for 90 days

Item	Asparagine level (%)	Dose level (%)			
		0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=9)
TP	(g/dL)	7.0E0.1 <sup>a)</sup>	7.1±0.2	7.2±0.2	7.0±0.2
A/G		1.7±0.1	1.7±0.2	1.5±0.2	1.6±0.2
ALB	(g/dL)	4.4±0.1	4.4±0.2	4.3±0.2	4.3±0.1
BIL	(mg/dL)	0.05±0.01	0.05±0.01	0.04±0.00	0.04±0.01
TC	(mg/dL)	70.1±3.8	66.8±12.9	61.2±9.2	72.6±14.0
GLU	(mg/dL)	168±29	165±18	149±14	165±17
PL	(mg/dL)	116±7	114±20	103±14	117±19
TG	(mg/dL)	112±24	122±49	112±32	143±38
BUN	(mg/dL)	15.2±0.9	16.9±1.6	15.5±1.6	17.3±2.3
CRN	(mg/dL)	0.25±0.01	0.25±0.02	0.26±0.01	0.26±0.02
Ca	(mg/dL)	10.6±0.3	10.6±0.5	10.8±0.2	10.5±0.2
P	(mg/dL)	5.3±0.7	5.4±1.0	5.2±0.6	4.6±0.7
Na	(mEq/L)	140±1.1	139±2.0	140±0.7	139±1.1
Cl	(mEq/L)	101.7±1.1	100.6±1.4	101.3±1.2	100.9±1.1
K	(mEq/L)	3.9±0.6	4.1±0.5	3.8±0.3	4.0±0.3
AST	(IU/L)	61.2±7.0	65.7±6.3	65.4±4.7	68.3±9.2
ALT	(IU/L)	33.4±5.4	37.3±6.4	38.2±5.1	39.6±7.9
ALP	(IU/L)	437.3±22.8	431.9±38.5	396.5±27.0*	424.0±33.8
?-GTP	(IU/L)	<2 <sup>b)</sup>	<2	<2	<2

a): MeanES.D.

b): Undetectable for under the capacity.

\*: Significantly different from the control group at p<0.05.

Table 5. Serum biochemical data for F344 female rats given Asparagine for 90 days

Item	Asparagine level (%)	Dose level (%)			
		0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=9)
TP	(g/dL)	7.2E0.2 <sup>a)</sup>	7.1±0.4	7.3±0.3	7.1±0.3
A/G		2.0±0.1	2.0±0.3	2.0±0.1	2.0±0.2
ALB	(g/dL)	4.8±0.1	4.7±0.2	4.9±0.2	4.7±0.1
BIL	(mg/dL)	0.05±0.00	0.05±0.01	0.05±0.01	0.05±0.01
TC	(mg/dL)	63.2±9.2	69.9±10.2	68.6±13.5	78.4±18.4
GLU	(mg/dL)	106.6±7.3	120.6±8.2 <sup>**</sup>	115.9±7.6	131.9±12.6 <sup>**</sup>
PL	(mg/dL)	114.7±13.0	127.8±13.7	129.6±19.3	143.9±27.3 <sup>**</sup>
TG	(mg/dL)	21.8±8.2	53.7±22.8 <sup>**</sup>	65.9±8.4 <sup>**</sup>	68.8±20.5 <sup>**</sup>
BUN	(mg/dL)	16.1±1.4	16.3±1.8	16.2±0.9	17.1±1.6
CRN	(mg/dL)	0.27±0.02	0.24±0.03 <sup>*</sup>	0.27±0.01	0.25±0.02
Ca	(mg/dL)	10.3±0.3	10.4±0.2	10.7±0.1	10.9±1.5
P	(mg/dL)	5.9±0.7	5.8±1.4	4.8±0.4	5.0±0.9
Na	(mEq/L)	141±1.5	141±1.7	143±1.1	140±2.3
Cl	(mEq/L)	104±2.0	104±1.2	103±1.1	101±5.4
K	(mEq/L)	4.1±0.3	4.4±1.0	4.5±0.4	4.8±0.6 <sup>*</sup>
AST	(IU/L)	68.6±4.6	69.3±5.5	69.3±5.5	77.2±12.2
ALT	(IU/L)	26.8±2.4	27.7±2.6	28.5±2.0	32.4±3.4 <sup>**</sup>
ALP	(IU/L)	307.4±43.6	339.6±50.2	339.1±58.0	349.3±49.1
?-GTP	(IU/L)	<2 <sup>b)</sup>	<2	<2	2.4±1.3

a): MeanES.D.

b): Undetectable for under the capacity.

\*, \*\*: Significantly different from the control group at p<0.05, p<0.01, respectively

Table 6-a. Organ weights and absolute organ weights of F344 male rats given Asparagine for 90 days

Item	Asparagine dose level (%)			
	0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=10)
Body weight (g)	290 $\pm$ 8 <sup>a)</sup>	273 $\pm$ 15*	276 $\pm$ 11	271 $\pm$ 14**
Absolute (g)				
Organs				
Brain	1.92 $\pm$ 0.07	1.95 $\pm$ 0.06	1.93 $\pm$ 0.06	1.94 $\pm$ 0.04
Thymus	0.21 $\pm$ 0.03	0.23 $\pm$ 0.09	0.19 $\pm$ 0.03	0.21 $\pm$ 0.06
Lungs	1.12 $\pm$ 0.15	1.26 $\pm$ 0.49	1.49 $\pm$ 0.63	1.25 $\pm$ 0.46
Heart	0.88 $\pm$ 0.05	0.86 $\pm$ 0.05	0.86 $\pm$ 0.08	0.85 $\pm$ 0.07
Spleen	0.61 $\pm$ 0.03	0.64 $\pm$ 0.26	0.62 $\pm$ 0.04	0.59 $\pm$ 0.05
Liver	6.21 $\pm$ 0.25	6.10 $\pm$ 0.48	6.22 $\pm$ 0.53	6.10 $\pm$ 0.44
Adrenals	0.048 $\pm$ 0.011	0.044 $\pm$ 0.011	0.048 $\pm$ 0.013	0.044 $\pm$ 0.008
Kidneys	1.51 $\pm$ 0.09	1.51 $\pm$ 0.10	1.53 $\pm$ 0.04	1.51 $\pm$ 0.08
Testes	2.90 $\pm$ 0.11	2.85 $\pm$ 0.10	2.90 $\pm$ 0.09	2.91 $\pm$ 0.13
Pituitary	0.008 $\pm$ 0.001	N.D. <sup>b)</sup>	0.013 $\pm$ 0.021	N.D.
Salivary glands	0.47 $\pm$ 0.02	0.44 $\pm$ 0.04	0.46 $\pm$ 0.03	0.44 $\pm$ 0.04
Prostate	0.61 $\pm$ 0.19	N.D.	0.71 $\pm$ 0.17	N.D.
Seminal vesicle	0.79 $\pm$ 0.14	N.D.	0.88 $\pm$ 0.23	N.D.

a): Mean $\pm$ S.D.

b): Not detected.

\*, \*\*: Significantly different from the control group at  $p < 0.05$ ,  $p < 0.01$ , respectively.

Table 6-b. Organ weights and relative organ weights of F344 male rats given Asparagine for 90 days

Item	Asparagine dose level (%)			
	0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=10)
Body weight (g)	290 $\square$ 8 <sup>a)</sup>	273 $\pm$ 15*	276 $\pm$ 11	271 $\pm$ 14**
Relative (g/100g B. W.) Organs				
Brain	0.66 $\pm$ 0.03	0.72 $\pm$ 0.05	0.70 $\pm$ 0.04	0.72 $\pm$ 0.04*
Thymus	0.07 $\pm$ 0.01	0.08 $\pm$ 0.04	0.07 $\pm$ 0.01	0.08 $\pm$ 0.03
Lung	0.39 $\pm$ 0.04	0.47 $\pm$ 0.21	0.54 $\pm$ 0.25	0.47 $\pm$ 0.19
Heart	0.30 $\pm$ 0.02	0.32 $\pm$ 0.02	0.31 $\pm$ 0.03	0.31 $\pm$ 0.02
Spleen	0.21 $\pm$ 0.01	0.23 $\pm$ 0.09	0.22 $\pm$ 0.01	0.22 $\pm$ 0.02
Liver	2.14 $\pm$ 0.08	2.23 $\pm$ 0.08	2.25 $\pm$ 0.12	2.25 $\pm$ 0.09
Adrenals	0.017 $\pm$ 0.004	0.016 $\pm$ 0.004	0.017 $\pm$ 0.004	0.016 $\pm$ 0.003
Kidneys	0.52 $\pm$ 0.03	0.55 $\pm$ 0.02	0.55 $\pm$ 0.03	0.56 $\pm$ 0.03*
Testes	1.00 $\pm$ 0.02	1.04 $\pm$ 0.05	1.05 $\pm$ 0.07	1.07 $\pm$ 0.05*
Pituitary	0.003 $\pm$ 0.000	N.D. <sup>b)</sup>	N.D.	0.005 $\pm$ 0.008
Salivary glands	0.16 $\pm$ 0.01	0.16 $\pm$ 0.01	0.17 $\pm$ 0.01	0.16 $\pm$ 0.01
Prostate	0.21 $\pm$ 0.07	N.D.	N.D.	0.26 $\pm$ 0.07
Seminal vesicle	0.24 $\pm$ 0.10	N.D.	N.D.	0.32 $\pm$ 0.09

a): Mean  $\square$  S.D.

b): Not detected.

\*, \*\*: Significantly different from the control group at  $p < 0.05$ ,  $p < 0.01$ , respectively



Table 7-a. Body weights and absolute organ weights of F344 female rats given Asparagine for 90 days

Item	Asparagine dose level (%)			
	0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=10)
Body weight (g)	160 □ <sup>a</sup>	161 ± 8	158 ± 8	162 ± 4
Absolute (g)				
Organs				
Brain	1.79 ± 0.04	1.76 ± 0.11	1.81 ± 0.06	1.77 ± 0.08
Thymus	0.15 ± 0.03	0.15 ± 0.04	0.16 ± 0.03	0.16 ± 0.02
Lung	0.83 ± 0.13	0.75 ± 0.08	0.76 ± 0.10	0.74 ± 0.06
Heart	0.56 ± 0.02	0.55 ± 0.04	0.55 ± 0.03	0.54 ± 0.02
Spleen	0.36 ± 0.03	0.35 ± 0.02	0.37 ± 0.03	0.36 ± 0.02
Liver	3.21 ± 0.17	3.29 ± 0.29	3.37 ± 0.23	3.40 ± 0.22
Adrenals	0.050 ± 0.004	0.053 ± 0.021	0.045 ± 0.005	0.048 ± 0.08
Kidneys	0.90 ± 0.04	0.92 ± 0.06	0.92 ± 0.05	0.93 ± 0.05
Pituitary	0.011 ± 0.002	N.D. <sup>b)</sup>	N.D.	0.009 ± 0.001
Salivary glands	0.31 ± 0.02	0.31 ± 0.02	0.30 ± 0.02	0.28 ± 0.02
Ovaries	0.081 ± 0.007	0.084 ± 0.015	0.086 ± 0.009	0.088 ± 0.012
Uterus	0.39 ± 0.09	N.D.	N.D.	0.39 ± 0.13

a): Mean □ S.D.

b): Not detected.

Table 7-b. Body weights and relative organ weights of F344 female rats given Asparagine for 90 days

Item	Asparagine dose level (%)			
	0.00 (N=10)	1.25 (N=10)	2.50 (N=10)	5.00 (N=10)
Body weight (g)	160 $\square$ 8 <sup>a)</sup>	161 $\pm$ 8	158 $\pm$ 8	162 $\pm$ 4
Relative (g/100g B. W.) Organs				
Brain	1.12 $\pm$ 0.06	1.09 $\pm$ 0.07	1.15 $\pm$ 0.08	1.09 $\pm$ 0.04
Thymus	0.09 $\pm$ 0.02	0.09 $\pm$ 0.03	0.10 $\pm$ 0.02	0.10 $\pm$ 0.01
Lung	0.52 $\pm$ 0.09	0.46 $\pm$ 0.04	0.48 $\pm$ 0.05	0.46 $\pm$ 0.03
Heart	0.35 $\pm$ 0.03	0.34 $\pm$ 0.01	0.35 $\pm$ 0.02	0.33 $\pm$ 0.01
Spleen	0.22 $\pm$ 0.01	0.22 $\pm$ 0.01	0.23 $\pm$ 0.01	0.22 $\pm$ 0.01
Liver	2.02 $\pm$ 0.11	2.04 $\pm$ 0.11	2.13 $\pm$ 0.07	2.10 $\pm$ 0.13
Adrenals	0.031 $\pm$ 0.002	0.033 $\pm$ 0.013	0.029 $\pm$ 0.004	0.030 $\pm$ 0.005
Kidneys	0.56 $\pm$ 0.03	0.57 $\pm$ 0.03	0.58 $\pm$ 0.02	0.58 $\pm$ 0.02
Pituitary	0.007 $\pm$ 0.001	N.D. <sup>b)</sup>	N.D.	0.006 $\pm$ 0.001
Salivary glands	0.19 $\pm$ 0.02	0.19 $\pm$ 0.01	0.19 $\pm$ 0.01	0.18 $\pm$ 0.02
Ovaries	0.051 $\pm$ 0.005	0.052 $\pm$ 0.009	0.054 $\pm$ 0.006	0.054 $\pm$ 0.008
Uterus	0.24 $\pm$ 0.06	N.D.	N.D.	0.24 $\pm$ 0.08

a): Mean  $\square$  S.D

b): Not detected.

Table 8. Summary of histopathological findings.

Sex	Male		Female	
	5.0 (N=10)	0.0 (N=10)	5.0 (N=10)	0.0 (N=10)
<b>Lung/bronchial</b>				
Accumulation, foam cell/(1) <sup>a)</sup>	5	2	6	6
Accumulation, foam cell/(2) <sup>a)</sup>	0	0	1	2
Acute inflammation/(1) <sup>a)b)</sup>	1	2	1	0
Acute inflammation/(2) <sup>a)b)</sup>	0	0	0	1
Acute inflammation/(3) <sup>a)b)</sup>	0	0	0	0
Granulation	0	0	1	0
Monocytic cell leukemia	2	0	2	0
<b>Ovary</b>				
Simple cyst	0	0	0	1
<b>Zymbal's gland</b>				
Sebaceous adenoma	1	0	0	0

a) : Numbers in parenthesis indicate the grades of lesion : (1) Slight (2) Moderate (3) Severe

b) : Major finding about acute inflammation is neutrophile infiltration.

There were no significant intergroup differences by Fischer's exact test.

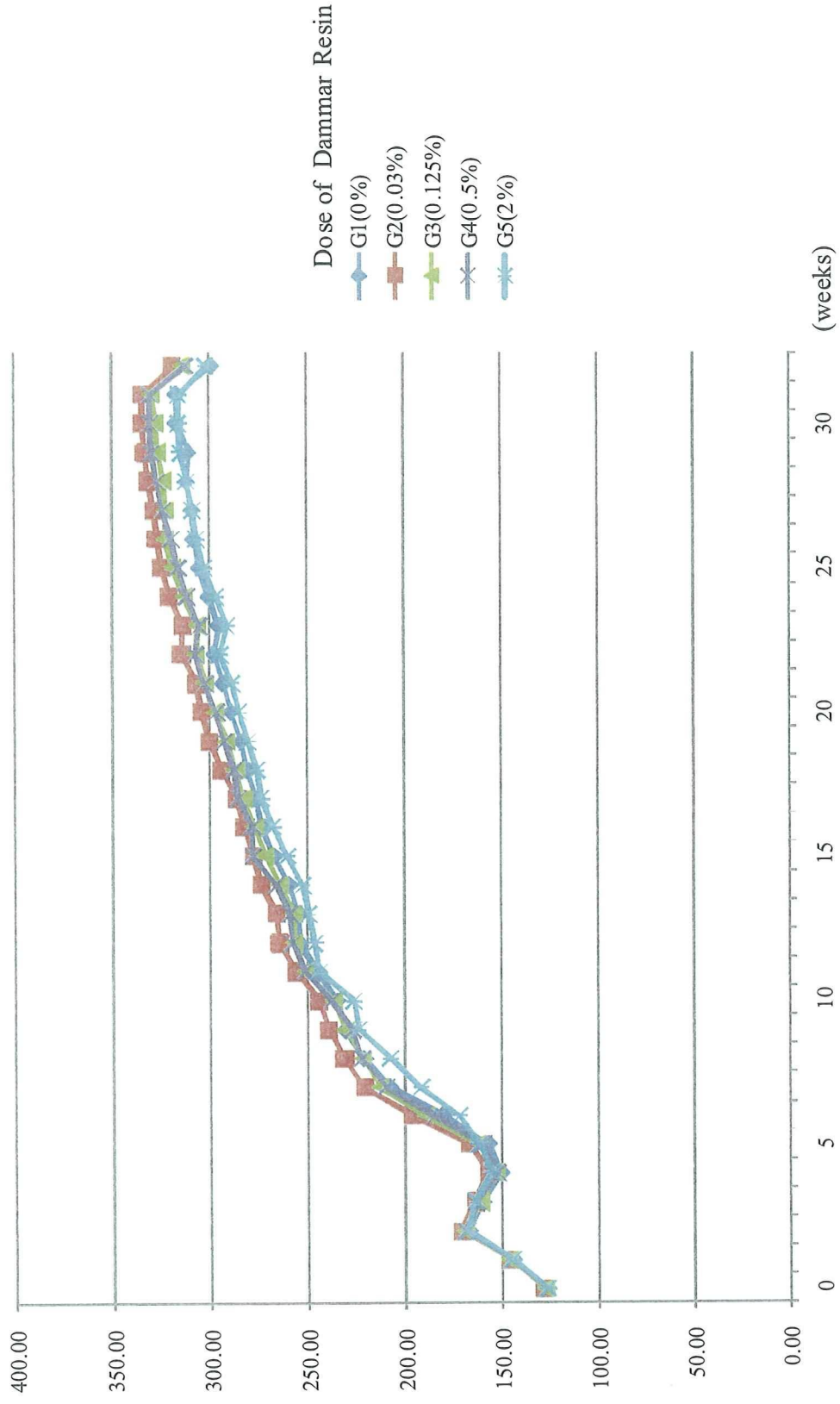


Fig.2 Body weight curves

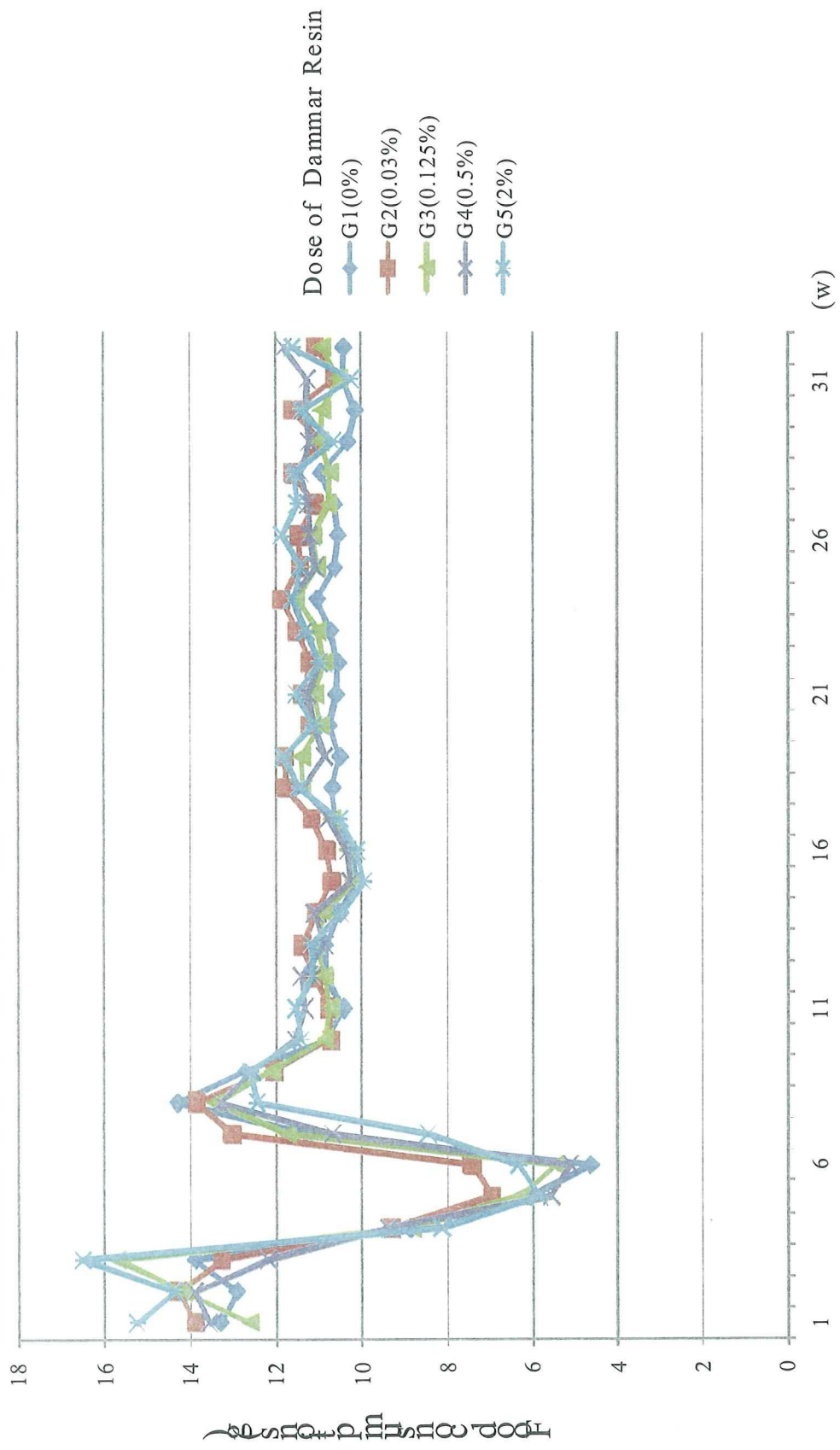


Fig.3 Food Consumptions

Table 9 Average of Food consumptions

Group	Dose of		No.*	Food consumption (g/rat/day)
	Dammar Resin			
1	0%		20	10.66 ± 1.79
2	0.03%		20	11.27 ± 1.46
3	0.125%		21	10.99 ± 1.72
4	0.50%		18	11.16 ± 1.51
5	2%		12	11.22 ± 2.14

\*Effective numbers of rats

Table 10 Hematological data

Item	Dammar Resin (%)	Dose level (%)			
		0.00 (N=20)	0.03 (N=20)	0.125 (N=21)	0.50 (N=18)
RBC	(x10 <sup>4</sup> /μL)	829±57a)	828±93	819±94	849±65
Hb	(g/dL)	14.4±1.7	14.1±2.1	14.2±2.0	14.5±1.1
Ht	(%)	44.3±4.0	43.7±5.3	42.8±5.5	43.6±3.1
MCV	(fL)	53.4±1.9	52.9±1.1	52.2±2.7	51.3±1.2
MCH	(pg)	17.4±1.4	16.8±1.0	17.3±1.2	17.0±0.3
MCHC	(g/dL)	32.4±1.4	32.0±1.5	33.3±0.9	33.1±0.7
PLT	(x10 <sup>4</sup> /μL)	64.5±9.8	68.0±10.8	61.3±9.7	59.3±5.0
WBC	(x10 <sup>2</sup> /μL)	44.9±7.7	45.3±8.2	48.9±11.4	52.5±8.0

a): Mean±S.D.

Table 11 Serum biochemical data

Item	Dammar Resin (%)	Dose level (%)				
		0.00 (N=20)	0.03 (N=20)	0.125 (N=21)	0.50 (N=18)	2.00 (N=12)
TP (g/dL)	6.6±0.3 <sup>a)</sup>	6.6±0.3	6.5±0.5	6.8±0.3	7.1±0.3*	
ALB (g/dL)	4.5±0.2	4.5±0.4	4.4±0.3	4.6±0.2	4.8±0.2	
BIL (mg/dL)	0.07±0.02	0.06±0.01	0.05±0.02	0.04±0.02	0.03±0.01*	
TC (mg/dL)	73.7±7.5	67.3±9.1	70.2±8.1	69.6±7.9	75.2±9.0	
GLU (mg/dL)	147±13	151±17	146±18	146±16	153±16	
TG (mg/dL)	77.4±24	89.9±21	89.0±32	61.8±16	61.4±44	
BUN (mg/dL)	20.9±1.9	21.9±1.7	22.3±1.9	20.2±1.9	21.4±7.0	
CRN (mg/dL)	0.30±0.02	0.34±0.02	0.33±0.04	0.29±0.02	0.28±0.02	
Ca (mg/dL)	10.4±0.3	10.5±0.2	10.1±0.4	10.3±0.3	10.6±0.2	
P (mg/dL)	5.1±0.8	4.8±0.5	4.6±0.6	5.0±0.3	5.4±0.4	
Na (mEq/L)	144±1.4	144±1.9	139±3.0	141±2.8	143±1.2	
Cl (mEq/L)	107.5±2.0	107.4±1.6	103.3±2.4	104.6±2.9	106.9±3.1	
K (mEq/L)	3.9±0.4	4.3±0.7	4.8±0.7	4.4±0.7	4.2±0.3	
AST (IU/L)	104.6±11.3	111.05±24.4	102.3±22.0	83.2±11.4	75.0±10.1*	
ALT (IU/L)	72.9±6.9	73.0±16.7	65.4±12.7	58.1±7.1	59.6±10.8*	
ALP (IU/L)	456.5±66.5	573.5±37.8	444.2±88.1	398.6±49.4	409.0±128.7	
?-GTP (IU/L)	3.0±0.01	3.2±0.5	3.1±0.5	3.4±0.6	3.8±1.7*	

a): Mean±S.D.

\*: Significantly different from the 0% (control) group at p<0.05.



Table 12 Absolute organ weights

Item	Dammar Resin dose level (%)				
	0.00 (N=20)	0.03 (N=20)	0.125 (N=21)	0.50 (N=18)	2.00 (N=12)
Body weight (g)	299±22 <sup>a)</sup>	318±24	314±25	312±20	301±14
Absolute (g)					
Organs					
Brain	1.98±0.05	1.98±0.05	1.99±0.05	1.98±0.05	1.94±0.03
Thymus	0.10±0.05	0.18±0.17	0.17±0.21	0.14±0.07	0.14±0.07
Lungs	1.18±0.08	1.19±0.08	1.13±0.11	1.20±0.26	1.15±0.11
Heart	0.91±0.04	0.92±0.05	0.93±0.08	0.95±0.04	0.90±0.06
Spleen	0.96±0.12	0.92±0.20	0.86±0.19	0.97±0.12	0.84±0.09
Liver	6.47±0.64	6.68±1.67	6.93±0.79	7.46±0.64*	8.71±1.11*
Adrenals	0.05±0.01	0.04±0.01	0.04±0.01	0.04±0.01	0.04±0.01
Kidneys	1.95±0.14	1.97±0.17	2.51±2.28	1.98±0.15	1.98±0.38
Testes	2.64±0.17	2.69±0.29	2.62±0.24	2.75±0.31	2.76±0.12
Salivary glands	0.41±0.04	0.43±0.06	0.42±0.04	0.42±0.03	0.43±0.05

<sup>a)</sup>: Mean±S.D.

\*: Significantly different from the 0% (control) group at p<0.05, respectively.

Table 13 Relative organ weights

Item	Dammar Resin dose level (%)			
	0.00 (N=20)	0.03 (N=20)	0.125 (N=21)	0.50 (N=18)
Body weight (g)	299±22 <sup>a)</sup>	318 ±24	314±25	312±20
Relative (g/100g B. W.) Organs				301 ±14 (N=12)
Brain	0.66 ±0.06	0.63 ±0.05	0.64 ±0.05	0.64 ±0.04
Thymus	0.03 ±0.02	0.06 ±0.06	0.05 ±0.06	0.04 ±0.02
Lung	0.40 ±0.03	0.38 ±0.03	0.36 ±0.03	0.38 ±0.07
Heart	0.30 ±0.03	0.29 ±0.02	0.30 ±0.03	0.31 ±0.02
Spleen	0.33 ±0.06	0.29 ±0.09	0.28 ±0.07	0.31 ±0.05
Liver	2.16 ±0.11	2.08 ±0.49	2.21 ±0.13	2.39 ±0.10
Adrenals	0.02 ±0.003	0.01 ±0.002	0.01 ±0.003	0.01 ±0.003
Kidneys	0.65 ±0.05	0.62 ±0.06	0.80 ±0.71	0.64 ±0.04
Testes	0.89 ±0.06	0.85 ±0.11	0.84 ±0.09	0.88 ±0.11
Salivary glands	0.14 ±0.02	0.14 ±0.02	0.13 ±0.01	0.13 ±0.01

a): Mean±S.D.

\*: Significantly different from the 0% (control) group at p<0.05, respectively

Table 14 GST-P Positive Foci

Group	Dose of Dammar Resin		GST-P Positive Foci		
	No. <sup>a</sup>	No./cm <sup>2</sup>	AREA (mm <sup>2</sup> /cm <sup>2</sup> )	No./cm <sup>2</sup>	AREA (mm <sup>2</sup> /cm <sup>2</sup> )
1	20	6.363 ± 3.478	0.670 ± 0.660		
2	20	5.977 ± 3.792	0.586 ± 0.345		
3	21	5.859 ± 3.594	0.598 ± 0.439		
4	18	6.754 ± 2.439	1.182 ± 1.283*		
5	12	7.850 ± 2.553	1.748 ± 1.154**		

<sup>a</sup> Effective number of rats

\*, \*\*: Represents significant difference from 0% (control) group (P<0.05, 0.01).

Table 15 Summary of histopathological findings.

Organ	Findings	Group				
		1 (0%)	2 (0.03%)	3 (0.125%)	4 (0.5%)	5 (2%)
	No. of rats	20	20	21	18	12
Liver	Biliary cyst/(2)a	0	0	1	3	0
	Cystic degeneration/(2)a	1	2	4	5	0
	Necrosis/(2)a	2	0	1	0	0
	Vacuolation, cytoplasmic(2)a	0	0	1	0	0
	Hyperplasia, bile duct	2	3	1	1	0
	Adenoma, hepatocellular	1	0	0	0	0
	Hemangioma	2	0	0	0	0
	Hepatocellular carcinoma	0	0	0	1	2

a: Numbers in parenthesis indicate the grades of lesion: (1) Minimal (2) Slight (3) Moderate (4) Marked (5) Severe

There were no significant intergroup differences.