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Historical Control Data from Repeated Dose 90-days Oral Toxicity Studies of Wistar Rats (Mlac:WR)

Passaraporn Srimangkornkaew Kittigan Suwannasaroj Pakamon Yottharat and Aunchalee Sirimontaporn

National Laboratory Animal Center, Mahidol University, Nakhon Pathom 73170, Thailand

ABSTRACT The control group data of any parameters such as age, sex, food/water consumptions, hematological, clinical biochemistry parameters and organs weights were useful for toxicity studies. The aim of this study was to collect data from 13-week of Wistar rats (Mlac: WR) which the strain widely used for toxicity study and efficacy research. The data of this research consist of hematological parameters and clinical biochemistry parameters including organ weights in 239 rats (119 males and 120 females) were collected base on 8 repeated dose 90-days oral toxicity studies and the result were shown as maximum and minimum values, means and standard deviations. Thus, these historical control group data would help to support for interpret the effects of test items in toxicity studies that used Wistar rats for further study.

Keywords: Wistar rat, Historical control data, Toxicity studies

Corresponding author E-mail: kittigan.suw@mahidol.edu

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Introduction

Wistar stain rat which the scientific name was *Rattus norvegicus* and this strain derived from Denmark. The weight of mature had in range 250 - 300 and 180- 220 grams for male and female animals, respectively. For the husbandry, various environment factors, such as ventilation, temperature and humidity were controlled under the HVAC system. The temperature and humidity were controlled at 22±3°C and 30- 70% RH. Lighting cycle was 12 hours lighting and 12 hours dark including the noise control to not more than 85 dB. Drinking water was reversed osmosis (RO) water with chlorine concentration of 5 - 7 ppm which sterile for *Pseudomonas aeruginosa*. Bedding made from corn cob and mixed with water hyacinth that sterilized at 135°C for 7 minutes before being used. The Wistar rat was used to study and research in different fields such as Nutrition, Pathology, Pharmacology, Toxicology, Physiology, etc.[1] This strain produced, husbandry by National Laboratory Animal Center (NLAC), Mahidol University and used in various toxicity and efficacy studies in many products such as food additives, pharmaceuticals and industrial chemicals which carried out according to international guidelines, such as OECD guideline or ISO 10993. For the background or historical data are used to determine various parameters ranges and these data were invaluable and essential because it was the first step for appropriate interpretation of treatment related changes and help better evaluate the toxicity of various substances.[2] Historical control data on toxicity studies in rodent,[3] rat[4, 5] and rabbit[6] or some strain of rat such as Crl: CD (SD)[2] or RccHan™: WIST and Crl: WI(Han)[7] have been previously reported. However, the background data of experimental parameters for Wistar rat (Mlac: WR) from National Laboratory Animal Center, Mahidol University in toxicity studies have not been published yet. The results in many studies that use this strain have been interpreted on the basis of background data from previous toxicity study instead of the histological control data. Therefore, the purpose of this study is to publish histological control data in Wistar rat (Mlac: WR) by collecting data from 13- week of Wistar rats (Mlac: WR) on 8 repeated dose 90- days oral toxicity studies. The results had 3 parts (hematological, clinical biochemistry parameters and organ weights) which were analyzed and shown as maximum and minimum values, means and standard deviations.

Materials and Methods

Preparation of Animals:

Healthy 13 weeks, 119 male and 120 female, Wistar rats (Mlac: WR) of body weight range 200 g ± 20% were obtained from Office of Laboratory Animal Production, National Laboratory Animal Center, Mahidol University, Thailand. The animal had been quarantined and acclimatized for at least 6 days prior to the study. They were observed from their general health. The animals had been housed in stainless steel cages (two rats/cage) with commercial feed diet (No. CP 082, Perfect Companion Group Co., Ltd) and 5- 7 ppm chlorinated water ad libitum under the following conditions: 12 hours light dark cycle, at temperature 22±3 °C and 30- 70% relative humidity.

In during the dosing period, the animal had received distilled water by gavage once daily. Guidelines of "Guide for the care and use of laboratory animals" were strictly followed throughout the study.[8] The study was approved by National Laboratory Animal Center Animal Care and Use Committee (NLAC- ACUC), Mahidol University; Thailand, approved all experimental protocols conducted between 2018 and 2020.

Hematological and Clinical biochemistry Analysis:

On the last day, all animals were kept for overnight (15- 18 hours) fasting (feed but not water) prior to blood sample collection. The animals were euthanized using CO_2 inhalation.[9] Blood samples were collected via cardiac puncture and separated into 2 tubes, one tube contained EDTA for hematological and the other tube for serum clinical biochemistry analysis. The hematological analysis used approximately 200 µl of blood and were analyzed by using an automated hematology analyzer (Procyte DxTM, IDEXX Laboratories, Westbrook, Maine, USA) which parameters, unit and measurement method were summarized in Table 1. For the clinical biochemistry analysis, that used approximately 800 µl of blood per sample. After that, blood will be coagulated by remaining at room temperature for 60 – 120 minutes and then centrifuged 2 times at 6,000 rpm for 10 minutes to collect serum samples. The clinical biochemistry analysis were measured by an automated blood analyzer (Cobas®c311, Roche Diagnostics, Basel, Switzerland). The parameters, unit and measurement method were shown in Table 2.

Table 1 The parameter, unit and measurement method for hematological analysis

Parameter	Abbreviation	Unit	Measurement Method
Red blood cell count	RBC	M/µl	Laser Flow Cytometry
Hemoglobin	HGB	g/dL	SLS-Hemoglobin Method
Hematocrit	HCT	%	Laser Flow Cytometry
Mean corpuscular volume	MCV	fL	$MCV = \frac{(Hct(\%) \times 10)}{(RBC\ Count \times (\frac{10}{L})^{12}}$
Mean corpuscular hemoglobin	MCH	pg	$MCH = \frac{(HGB\ (\frac{g}{dl}) \times 10}{(RBC\ Count \times (\frac{10}{L})^{12}}$
Mean corpuscular hemoglobin concentration	MCHC	g/dL	$MCHC = \frac{(HGB(\frac{g}{dl}) \times 1{,}000)}{MCV(fl) \times RBC \times (\frac{10}{L})^{12}}$
Red blood cell distribution width	RDW	fL	Laser Flow Cytometry
Reticulocyte count	RET	%	Laser Flow Cytometry
Reticulocyte hemoglobin	RET-He	pg	Optical Fluorescence
Platelet	PLT	K/µl	Laser Flow Cytometry
Platelet distribution width	PDW	fL	Laser Flow Cytometry

Table 1 The parameter, unit and measurement method for hematological analysis (Continued)

Parameter	Abbreviation	Unit	Measurement Method
Mean platelet volume	MPV	fL	Laminar Flow Impedance
Plateletcrit	PCT	%	Laminar Flow Impedance
White blood cell count	WBC	K/µl	Laser Flow Cytometry
Neutrophil	NEUT	%	Laser Flow Cytometry
Lymphocyte	LYMPH	%	Laser Flow Cytometry
Monocyte	MONO	%	Laser Flow Cytometry
Eosinophil	EO	%	Laser Flow Cytometry
Basophil	BASO	%	Laser Flow Cytometry

Table 2 The parameter, unit and measurement method for clinical biochemistry analysis

Parameter	Abbreviation	Unit	Method
Sodium	Na	mmol/L	ISE Indirect
Potassium	K	mmol/L	ISE Indirect
Chloride	Cl	mmol/L	ISE Indirect
Glucose	SGLU3	mg/dL	Enzymatic Hexokinase
Cholesterol	CHO2I	mg/dL	Enzymatic Colorimetric
Triglyceride	TRIGL	mg/dL	Enzymatic Colorimetric
Uric acid	UA2	mg/dL	Enzymatic Colorimetric
Blood urea nitrogen	U-BUN	mg/dL	Enzymatic Colorimetric
Creatinine	CREA2	mg/dL	Enzymatic Colorimetric
Total protein	TP2	g/dL	Colorimetric Assay
Albumin	ALB2	g/dL	Colorimetric Assay (Bromcresol Green – BCG)
Globulin	GLO	mg/dL	Calculate from Total Protein Albumin
High-density lipoprotein	HDLC4	mg/dL	Enzymatic Colorimetric
Low-density lipoprotein	LDLC3	mg/dL	Enzymatic Colorimetric
Alanine amino transferase	ALTL	U/L	IFCC without Pyridoxal Phosphate
Aspartate amino transferase	ASTL	U/L	IFCC without Pyridoxal Phosphate
Alkaline phosphatase	ALP2S	U/L	Colorimetric Assay/IFCC

Organ Weighting:

After blood samples collection, all animals were sacrificed. The positions, shapes, sizes and colours of internal organs were evaluated. The following organ: Liver, Kidneys, Heart, Adrenal glands, Brain, Testes, Epididymides, Ovaries and oviduct, Uterus, Spleen and Thymus were trimmed to visually detect gross lesions and weighed (For all of the paired organs were separately weighed) by using an electronic balance 4 digits (Mettler - Toledo, Columbus, Ohio, USA). Then, the weights of these organs were converted to relative organ weights by calculating in the relative weights per 100 g animal body weight.

Data collection and analyzed:

The data of Wistar rats (Mlac: WR) that same breeder, ages and animal sources of Wistar rats (Mlac: WR) on 8 repeated dose 90- days oral toxicity studies. This studies had been performed in the same of environment, equipment, and facility testing (National Laboratory Animal Center, Mahidol University, Thailand). All animal data were collected for hematological parameters, clinical biochemistry parameters, organ weights and then, statistical analysis was calculated by using Microsoft Excel (Version 2013, Microsoft Corporation, Redmond, WA, USA) and performed in maximum, and minimum values, means and standard deviations.

Results

The clinical biochemistry analysis data for male and female animals were shown in Table 3 and 4, respectively. For both sexes animal, the standard deviations of Total protein, Albumin, Sodium and Chloride were less than 10% of mean values. The standard deviations of male animals were less than 20% of mean values for Blood urea nitrogen, Creatinine, Uric acid, Cholesterol, Alkaline phosphatase, Potassium, Globulin and the standard deviations were more than 30% of mean values for Glucose, Triglyceride, Low- density lipoprotein, Aspartate amino transferase, Alanine amino transferase, High- density lipoprotein. In female animals had the standard deviations of Blood urea nitrogen, Creatinine, Alkaline phosphatase, Potassium, High- density lipoprotein, Globulin less than 20% of mean values and the standard deviations of Glucose, Uric acid, Cholesterol, Triglyceride, Low- density lipoprotein, Aspartate amino transferase and Alanine amino transferase were more than 20% of mean values.

Table 3 The hematological analysis of male animals

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
RBC (M/µl)	119	9.90 ± 0.74	12.06	3.49	8.42	11.38
HGB (g/dl)	119	17.4 ± 0.73	20.5	16.0	16.0	18.9
HCT (%)	119	54.8 ± 2.78	67.0	48.3	49.2	60.4
MCV (fL)	119	55.1±1.94	58.8	50.1	51.2	59.0
MCH (pg)	119	17.5 ± 0.43	18.5	16.1	16.6	18.4
MCHC (g/dl)	119	31.8 ± 0.94	34.5	29.8	29.9	33.7
RDW (fL)	119	32.0 ± 1.27	35.7	30.0	29.5	34.6
RET (%)	119	3.18 ± 0.53	4.48	0.61	2.12	4.25
RET-He (pg)	119	19.1 ± 0.47	20.1	17.9	18.2	20.0
PLT (K/µl)	119	888 ± 78.72	1215	699	731	1046
PDW (fL)	119	8.8 ± 0.51	10.2	7.5	7.8	9.8
MPV (fL)	119	7.3 ± 0.32	8.2	6.6	6.7	7.9

Table 3 The hematological analysis of male animals (Continued)

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
PCT (%)	119	0.65 ± 0.07	0.93	0.50	0.51	0.79
WBC (K/µl)	119	6.92 ± 1.09	9.89	4.18	4.73	9.11
NEUT (%)	119	12.1 ± 4.14	21.5	0.7	3.8	20.4
LYMPH (%)	119	81.4 ± 4.32	94.0	71.8	72.8	90.1
MONO (%)	119	5.4 ± 1.72	13.8	2.1	2.0	8.9
EO (%)	119	0.9 ± 0.30	1.9	0.3	0.3	1.5
BASO (%)	119	0.1 ± 0.11	0.5	0.0	0.0	0.3

Table 4 The hematological analysis of female animals

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
RBC (M/µl)	120	9.57 ± 0.60	11.26	8.35	8.36	10.78
HGB (g/dl)	120	17.8 ± 1.08	20.9	15.5	15.6	20.0
HCT (%)	120	55.9 ± 3.65	67.7	49.2	48.6	63.2
MCV (fL)	120	58.4 ± 1.53	62.4	53.9	55.4	61.5
MCH (pg)	120	18.6 ± 0.37	19.6	17.5	17.8	19.3
MCHC (g/dl)	120	31.8 ± 0.73	33.5	30.0	30.4	33.3
RDW (fL)	120	29.7 ± 1.09	32.9	27.4	18.2	22.9
RET (%)	120	3.43 ± 0.61	4.98	2.15	2.20	4.66
RET-He (pg)	120	20.1 ± 0.52	21.6	18.7	19.1	21.1
PLT (K/µl)	120	931 ± 86.24	1150	702	758	1103
PDW (fL)	120	8.5 ± 0.52	9.8	7.6	7.4	9.5
MPV (fL)	120	7.2 ± 0.31	7.8	6.5	6.5	7.8
PCT (%)	120	0.67 ± 0.07	0.90	0.52	0.53	0.81
WBC (K/µl)	120	4.87 ± 1.02	8.68	2.69	2.83	6.91
NEUT (%)	120	8.6 ± 3.11	19.2	0.8	2.4	14.8
LYMPH (%)	120	85.9 ± 3.41	93.7	74.2	79.1	92.8
MONO (%)	120	4.7 ± 1.15	8.8	2.5	2.4	7.0
EO (%)	120	0.6 ± 0.28	1.8	0.2	0.0	1.1
BASO (%)	120	0.2 ± 0.17	0.9	0.0	0.0	0.5

The hematological analysis data of both sexes animal showed the standard deviations of Red blood cell count, Hemoglobin, Hematocrit, Mean corpuscular volume, Mean corpuscular hemoglobin, Mean corpuscular hemoglobin concentration, Red blood cell distribution width, Reticulocyte hemoglobin, Platelet, Platelet distribution width, Mean platelet volume, Lymphocyte and Reticulocyte count, Platelet, White blood cell count were less than 10% and 20% of mean values, respectively but the standard deviations of other differential counts were more than 30% of mean values. The all data for the clinical chemistry analysis were summarized in Table 5 for male animals and Table 6 for female animals.

Table 5 The clinical biochemistry analysis of male animals

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
SGLU3 (mg/dL)	119	451.1 ± 94.54	731.3	255.8	262.0	640.2
U-BUN (mg/dL)	119	20.8 ± 3.22	31.3	14.4	14.4	27.2
CREA2 (mg/dL)	119	0.39 ± 0.06	0.61	0.29	0.27	0.50
UA2 (mg/dL)	119	8.4 ± 1.64	15.0	4.6	5.2	11.7
CHO2l (mg/dL)	119	81.7 ± 15.87	141.0	43.9	50.0	113.4
TRIGL (mg/dL)	119	133.3 ± 34.11	224.8	69.9	65.1	201.5
LDLC3 (mg/dL)	119	9.0 ± 3.48	18.5	2.8	2.0	15.9
ASTL (U/L)	119	129.9 ± 43.28	267.0	63.7	43.3	216.4
ALTL (U/L)	119	126.2 ± 60.92	324.8	37.0	4.3	248.0
ALP2S (U/L)	119	75 ± 14.29	143	45	46	103
TP2 (g/dL)	119	7.56 ± 0.74	11.74	5.73	6.09	9.03
ALB2 (g/dL)	119	5.16 ± 0.43	7.06	3.88	4.30	6.02
HDLC4 (mg/dL)	119	63.0 ± 13.11	108.6	33.4	36.8	89.2
Na (mmol/L)	119	152.9 ± 11.25	197.0	124.8	130.4	175.4
K (mmol/L)	119	11.65 ± 1.98	16.55	7.83	7.68	15.61
Cl (mmol/L)	119	104.0 ± 7.78	134.8	84.6	88.5	119.6
GLO (mg/dL)	119	2.39 ± 0.34	4.48	1.85	1.71	3.07

Table 6 The clinical biochemistry analysis of female animals

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
SGLU3 (mg/dL)	120	220.7 ± 91.99	524.1	59.4	36.7	404.6
U-BUN (mg/dL)	120	20.1 ± 3.15	35.2	12.7	13.8	26.4
CREA2 (mg/dL)	120	0.42 ± 0.07	0.65	0.29	0.29	0.56
UA2 (mg/dL)	120	5.0 ± 1.04	9.2	2.2	2.9	7.1
CHO2l (mg/dL)	120	95.9 ± 19.39	152.1	55.2	57.2	134.7

Table 6 The clinical biochemistry analysis of female animals (Continued)

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
TRIGL (mg/dL)	120	85.8±27.20	182.6	42.1	31.4	140.2
LDLC3 (mg/dL)	120	8.5±3.54	21.2	1.7	1.4	15.6
ASTL (U/L)	120	86.5±18.57	224.4	60.3	49.4	123.7
ALTL (U/L)	120	47.9±10.05	82.0	28.2	27.8	68.0
ALP2S (U/L)	120	35±6.68	67	20	22	49
TP2 (g/dL)	120	7.54±0.68	9.92	5.82	6.18	8.89
ALB2 (g/dL)	120	5.48±0.45	7.38	4.39	4.58	6.39
HDLC4 (mg/dL)	120	78.9±14.64	119.0	44.0	49.6	108.2
Na (mmol/L)	120	151.1±10.22	205.0	131.5	130.6	171.5
K (mmol/L)	120	12.18±2.37	19.32	6.52	7.44	16.92
Cl (mmol/L)	120	107.2±8.12	146.4	90.7	91.0	123.4
GLO (mg/dL)	120	2.05±0.27	2.89	1.48	1.50	2.60

The standard deviations for the organ weights of male animals were less than 10% of mean values for liver, right kidney, heart, spleen, brain, right and left testis. For the left kidney, lung, right and left adrenal, right and left epididymis had the standard deviations less than 20% of mean values except the standard deviations of thymus which more than 20% of mean values. The standard deviations of liver, right and left kidney, heart, spleen and brain in female animals were less than 10% of mean values. The other organ as lung, right and left adrenal, right and left ovary and oviduct and thymus had the standard deviations less than 20% of mean values on the other hand, uterus had the standard deviations more than 30% of mean values. The organ weights for male and female animals can be summarized as shown in the Table 7 and 8, respectively.

Table 7 The organ weights of male animals

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
Liver	119	2.6916 ± 0.19	3.2191	2.2943	2.3042	3.0790
Right Kidney	119	0.2547 ± 0.02	0.3087	0.2106	0.2177	0.2917
Left Kidney	119	0.2511 ± 0.03	0.4185	0.2080	0.1930	0.3093
Heart	119	0.2861 ± 0.02	0.3346	0.2538	0.2542	0.3179
Lung	119	0.4123 ± 0.06	0.6473	0.2875	0.2931	0.5316
Spleen	119	0.1751 ± 0.02	0.2121	0.1382	0.1434	0.2068
Brain	119	0.4260 ± 0.03	0.5060	0.3464	0.3628	0.4892
Right Adrenal	118	0.0075 ± 0.00	0.0107	0.0055	0.0057	0.0093

Table 7 The organ weights of male animals (Continued)

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
Left Adrenal	119	0.0084±0.00	0.0112	0.0061	0.0063	0.0105
Right Testis	119	0.3674±0.03	0.4567	0.2879	0.3017	0.4330
Left Testis	119	0.3695±0.03	0.4523	0.2904	0.3072	0.4317
Right Epididymides	74	0.1136±0.01	0.1441	0.0889	0.0903	0.1368
Left Epididymides	74	0.1133±0.01	0.1431	0.0836	0.0900	0.1366
Thymus	119	0.0598±0.01	0.0956	0.0384	0.0358	0.0838

Table 8 The organ weights of female animals

Organ	N	Mean ± SD	MAX	MIN	-2S.D.	+2S.D.
Liver	120	2.7335±0.25	3.4176	2.2193	2.2328	3.2343
Right Kidney	120	0.2936±0.01	0.3278	0.2526	0.2643	0.3229
Left Kidney	120	0.2804±0.02	0.3147	0.2385	0.2484	0.3124
Heart	120	0.3473±0.02	0.4135	0.3096	0.3074	0.3871
Lung	120	0.5895±0.09	0.8703	0.4058	0.4144	0.7646
Spleen	120	0.2271±0.02	0.2765	0.1639	0.1876	0.2667
Brain	120	0.7669±0.04	0.8795	0.6544	0.6817	0.8521
Right Adrenal	120	0.0162±0.00	0.0243	0.0119	0.0117	0.0206
Left Adrenal	120	0.0174±0.00	0.0282	0.0080	0.0121	0.0226
Right Ovary and oviduct	120	0.0179±0.00	0.0243	0.0127	0.0131	0.0227
Left Ovary and oviduct	120	0.0179±0.00	0.0258	0.0114	0.0127	0.0230
Uterus	120	0.2150±0.08	0.4324	0.1260	0.0624	0.3658
Thymus	120	0.0849±0.02	0.1405	0.0464	0.0521	0.1177

Discussion

The analyzed parameters for hematological and clinical biochemistry were frequently affected by fasting period, collection technique, conditions and methods of storage. In addition, the hematological parameters can be affected further by anticoagulants and measurement method. In our study, the parameter of hematological analysis consists of Red Blood Cells (RBC), Hemoglobin (HGB), Hematocrit (HCT), MCV, White Blood Cells (WBC), Neutrophils (NEUT), Reticulocytes (RET) in both sex animal and Lymphocytes (LYMPH), Basophils (BASO) in female animal were differences from previous reported findings.[10] The analyzed parameters of clinical biochemistry analysis were mostly differences tendency to that previously reported[10] except Alkaline Phosphatase (ALP). The fluctuation of data could be occurred due to age, gender, species and other factors.

The organ weights, male animal had number of epididymites in both sides less than another organ because some cases the tissue were missing. The organ weights parameters had affected by trimming method, weighting time, and measurement sensitivity. Addition notes of number for male and female animals were not the same because one of male animal died by the husbandry accident. For our study, the organ weight was similar tendency to that previously reported[5] except liver, kidney, heart, lung and testis in male animals and liver in female animals which the variation of data caused by species and other factors. However, the data included in this publication are for informational purposes only and can be used for establishing reference values for Wistar strain rats (Mlac: WR).

Conclusion

The present study carried out the hematological parameters, clinical chemistry parameters and organ weights data of 13- week Wistar rats (Mlac: WR) on 8 repeated dose 90- days oral toxicity studies to establish specific reference values of Wistar rats (Mlac: WR) which shown data in maximum and minimum values, means and standard deviations which will be helpful for interpretation of the experimental results and evaluation of the effects of various test items. For the future study, the data were usually improved in accuracy as the sample size increases.

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ข้อมูลกลุ่มควบคุมที่มาจากการทดสอบความเป็นพิษระยะกึ่งเรื้อรังทางปากของหนูแรทสายพันธุ์ Wistar (Mlac:WR)

ภัสสราภรณ์ ศรีมังกรแก้ว กฤติกาญจน์ สุวรรณสโรช ภคมณ ยศทรารัตน์ และอัญชลี สิริมนตาภรณ์
ศูนย์สัตว์ทดลองแห่งชาติ มหาวิทยาลัยมหิดล นครปฐม 73170

บทคัดย่อ ข้อมูลกลุ่มควบคุมของพารามิเตอร์ต่าง ๆ เช่น อายุ เพศ การบริโภคอาหาร/น้ำ ค่าโลหิตวิทยา ค่าเคมีคลินิกในเลือด และน้ำหนักอวัยวะ มีความสำคัญสำหรับการศึกษาความเป็นพิษ การศึกษานี้มีจุดมุ่งหมายเพื่อรวบรวมข้อมูลกลุ่มควบคุมจากการทดสอบความเป็นพิษของหนูแรทสายพันธุ์ Wistar (MLAC:WR) อายุ 13 สัปดาห์ ซึ่งเป็นสายพันธุ์ที่ใช้กันอย่างแพร่หลายในการทดสอบความเป็นพิษและการศึกษาประสิทธิภาพของสารทดสอบ โดยข้อมูลของงานวิจัยนี้ประกอบด้วยค่าโลหิตวิทยาและค่าเคมีคลินิกในเลือด รวมถึงน้ำหนักอวัยวะในหนู 239 ตัว (เพศผู้ 119 ตัว และ เพศเมีย 120 ตัว) ที่รวบรวมจากกลุ่มควบคุมของการทดสอบความเป็นพิษระยะกึ่งเรื้อรังทางปากจำนวน 8 การทดสอบ และผลการทดสอบแสดงอยู่ในรูปของค่าสูงสุด ค่าต่ำสุด ค่าเฉลี่ย และค่าส่วนเบี่ยงเบนมาตรฐาน ดังนั้น ข้อมูลกลุ่มควบคุมในอดีตเหล่านี้จะช่วยสนับสนุนการตีความผลความเป็นพิษของสารทดสอบในการทดสอบที่ใช้หนูแรทสายพันธุ์ Wistar ต่อไป

คำสำคัญ: หนูแรทสายพันธุ์ Wistar, ข้อมูลกลุ่มควบคุม, การทดสอบความเป็นพิษ