

Reference values for blood chemistry in the cotton rat (*Sigmodon hispidus*)

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Introduction

Since Armstrong (Armstrong 1939) used the cotton rat as a laboratory animal for the first time for studying poliomyelitis infection, cotton rats have been used for experimental filariasis studies (Bayer & Wenk 1983, Müller-Kehrmann 1988, Pringle & King 1968, Tanaka 1965, Tanaka 1967). This animal species is also used as an experimental host of *Leishmania donovani*, *Echinococcus* spp. and paragonimiasis (Iglauer *et al.* 1993, Vaux-Peretz 1991).

The cotton rat (*Sigmodon hispidus*) belongs to the family Crecetidae in the suborder Myomorpha of the order Rodentia.

We have previously reported hematological standard values (Katahira & Ohwada 1993)

and body surface area (Ohwada & Katahira 1993) in this animal species.

However, a few blood chemistry values remained undetermined. The reference values must be established for quantitative use of the cotton rat in research. Therefore, 15 reference values for blood chemistry were recorded herein.

Materials and methods

Animals: Twenty-eight cotton rats (17 females and 11 males) were bred in our laboratory for use in this study. At the time of the study, they ranged from 122.0 to 170.0 g (female) and 91.0 to 190.0 g (male) in weight. The animals were housed in plastic cages, lined with sterilized wood chips. These cages were kept

Table 1. Reference values in blood chemistry for cotton rat.

Item(Unit)	Abbreviation	Female				Male				Diff.
		n	Mean±SD	Min.-Max.	C.V.	n	Mean±SD	Min.-Max.	C.V.	
Total protein(g/dl)	Tp.	17	7.06±0.34	6.40-7.70	4.86	11	7.09±0.62	6.20-7.90	8.68	NS
Albumin(g/dl)	Alb.	17	2.95±0.24	2.30-3.30	8.22	11	3.08±0.29	2.60-3.50	9.27	NS
Blood urea nitrogen(mg/dl)	BUN	17	22.06±3.34	17.40-23.40	15.14	11	21.21±2.53	17.80-25.10	11.93	NS
Creatinine(mg/dl)	Crea.	15	0.65±0.18	0.30-1.00	27.33	11	0.50±0.12	0.30-0.70	23.66	P<0.05
Uric Acid(mg/dl)	UA	17	1.09±0.75	0.40-3.10	68.20	11	0.73±0.28	0.40-1.20	37.95	NS
Total bilirubin(mg/dl)	Tb.	17	0.18±0.13	0.00-0.40	70.54	11	0.19±0.19	0.00-0.70	97.87	NS
Glutamate oxaloacetate transaminase(IU/l)	GOT	15	153.39±28.71	118.60-214.20	18.72	10	120.41±56.20	41.80-202.40	46.68	NS
Glutamate pyruvate transaminase(IU/l)	GPT	16	82.88±33.96	35.30-164.70	40.98	11	63.95±34.39	11.40-113.80	53.78	NS
Alkaline phosphatase(U/l)	ALP	17	123.45±31.20	70.70-186.60	31.20	11	139.19±29.82	89.60-191.10	21.42	NS
Creatine phosphokinase(IU/l)	CK	17	236.15±135.09	100.70-823.40	57.20	11	167.15±104.99	36.70-358.00	62.81	NS
Lactate dehydrogenase(IU/l)	LDH	17	280.00±78.67	184.90-448.50	28.41	11	231.46±60.19	161.00-363.20	26.00	NS
Glucose(mg/dl)	Glu.	17	181.53±65.97	83.70-352.00	34.45	11	164.46±35.44	107.20-237.20	21.55	NS
Cholesterol(mg/dl)	Cho.	17	66.73±22.95	32.90-131.40	34.39	11	80.21±20.04	56.30-121.00	24.98	NS
HDL-Cholesterol(mg/dl)	HDL-Cho.	17	34.98±16.56	19.40-81.30	47.35	11	42.93±13.42	23.50-67.20	31.26	NS
Triglyceride(mg/dl)	TG	17	156.52±69.17	70.90-444.30	56.97	11	91.05±30.61	53.50-138.70	33.62	P<0.05
Body weight(g)	B.W.	17	140.29±13.99	122.00-170.00	9.98	11	130.09±25.33	91.00-190.00	20.24	-

SD:Standard deviation

C.V.:Coefficient of variation

Min.-Max.:Minimum and maximum value

Diff.:Significant difference with sex

NS:No significant difference

in an animal room at an ambient temperature of $22 \pm 2^\circ\text{C}$ and $55 \pm 5\%$ humidity. The animals were given a commercial solid diet for rats (Charles River, Inc.) and water *ad libitum* with an autowatering apparatus.

Blood collection: The animals were anesthetized with diethylether and exsanguinated from the canal vena cava.

Blood chemistry: Fifteen items, shown in Table 1, were measured. Measurements were carried out with a VISION™ system (DYNABOTT). Whole blood was used for all analyses and all items were measured on the day of sampling.

Statistical analysis: A personal computer (NEC PC9801 UX) and statistical software package (VIEW FLEX Co. Ltd.) were used. The mean, standard deviations (SD) and coefficients of variation (C.V.) were calculated. The sex differences among items were also analyzed.

Results and discussion

Table 1 shows the results expressed as the mean and standard deviation, coefficient of variation, minimum-maximum value range according to sex.

UA, TB, GPT, CK, HDL-CHO and TG values in females and TB, GOT, GPT, CK values in males varied widely with their coefficient of variation being over 40%.

Significant sex-related differences were found for creatinine and triglyceride ($P < 0.05$).

Compared to the reference values for rat (Mitruka & Rawnsley 1991), the average values for TP, ALB, UA, TB, TG in the cotton rat tend to be lower than those in the rat. On the contrary, the average values for BUN, GOT, GPT, ALP, CK, LDH, GLU in the cotton rat were higher than those in the rat. These findings stimulate interest in comparative research to clarify the details.

The range of fluctuation in measured values was small except for the items described in the text.

The present report provides useful reference values for the cotton rat.

Summary

Fifteen blood chemistry values for cotton rat (*Sigmodon hispidus*) were measured in 17 females ranged from 122.0 and 170.0 g and 11 males ranged from 91.0 to 190.0 g in weight. Significant sex differences were found for creatinine and triglyceride ($P < 0.05$). Six items (UA, TB, GPT, CK, HDL-CHO, TG) in females and 4 items (TB, GOT, GPT, CK) in males varied with coefficient of variation being over 40%. The average values for TP, ALB, UA, TB in the cotton rat tended to be lower than those in the rat. On the contrary, the average values of GOT, GPT, ALP, CK, LDH, GLU tended to be higher than those in the rat.

Sammendrag

I den här rapporten publiceras referensvärden för 15 kemiska blodvärden i båda kön av bomullsråtten (*Sigmodon hispidus*).

Yhteenveto / K. Pelkonen

Tässä tutkimuksessa on mitattu 15 verimuuttujan viitearvot 17 naaraspuolisesta puuvillarotasta (cotton rat, *Sigmodon hispidus*), joiden paino vaihteli 91–190 gramman välillä, ja 11 uroksesta, joiden paino vaihteli 91–190 gramman välillä. Kreatiniinin ja triglyseridien määrässä oli merkittävästi eroa sukupuolten välillä ($p < 0.05$). Vaihtelukertoin oli yli 40% naarailla kuudessa muuttujassa: virtsahappo, kokonaisbilirubiini, GPT, kreatiinifosfokinaasi, HDL-kolesteroli, triglyseridit, ja uroksilla neljässä muuttujassa: kokonaisbilirubiini, GOT, GPT, kreatiinifosfokinaasi. Kokonaisproteiini, albumiini, virtsahappo ja kokonaisbilirubiini olivat puuvillarotalla alemmat, mutta GOT, GPT, alkalinen fosfataasi, kreatiinifosfokinaasi, maitohappo ja glukoosi korkeammat kuin rotalla.

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