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Hematology and Serum Chemistry Values in Adult Minks in Hebei Province, China

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Abstract: This study examined hematology and serum chemistry status of adult American minks (Mustla vison), living in the Changli fur farms of Hebei province, Eastern China to provide important baseline data for clinical diagnosis and breeding in the corresponding animal species. The 41 values were compared between males (n = 10) and female (n = 10) minks. The results showed that gender influenced ($p<0.05$) serum biochemistry values. Male minks had higher ($p<0.05$) Creatin Kinase (CK) and Alanine aminotrotransferase (ALT) and lower ($p<0.05$) Amylase (AM) than females. However, the hematology values were not different by genders.

Key words: Blood chemistry, hematology, mink, gender, farms, China

INTRODUCTION

Minks being the special economic animals are known as excellent species that played vital role in the world's fur industry. Fur animals were originally cultivated and breed in European countries while fur animal breeding has developed rapidly in China which stimulated the regional economics development in recent years. With the expanded farming and lack of corresponding systematic basic research on wild animals, the difficulties in diseases diagnosis of minks are under concern.

Previous study on hematological parameters in raccoon dogs, foxes and minks was reported about 60-70 years ago (Kennedy, 1935; Spitzer *et al*., 1941). Hematological value differs with the variation among different animal species, sex, age, nutritional status and seasons (Crooks *et al*., 2000). Additionally, the hematological indicators are widely used to assess animal health, physical condition, indirectly reflecting the nutritional status, disease, injury, life environmental quality, external stimulus and so on (DelGiudice *et al*., 1991; Gates and Goering, 1976; McCue and O'Farrell, 1987, 1992; Seal *et al*., 1975; Smith and Rongstad, 1980). Only one research on the determination of blood data in minks of plateau area had been reported in China, no further study was done related to the hematological indicators in the captive minks.

Hematology and serum chemistry values are essential diagnostic tools to assess the health of captive and free-ranging animal populations. Therefore, it is necessary to provide updated reference values for minks. The experiment was conducted to measure the normal values of hematology physiological and biochemical indicators for minks and hopefully to provide reference data for future captive breeding and clinical veterinary diagnosis in the corresponding animal species.

MATERIALS AND METHODS

Sample animals: The 20 minks (Local American black minks, 6 months old) male and female ratio 1:1 were taken from the fur animal breeding farms in Changli county of Hebei province, Eastern China which located at longitude 118°45'-119°20', latitude 39°22'-39°48' and warm temperate and semi-humid continental climate. The sampled animals were domesticated for many years and were species representative. All animal were in good condition and seemed overtly healthy.

Blood samples collection: After the experimental animals were fasted 12 h for each individual, a 5 mL sample of blood were collected from the heart (minks) at 9:00 am. For each animal, 1 mL of the sample was collected into tubes containing EDTA for hematology analysis in this study.

About 4 mL of blood samples was collected into a tube voided of an anticoagulant to obtain serum for biochemistry analysis. All blood samples were stored in cool boxes (4-8°C) for the 20-30 min transport to the

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research base. Aliquots with no EDTA were centrifuged at 3,000 rpm for 10 min (TGL-16G, Centrifuge, Shanghai Anting Science Instrument Factory, China); serum was recovered, placed in labeled cryotubes.

Determination indexes and methods: Erythrocytes, leukocytes, eosinophils, basophiles, neutrophils, lymphocytes, monocytescounts counts, MCV, MCH and hemoglobin content were determined by hematology analyzer (KX21, Sysmex Corporation, Japan). The concentrations of potassium, sodium, chloride, calcium in serum were determined by electrolyte analyzer (XD-685, Shanghai Xunda Medical Device Co., Ltd., Shanghai, China) and the activity levels of amylase, GGT, GOT, CK and so on were determined by automatic biochemical analyzer (Liasys, AMS Corporation, Italy).

Statistical analysis: Data are presented as means-Standard Error of Mean (SEM). Statistical analyses were performed using SPSS 14.0. Comparison of mean hematology and blood biochemistry values on the basis of gender were performed using a Student's t-test. Differences were considered significant at $p<0.05$.

RESULTS AND DISCUSSION

The hematologic values for male versus female minks: Hematology values were not by genders ($p>0.05$) (Table 1). However, the data analysis results showed that the lymphocyte and monocyte percent of female minks were lower than males, the others hematologic values of female minks were higher than males.

The serum chemistry values for male versus female minks: The results indicated that male minks had significantly higher activities of CK and GPT and lower activity of amylase than females ($p<0.05$) (Table 2). The lactate dehydrogenase, hydroxybutyric dehydrogenase, total bilirubin, direct bilirubin, indirect bilirubin, aspartate aminotransferase and uric acid of male minks were higher than females whereas no other significant differences were found between genders ($p>0.05$). However, blood

Table 1: Hematological values between genders of minks

Hematology traits	Female (n = 10)	Male (n = 10)	Mean±SEM
Leukocytes (10^9 L^{-1})	5.49±1.860	5.00±1.8700	5.22±1.840
Erythrocytes (10^{12} L^{-1})	9.26±2.220	9.21±1.0700	9.23±1.670
Hemoglobin (g L^{-1})	160.2±36.240	154.64±15.460	157.29±26.81
Hematocrit (L L^{-1})	0.50±0.120	0.48±0.0600	0.49±0.090
Mean corpuscular volume (fL)	53.62±1.410	52.42±1.0500	52.99±1.350
Mean corpuscular hemoglobin (Pg $cell^{-1}$)	17.44±0.830	16.77±0.4900	17.09±0.740
Mean corpuscular hemoglobin concentration (g L^{-1})	325.10±13.31	321.18±5.9500	323.05±10.07
Platelets (10^9 L^{-1})	274.50±72.28	274.25±122.81	274.38±97.34
Basophils (%)	1.25±0.960	1.00±0.9600	1.00±0.930
Eosinophils (%)	2.25±0.960	1.00±0.8200	1.63±1.060
Neutrophils (%)	43.50±1.290	41.00±2.1600	42.25±2.120
Lymphocytes (%)	50.25±3.400	53.67±2.1600	52.13±3.310
Monocytes (%)	2.75±1.710	3.33±1.2600	3.00±1.410

Means in the same line with different superscripts are significantly different ($p<0.05$)

Table 2: Serum chemistry values in minks among genders

Serum biochemistry traits	Female (n = 10)	Male (n = 10)	Mean±SEM (n = 20)
Amylase (U L^{-1})	121.49±29.51^a	97.95±15.21^b	112.66±27.17
Creatine kinase (U L^{-1})	873.78±448.79^b	1272.95±243.47^a	1091.51±392.00
Lactate dehydrogenase (U L^{-1})	981.70±299.95	1262.61±220.72	1122.16±293.52
Hydroxybutyric dehydrogenase (U L^{-1})	504.77±166.33	706.91±94.12	612.58±164.87
Totalbilirubin (μmol L^{-1})	7.06±2.29	10.26±3.18	8.86±3.19
Direct bilirubin (μmol L^{-1})	4.96±1.17	6.43±2.17	5.79±1.90
Indirect bilirubin (μmol L^{-1})	2.11±1.39	3.82±1.15	3.08±1.50
Alanine aminotransferase (U L^{-1})	194.06±60.46^B	237.71±26.78^A	222.12±45.14
Aspartate aminotransferase (U L^{-1})	189.32±32.41	229.01±26.99	213.13±34.59
Glutamyltransferase (U L^{-1})	5.36±1.79	6.22±2.47	5.86±2.19
Alkaline phosphatase (U L^{-1})	136.77±53.41	135.01±61.51	135.89±55.35
Total protein (g L^{-1})	72.47±12.95	78.03±6.77	75.53±10.14
Albumin (g L^{-1})	35.87±2.54	36.63±2.31	36.21±2.40
Globulin (g L^{-1}))	36.59±12.64	37.91±4.67	37.21±9.48
Glucose (mmol L^{-1})	5.01±1.22	5.41±1.58	5.22±1.39
Uric acid (mmol L^{-1})	197.49±67.95	252.65±89.99	226.91±82.70
Blood urea nitrogen (mmol L^{-1})	10.41±2.76	8.41±1.95	9.41±2.54
Creatinine (μmol L^{-1})	83.38±17.90	62.10±16.92	74.63±23.65
Inorganic phosphorus (mmol L^{-1})	2.42±0.75	2.38±0.54	2.40±0.63
Magnesium (mmol L^{-1})	1.49±0.19	1.46±0.17	1.47±0.11
Total cholesterol (mmol L^{-1})	8.29±1.22	8.32±1.26	8.31±1.21
Triglyceride (mmol L^{-1})	1.44±0.34	1.35±0.28	1.40±0.31
Potassium (mmol L^{-1})	7.77±1.17	7.86±0.74	7.82±0.95
Sodium (mmol L^{-1})	156.87±2.39	157.08±3.44	156.98±2.92
Chloride (mmol L^{-1})	112.03±2.56	113.42±2.16	112.76±2.41
Calcium (mmol L^{-1})	1.17±0.10	1.20±0.04	1.19±0.07

Means in the same line with different superscripts (capital letters) are significantly different ($p = 0.01$); Means in the same line with different superscripts (small letters) are significantly different ($p<0.05$)

urea nitrogen, creatinine, inorganic phosphorus and triglyceride in serum were lower in malesthan in females ($p>0.05$).

This is the first systematic evaluation of the hematology and serum biochemistry of adult minks in Changli, Hebei province, China. These findings provide important baseline data for an ongoing effort to examine the influence of rapid human encroachment on disease susceptibility and long-term fitness of this species.

The hematological reference values are the main indicators not only for health prevalence but also for diagnosis and detection of disease. The number and size of RBC and the hemoglobin content can reflect the blood oxygen-carrying capacity of animals. The determination results showed that there were no significant difference in RBC count and hemoglobin content between genders of minks ($p>0.05$). However, compared with the report ($12.63\times1012\ L^{-1}$, 19.38 g) of Liu and Gong (1979) in Qinghai province the number of RBC ($9.23\times1012\ L^{-1}$) and the content of hemoglobin (15.73 g) were decreased. The hemoglobin content MCV and MCH were lower than the report of Fletch and Karstad (1972). Under different feeding and management conditions, the blood parameters are different.

Thus, these difference may be caused by the remarkably different ecology environment in which animals lived. Because the bone marrow hyperactivity was stimulated in the high altitude environment, the number of RBC and the content of hemoglobin increased sharply under such conditions.

In this trial, 28 serum chemistry values were determined the results indicated that male minks had significantly higher activities of CK and GPT and lower activity of amylase than females ($p<0.05$). The lactate dehydrogenase, hydroxybutyric dehydrogenase, Total Bilirubin (TB), Direct Bilirubin (DB), Indirect Bilirubin (IB), Aspartate Aminotransferase (AST) and Uric Acid (UD) of male minks were higher than females ($p>0.05$). Blood urea nitrogen, creatinine, inorganic phosphorus and triglyceride in serum were lower in males than in females ($p>0.05$).

CONCLUSION

In this research based on the functions of the liver and kidney relevant indicators minks it was clear that TB, DB, ALT, AST, ALP and LDH were significantly higher in male minks than females on the liver metabolism. The relatively stronger liver metabolism in males suggests that male minks might have stronger detoxification ability than females.

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