IRON CONTENT IN ANIMAL HAIR AND RESULTS OF HEMATOLOGICAL AND BIOCHEMICAL INVESTIGATIONS IN FREE-LIVING AND DOMESTIC CATS FROM THE WARSAW REGION

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Key words: free-living cats, domestic cats, animal hair, iron, hematology, ALAT, AspAT, AP, glucose, creatinine, urea.

Introduction

In relation to its content iron in animal organisms is between micro- and macro-elements. Its elimination is small and it happened mainly through the alimentary way. Biological role of iron results from the fact that it is a component of hemoglobin, cytochromes, hemosiderin, myoglobin, haptoglobin, and transferine (Anke 1994, Jurczyk 2000). This element also plays a particularly important role in specific and nonspecific immune mechanisms (Kondracki and Bednarek 1996). In the course of newest investigations a peptide playing a key role in iron metabolism was identified and called hepcidin (Kosla et al. 2004).

At present the population of cats living in urban environment could be divided into a number of categories: a/ Animals living exclusively in human houses. They don't hunt; they are fully dependent on human care. b/ Homeless cats living close to human houses. They are directly (purposeful feeding) or indirectly (wastes) fed by man. c/ Domestic cats with outdoor access which comprise a medial category between animals from group a and b (Liberg and Sandell 1988, Natoli 1994, Gunther and Terkel 2002).

Feral urban cat as a synanthropic animal living in the urbanized environment feeds on human consumption wastes. Thus it can be treated as a bioindicator of the presence of certain elements in the environment.

The aim of the present report was an attempt at noting whether there is a correlation between the iron content in hair of free living and domestic cats and hematological and biochemical indicators in those animals.

Material and methods

The investigation material comprised feral urban cats of both sexes and domestic cats. Homeless animals were caught alive in the Warsaw district – Ursynow within the action of limiting the population of homeless cats. After catching the animals were subjected to surgical spaying. On the basis of clinical examination a group of twenty males and females, which did not show any pathological signs, was selected. Hair samples were shorn off from the animal stomach region and blood samples were collected from the cephalic vein. Hair samples, defatted in 70% ethyl alcohol for 20 min. were mineralized in the microwave apparatus under pressure (HNO_3, sample from 0.25 g to 0.5 g of aired dry matter). Iron in the hair was determined with the help of the ICP-OES method. Morphology and smear were done in the blood samples and biochemical indicators ALAT, AspAT, AP and the level of glucose; creatinine and urea were determined in the blood serum. The obtained results were analyzed statistically with the help of the program Statistica™ 5.0.

Results

Statistical analysis concerning the content of iron did not reveal any significant differences between the group of free-living cats and domestic cats, also in the group of females and males (Table 1).

Statistical analysis of hematological parameters (leucocytes, segments and eosinophilic) showed the existence of significant differences between free-living and domestic animals (Table 2). Significant differences ($p<0.05$) also appeared in the analysis of biochemical parameters of blood serum and concerned creatinine and glucose content while highly significant differences ($p<0.01$) appeared in relation to alkaline phosphatase, alanine aminotransferase, creatinine and urea (Table 3).

Table 1. Iron content in the hair of investigated cats ($mg \cdot kg^{-1}$ d.m.)

Statistical parameters	Females		Males		Total number of animals
	Free-living	Domestic	Free-living	Domestic	
Arithmetic mean	74.4	40.4	128.2	140.4	95.85
Standard deviation	38.69	29.24	141.4	165.9	110.58
Lower quartile (25%)	46.0	16.0	27.0	28.0	24.0
Median	95.0	31.0	35.0	77.0	51.5
Upper quartile (75%)	101.0	57.0	241.0	156.0	105.0

Table 2. Mean values of particular hematological parameters in the group of investigated cats

Investigated parameter	Females		Males		Total number of animals
	Free-living	Domestic	Free-living	Domestic	
Hb g/l	136	140.2	132.6	132.2	136.25
RBC T/l	9.11	9.73	8.9	9.45	9.29
WBC G/l	10.9	8.2*	11.5*	8.52*	9.81
MCV fl	44.9	46.78	46.2	45.06	45.73
EO%	1.4	1.6	0.0	3.6	1.65
Rods%	1.8	1.4	1.4	1.6	1.55
Segments%	75.2*	56.6*	67.8	55.0*	63.65
Lymphocytes%	21.2	33.2	26.2	34.8	28.85

* - significant differences ($p<0.05$)
** - highly significant differences ($p<0.01$)

Table 3. Mean values of the chosen biochemical parameters of blood serum in the investigated cats

Investigated parameter	Females		Males		Total number of animals
	Free-living	Domestic	Free-living	Domestic	
AspAT U/l	64.6	77.12	53.6	47.28	60.65
ALAT U/l	100.52	125.72**	89.7	66.66**	95.65
AP U/l	69.8	87.94**	45.9**	68.44	68.05
Glucose mg%	122.6*	97.5*	93.5*	105.5	104.8
Creatinine mg%	1.34**	1.52*	1.6**	1.6**	1.52
Urea mg%	47.2**	43.06**	47.7**	60.0**	49.48

* - differences significant ($p<0.05$)
** - differences highly significant ($p<0.01$)

Discussion

In the accessible literature there are no data concerning the trials at determining the iron content in the hair of cats. Up till now, there were few experiments in which the iron content was determined in the tissues of cats. While determining the content of iron in the tissues of cats, Soltysiak et al. (1997) obtained the following results: brain – 21.09, cerebellum – 26.46; liver – 164.00, kidney – 61.80 $mg \cdot kg^{-1}$ fresh tissue. In farm animals from which consumption meat is obtained analyses can be performed *post mortem* as a reflection of the microelement status in a particular region. Unfortunately in the case of cats, analyses of tissues are only performed in ill animals, thus the results could be mistaken as being affected by the disease process. Comparing the content of iron in the hair of cats with the results obtained for the hair of horses the lack of significant differences depending on the animal sex is clearly visible (the mean iron content in mares amounted to 34 $mg \cdot kg^{-1}$ d.m. and in geldings 31 $mg \cdot kg^{-1}$ d.m.) whereas no significant differences were observed depending on age and hair colour. Depending on the living under various conditions there were also no significant differences (28 – 39 $mg \cdot kg^{-1}$ d.m.) (Kosla 1988).

In the hematological investigation both in males and females the obtained results corresponded to the reported in the literature reference values accepted for this species of

animals (Winnicka 2002). In the case of feral urban cats the basic difficulty of the experiment is the gathering of a group of healthy animals. Frequently hunted animals show some disease symptoms, which are the contraindication for performing surgery, and thus they disqualify them for the experimental work. The survival rate of cats is limited by a number of factors such as infectious and invasive diseases, poisonings and communication accidents. In the case of males an important role is played by injuries suffered during territorial battles (Remfry 1981).

Conclusions

1. The mean iron content in the hair of the investigated cats amounted to 95.85 $mg \cdot kg^{-1}$ d.m., while in free-living males the mean iron content in the hair amounted to 128.2 $mg \cdot kg^{-1}$ d.m. and in females to 74.4 $mg \cdot kg^{-1}$ d.m. and in domestic cats the mean value of the iron content for males was 140.4 $mg \cdot kg^{-1}$ d.m. and in females 40.4 $mg \cdot kg^{-1}$ d.m.
2. There were observed differences in the level of hematological parameters depending on the way of living of cats.
3. Differences were observed in the content of biochemical parameters depending on the way of living and the sex of cats.

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