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IRON CONTENT IN THE HAIR OF SCHNAUZER BREED DOGS FROM THE REGION OF WARSAW DEPENDING ON THE BREED, SEX AND COLOUR

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Introduction

Iron is a component of all tissues and organs of mammals. In the organism most iron is bounded in haemoglobin and mioglobin (Kabata-Pendias, Pendias 1998) while iron reserve is stored in the form of haemosiderin, transferrin and ferritin (Kosla 1999, Jurczyk 200). The storage place of iron is the liver and spleen (Kabata-Pendias and Pendias 1999).

Better understanding of factors regulating the magnitude of iron absorption from the alimentary tract, repeated use of iron from the ageing cells, increased deposition of iron in the liver was possible due to the discovery and investigation of the role of hepcidine, a hormone responsible for iron metabolism (Kosla 2004).

The iron content in the hair is an adequate intravital indicator of the organism supply with that element (Combs et al., 1982, Narasimhalu et al. 1986, Grace 1986). Kosla (1988) demonstrated the correlation between that metal content in the hair and muscles of horses, while Yoshinaga et al. (1990) did not find the correlation between iron content in the hair and various organs of man.

The aim of the present research was the determination of iron content in the hair of dogs from the region of Warsaw agglomeration; the differences in the iron content in the hair of dogs depending on their sex, breed and colour were also determined.

Material and methods

The investigation material comprised hair samples collected from dogs from the group of schnauzer breed (black giant schnauzer, salt and pepper giant schnauzer, black medium schnauzer, salt and pepper medium schnauzer, black miniature schnauzer, salt and pepper miniature schnauzer, black and silver miniature schnauzer, according to Sciesinski 2003) from the region of Warsaw. Hair samples were collected at the pet beauty parlour during dog

shearing. Shearing was done close to the skin with the help of electric shaver. Thirty-five hair samples were collected; 15 from females and 20 from males. All samples were degreased with 70% ethyl alcohol in the extraction apparatus SER 148. Time of degreasing from the moment of alcohol boiling was 20 min. Then hair was washed with hot water and three times rinsed with redistilled water. Squeezed samples were left to dry on the blotting paper. In order to obtain dry matter samples were placed in the early prepared crucibles in the drier at the temperature of 105ºC. After weighing, crucibles were placed in the muffle furnace in which the burning temperature was gradually increased from 250º to 450ºC. Ash was dissolved in 25% hydrochloric acid and transferred quantitatively to calibrated flasks, standardizing it with 2.5% HCl in a sample. In such prepared samples, the iron content was determined using the method of flame atomic absorption spectrophotometer (FAAS) in the apparatus Shimadzu in the Section of Physicochemical Analyses SGGW. The obtained results were analyzed statistically using the program Statistica. The following features were compared: sex, breed, hair colour.

One-factor variance analysis was done in order to find differences between groups, the significance of means were compared with the Tukey's test for various numbers of animals in groups.

Results and discussion

Results of iron content in the hair of dogs depending on sex are presented in Table 1.

Table 1. Iron content in the hair of schnauzer dogs depending on sex (mg.kg^{-1} d.m.)

Statistical parameters	Females	Males	Total number of dogs
Number of dogs in a group (N)	15	20	35
Arithmetic mean	83.16*	53.24*	66.06
Standard deviation	43.56	33.96	40.64
Lower quartile (25%)	46.58	30.12	34.40
Median	77.45	40.64	55.17
Upper quartile (75%)	115.38	66.69	86.71

* significance of differences between groups at $p<0.05$

The performed analysis of variance together with Tukey's test showed significant differences between the group of females and males ($p<0.05$). Iron content in the hair of females was higher (83.16 mg.kg^{-1} d.m.) than in males (53.24 mg.kg^{-1} d.m.). Also the remaining statistical parameters point to the fact that the content of iron did not depend on the single results, which extremely differed from the mean, and most results in groups were similar – the hair of females contained more iron. Similar dependence in the human hair between girls and boys was demonstrated by Creason et al. (1975). On the other hand, while investigating the horse hair (Kosla 1988) no such significant differences in the iron content

depending on sex was observed, only a certain trend for higher iron content in the female hair could be noted.

Results concerning iron content in the hair of dogs depending on breed are presented in Tab.2.

Table 2. Iron content in the hair of schnauzer dogs depending on breed (mg.kg^{-1} d.m.)

Statistical parameters	Schnauzer breeds[1] giant; medium	Miniature schnauzer breeds[2]
Number of dogs in a group (N)	12	23
Arithmetic mean	57.47	70.54
Standard deviation	20.41	47.78
Lower quartile (25%)	43.97	30.35
Median	55.64	55.17
Upper quartile (75%)	66.69	115.38

[1] this group comprised hair samples (N) collected from the breeds: black giant schnauzer (2), salt and pepper giant schnauzer (1), black medium schnauzer (3), salt and pepper medium schnauzer (6).

[2] this group comprised hair samples (N) collected from the breeds: black miniature schnauzer (5), salt and pepper miniature schnauzer (9), black and silver miniature schnauzer (9).

Notice: Differences between groups are non-significant statistically.

No statistically significant differences in iron level were demonstrated; there was only a trend for higher iron content in miniature breeds. Similar results were obtained in horses (Kosla 1988). Results concerning iron content in the hair of schnauzer dogs depending on the hair colour are presented in Table 3.

Table 3. Iron content in the hair of schnauzer dogs depending on the hair colour (mg.kg^{-1} d.m.)

Statistical parameters	Salt and pepper hair	Black hair	Black and silver hair
Number of dogs in a group (N)	16	10	9
Arithmetic mean	66.94	63.58	67.26
Standard deviation	47.62	26.95	44.04
Lower quartile (25%)	32.74	36.42	30.35
Median	55.64	58.12	49.77
Upper quartile (75%)	80.52	86.71	115.38

Notice: Differences between groups are non-significant statistically.

Three hair colour groups were separated which became the basis for dividing schnauzer dogs into breed groups (Sciesinski 2003). The differences between groups depending on colour proved to be non-significant. Arithmetic means are similar, other statistical parameters point to homogeneity in particular groups and it can be stated that dogs with salt and pepper and black hair colours are more homogenous in iron content than the group of black and silver hair colour. Similar results, i.e. no effect of hair colour on iron content were obtained in cattle by Anke (1965), in humans by Anke and Schneider (1966) and in horses by Kosla (1988). Iron content in the hair is conditioned by species and in cattle

(Anke 1965) is similar as in dogs; while in horses (Kosla 1988) and humans (Yoshinaga et al. 1990) is twice lower than in dogs.

Comparing hair samples in horses depending on it thickness (hair from the back and hair from the mane) did not reveal any differences in iron content (Kosla 1988), differences in the coarseness of hair in schnauzer dogs could not be analyzed statistically due to a small number of samples of bristle and soft hair.

Conclusions

1. Significant differences in iron content were observed in the hair of schnauzer dogs depending on sex. In the female hair iron content was clearly higher.
2. Mean iron content in the hair of dogs was determined; it is species dependent and similar to that in cattle quoted in literature, but twice higher as compared to the literature data for humans and horses.
3. The investigations did not reveal the correlation between iron content in the hair of schnauzer dog breeds accepted by the International Cynological Federation and dog hair colour.
4. In order to determine the species dependent iron content in the hair as the reflection of the supply of dogs with that necessary microelement, further investigations are needed of the hair from dogs of various breeds and various coarseness.

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