

## **THE CONCENTRATIONS OF SELECTED ELEMENTS (CA, P, MG, CU, ZN) IN PREGNANT POLAR FOX FEMALES DEPENDING ON SAMPLE COLLECTING BODY REGION**

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### **Introduction**

Hair is valuable analytic material, which does not vary biologically. Long-term changes in body mineral content appear more accurate in hair analysis (Koper and Zamorski, 1990). Anke and Risch (1979) showed hair feasibility in copper, zinc, manganese, selenium and lead marking. According to Gabryszuk (1988) many factors affect animal mineral management's level and state; element's demands differ due to physiological state, sex, nutrition, productivity and season. Fox physiological state is of special importance.

The aim of the study was to compare the content of five elements in fur coat of pregnant fox females.

### **Material and methods**

Hair was collected from 30 polar fox females. From each vixen 2 samples were collected, from hip and lower side of the tail. Young females were 12 months old, older ones were 3-4 years old. All of them were in 4-5<sup>th</sup> week of gestation.

Fat was removed from hair samples using diethyl ether. Later they were flushed with water and dried. The content of calcium, magnesium, copper and phosphorus was determined by ICP-OES method, zinc level by FAAS. Tolerance for mineral content was  $\pm 8\%$  for calcium, magnesium, zinc and phosphorus but for copper  $\pm 10\%$ .

Statistical analysis of the results included average element's content, standard deviation, correlation and variance analysis.

### **Results and discussion**

Differences in element content have been discovered (table 1). Levels of calcium, magnesium, zinc and phosphorus differed significantly. Copper level differed slightly. According to sample collecting site, hair from the tail showed significantly higher concentration of calcium, magnesium, zinc and phosphorus than hip hair. There were no significant differences in copper level between sample collecting sites. Highest variation was

observed in zinc level. Average zinc content in tail hair was 3796,0 µg/g dry matter (d.m.); in hip hair 553,7 µg/g d.m.

Table 1. Average content of particular element according to sample localization.

	Average content (hip)	Standard deviation	Average content (tail)	Standard deviation
Ca (µg/g d.m)	316,1	52,6	570,1	147,9
Mg (µg/g d.m)	70,4	9,6	107,1	18,5
Zn (µg/g d.m)	553,7	289,1	3796	1583,6
Cu (µg/g d.m)	8,3	1,4	8,2	1,1
P (µg/g d.m)	337,9	41,2	455,7	116,8

Also in calcium level strong variation was noted. Average in tail hair was 570,1 µg/g d.m.; in samples taken from the hip 316,1 µg/g d.m. Mertin (1990) also noted significantly higher element's levels in terminal side of the tail. Similar results had Berestov (1984), who observed highest concentration of elements in hair on whole tail. Dierzanowska-Goryn (2000) found calcium content in polar vixen's hair at 177 µg/g d.m. to 345 µg/g d.m., in some earlier experiment Berestov et al. (1983) measured average calcium in winter fur coat of polar fox as 230,3 µg/g d.m. Studies on calcium level in blood of polar fox females during lactation found that vixen with smaller litters had lower Ca concentration (3,32 mmol/l) than these with many pups (3,54 mmol/l).

In hitherto publications concerning magnesium level in blue polar fox hair, its level was at 64,6 µg/g d.m., and in white polar fox 48,9 µg/g d.m. (Berestov, 1984). Dierzanowska-Goryn (2001) described magnesium level between 37,7 and 110 µg/g d.m. Majewska (2001) observed decrease of magnesium content in pregnant polar fox females.

Zinc level in hitherto studies varied in wide range from 174,8 to 884,0 µg/g d.m (Berestov, 1983; Dzierzanowska, 2000; Majewska, 2001). Berestov et al. (1983) found higher copper level in white polar fox (31,5 µg/g d.m.) than in blue polar fox (21,0 µg/g d.m.).

Phosphorus level in rearing females depended on litter size. Mothers with less pups had 1,42 mmol/l, but vixens with larger litters had 1,81 mmol/l.

Variance analysis between elements's content in samples from two sites shown highly significant differences for calcium, magnesium, zinc and phosphorus. Sample collection site was insignificant for copper content in hair. Coefficient of correlation for mineral element in 30 fox female's hair, undivided for site was positive and highly significant for: calcium and magnesium, calcium and zinc, calcium and phosphorus, magnesium and zinc, magnesium and

phosphorus plus zinc and phosphorus. There was no correlation between copper and other elements.

Considering sample collection site, high correlation was observed for zinc, phosphorus and copper in samples from tail and from hip. Correlation was highly significant for calcium in hip and tail hair with magnesium in tail samples. Also significant were correlation coefficients between phosphorus in hip samples and calcium plus zinc in samples from tail.

In samples collected from tail, coefficients were highly significant for calcium and magnesium, calcium and phosphorus plus magnesium and phosphorus, whereas significant for zinc and phosphorus plus zinc and copper.

Considering average levels of elements in hair and the age of the females, there was higher content of calcium and magnesium but zinc, copper and phosphorus content was lower in older vixens (hip samples). Other proportions appeared in tail samples. Calcium, magnesium and phosphorus levels were higher in older females. Comparing effect of sample collection site in age groups, in tail samples of young fox concentrations of calcium, magnesium, zinc and phosphorus were higher but lower for copper. In older females all elements content was higher in tail samples than in hip.

## **Conclusions**

1. Variance analysis have shown, that average content of calcium, magnesium, zinc and phosphorus in hair samples collected from two sites of polar fox females bodies, significantly differ. Sample collecting site does not affect significantly concentration of copper in hair.
2. Correlation coefficient between element concentrations in hair was positive, highly significant for calcium, magnesium, zinc and phosphorus, but not significant for copper relations with other studied elements. Correlation between element content in both sample collection sites was highly significant for following pairs: zinc, phosphorus and copper. Significant was correlation for calcium, calcium and magnesium, phosphorus and calcium plus phosphorus and zinc.
3. After estimation of obtained results, higher content of zinc, copper and phosphorus and lower level of calcium and magnesium was detected in hip samples. In samples collected from tail of younger vixens zinc and copper content was higher, but calcium, magnesium and phosphorus content was lower.

4. Further studies seem necessary considering effects of micro- and macro-elements on fox female's reproduction. In next stage, element levels should be studied in various physiological periods.

## References

1. Anke M., Risch M.;1979 *Haaranalyse und Spurenelementstatus*, VEB Gustav Fischer Verlag, Jena.
2. Berestov V.A., Tyurnina N.V., Tyutyunnik N.N.;1983 *Mineral composition of hair in some fur-bearing animal species. Communication 1,2. Scientifur*, vol.7, no.1,10-16.
3. Berestov V.A., Tyurnina N.V., Tyutyunnik N.N.;1984 *Mineralnyj sostav volosjanogo pokrova norok i pescov. Petrozavodsk, Izol. Karelia*,157.
4. Dzierzanowska – Goryn D., Brzozowski M.;2001 *Porównanie poziomu wybranych pierwiastków w okrywie włosowej samic lisów polarnych. Zesz. Nauk. PTZ Nr 58*, 127-132.
5. Dzierzanowska – Goryn D.;2000 *Zawartość wybranych makro i mikroelementów we włosach samic lisów polarnych w okresie rozrodu. Zesz. Nauk. PTZ Nr 53*, 181-185.
6. Gabryszuk M.;1988 *Zapotrzebowanie owiec na makroelementy i mikroelementy. Owczarstwo nr 4*, 7-9.
7. Koper J., Zamorski R.; 1990 *Zawartość Zn i Mg w wełnie owiec i jagniąt z ferm hodowlanych i okolic Bydgoszczy. Medycyna Weterynaryjna Nr 9*, 355-357.
8. Majewska U.; 2001 *Oznaczenie poziomu wybranych pierwiastków w okrywie włosowej samic lisów polarnych. Praca magisterska SGGW Warszawa*.
9. Mertin D., Rafay J., Stepanok V.; 1991 *Koncentracja niektórych mineralnych prvkov v srsti lisok striebornych v období kozusinovej zrelosti. Polnohospodrstvo 36*, s. 830-836.