

ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN – POLONIA

VOL. XXIII, 31

SECTIO EE

2005

Department of Animal and Environmental Hygiene, Faculty of Biology and Animal Breeding
of Agricultural University of Lublin

Department of Zoohygiene and Veterinary Prophylaxis, Podlaska Academy in Siedlce

BOŻENA NOWAKOWICZ-DEBEK, LEON SABA,
HANNA BIS-WENCEL, ELŻBIETA BOMBIK,

*Impact of Different Maintenance Conditions on the Lipid
Profile Parameters at Fox – Alopex lagopus**

Wpływ odmiennych warunków utrzymania na parametry profilu lipidowego
u lisów polarnych – *Alopex lagopus*

Currently the breeders of fur-bearing animals have aimed to improve the fox utility features in order to obtain the best possible final product, that is valuable skins, because of economic respects. These effects are possible to attain if the animals are provided with proper nutrients and the optimum microclimatic conditions. On the other hand, the inappropriate environmental factors may bring about not only the welfare state decline but activation of the limbic system and neurohormonal as well. These changes may induce growth in the corticoid release or increase of free fatty acids, triglycerides and cholesterol in blood. This activity of the environmental "stressors" is likely to cause some changes, mainly in the animal behavior and physiology of many systems [3, 5, 6, 9].

The objective of the present work was to determine the influence of different maintenance conditions of fox on the lipid profile parameters.

MATERIAL AND METHODS

The investigations were carried out on a group of 50 polar foxes (*Alopex lagopus*). The caged animals (3-4 year-old) were kept at the farm and constituted the control (10 males, 10 females). The treatment group (10 males, 10 females) was maintained in closed space provided with the outdoor air-flow. At the same time in both groups the monitoring of air cleanness was performed

* This work was conducted as part of the research project no. 3 PO6Z 054 24 financed by the State Committee for Scientific Research (2003-04)

using the colorimetric and gas chromatography techniques [2]. Throughout the experimental period the foxes were supplied with the same dietary units according to the feeding standards for furry animals and suitable for their age [1]. Besides, the animals were provided with the appropriate zootechnical and veterinarian services. Blood for examination was collected three times from the foot vein (*vena saphena parva*) and in the serum the lipidogram parameters were established with the diagnostic kits of Cormay firm and the dry biochemistry method on the VITROS 250 apparatus.

The data were analysed statistically with the variance analysis for the nonorthogonal triple cross classification at weighed restrictions.

RESULTS AND DISCUSSION

In every organism the developed autoregulation mechanism functions which have effects upon the amount and quality of feed supplied, while genetic and environmental factors account for the production of lipid profile components. This profile is defined on the basis of triglyceride content, total cholesterol value and its numerous fractions, among others, HDL (high density lipoproteins), LDL (low density lipoproteins) and VLDL (very low density lipoproteins). Disturbances in these parameters or their inappropriate rates make up the information about the malfunction of the above mentioned mechanisms in the organism. The most frequent disorders of the lipid metabolism concern the excessive growth of cholesterol content, LDL and VDL fractions and triglycerides. They are termed hyperlipoproteinemia [3, 5, 9].

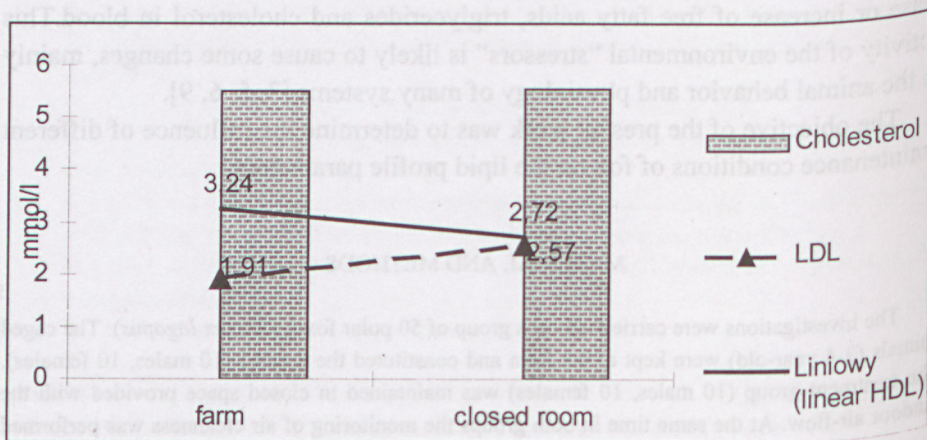


Fig. 1. Cholesterol level in foxes kept in different conditions (mmol/l)

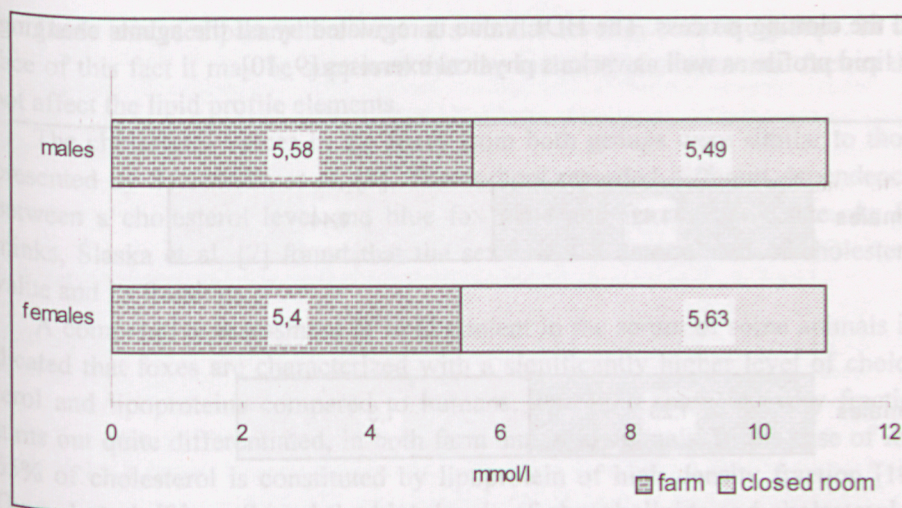


Fig. 2. Cholesterol content in fox females and males in each fox group (mmol/l)

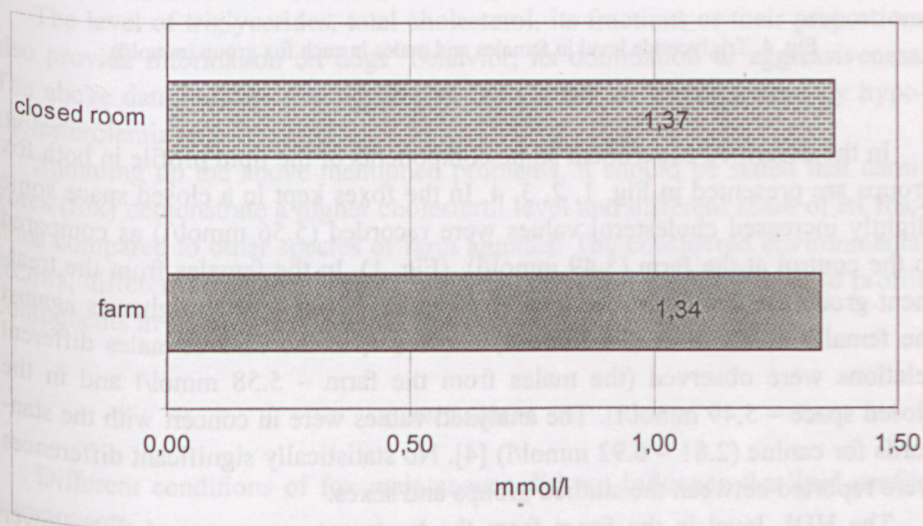


Fig. 3. Triglyceride level in foxes maintained in the different conditions (mmol/l)

There also exists a so-called "good" lipoprotein fraction, i.e. HDL. Its function consists in the transportation of cholesterol excess from cells to the liver. Another beneficial activity of the HDL operation was also confirmed, namely collecting the toxic lipid peroxides or protecting, eg. from the oxidative stress

and the clotting process. The HDL value is regulated by all the agents changing the lipid profile as well as various physical exercises [9, 10].

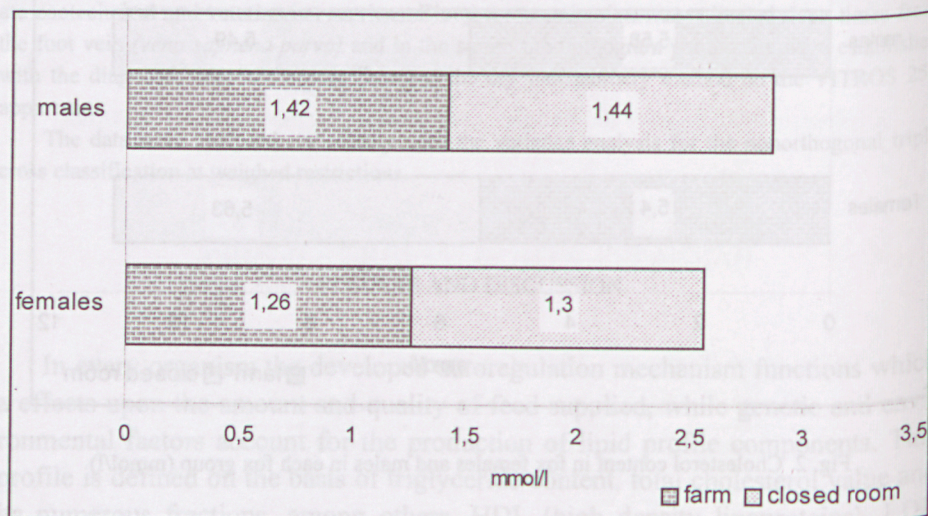


Fig. 4. Triglyceride level in females and males in each fox group (mmol/l)

In the described experiment some components of the lipid profile in both fox groups are presented in Fig. 1, 2, 3, 4. In the foxes kept in a closed space some slightly increased cholesterol values were recorded (5.56 mmol/l) as compared to the control at the farm (5.49 mmol/l), (Fig. 1). In the females from the treatment group the cholesterol content (5.63 mmol/l) was a little higher as against the females at the farm (5.4 mmol/l). However, in the case of males different relations were observed (the males from the farm – 5.58 mmol/l and in the closed space – 5.49 mmol/l). The analysed values were in concert with the standards for canine (2.81 – 6.92 mmol/l) [4]. No statistically significant differences were reported between the studied groups and sexes.

The HDL level in the foxes from the treatment group proved to be lower than in the animals maintained at the farm (Fig. 1). On the other hand, the LDL fraction showed a different dependence as indicated by the higher contribution of this fraction to blood of the foxes kept in the closed space (Fig. 1). The triglyceride content in the foxes from both groups persisted at the congenial level and was found within the reference values for canine (0.26–1.46 mmol/l), (Fig. 3) [4]. There were not noted any statistically significant differences between the sexes (Fig. 4).

These analysed parameters were at a similar level in both fox groups. In the face of this fact it may be supposed that the included environmental factors did not affect the lipid profile elements.

The cholesterol values in the foxes from both groups were similar to those presented by Szałowska *et al.* [8]. The authors recorded different dependences between a cholesterol level and blue fox male and female body size. As for minks, Ślaska *et al.* [7] found that the sex is not a determinant of cholesterol value and its fractions.

A comparative assessment of lipid content in the serum of some animals indicated that foxes are characterized with a significantly higher level of cholesterol and lipoproteins compared to humans. The lipid share in every fraction turns out quite differentiated, in both farm and wild animals. In the case of fox, 65% of cholesterol is constituted by lipoprotein of high density fraction [10]. Guyard *et al.* [3] confirmed the high levels of phospholipids and cholesterol in dogs (2.41- 1.86 g/l) and cats (1.68-1.42 g/l). The triglycerides examined in these species exhibited a wide range of values. The data were confirmed on the basis of the lipoprotein-dependent and independent examinations.

The level of triglycerides, total cholesterol, its fractions or their proportions also provide information on dogs' behavior, its domination or aggressiveness. The above data indicate that aggressive individuals are characterized by hypocholesterolemia [6].

Summing up the above mentioned problems, it should be stated that carnivores (fox) demonstrate a higher cholesterol level and different share of its fractions compared to other species of farm animals. The considered environmental factors, different maintenance conditions did not affect the level of lipid profile components in foxes at this stage of research work.

CONCLUSION

Different conditions of fox maintenance did not influence the lipid profile components.

REFERENCES

1. Barabasz B., Bielański P., Niedźwiadek S., Sławoń J.: Normy żywienia mięsożernych i roślinożernych zwierząt futerkowych. IFiZZ PAN, Jabłonna 1994.
2. Bartulewicz J., Gawłowski J., Bartulewicz E.: Zastosowanie chromatografii gazowej i cieczowej do analizy zanieczyszczeń środowiska. Państwowa Inspekcja Ochrony Środowiska. Biblioteka Monitoringu Środowiska, Warszawa 1997.

3. Guyard-Dangremont V., Desrumaux C., Gambert P., Lallemand C., Lagrost L.: Phospholipid and cholesteryl ester transfer activities in plasma from 14 vertebrate species. Relation to atherogenesis susceptibility. *Comparative Biochemistry and Physiology Part B*, 120, 517–525, 1998.
4. Meyer D. J., Harvey J. W.: *Veterinary laboratory medicine. Interpretation & Diagnosis*. W.B.Saunders Company, 346-349, 1998.
5. Pac-Kożuchowska E.: Hipercholesterolemia rodzinna – czynnik ryzyka miażdżycy. *Medycyna Rodzinna*, 14, 3-4, 2001.
6. Pentürk S., Yalcin E.: Hypocholesterolemia in Dogs with Dominance Aggression. *J. Vet. Med., Series A*, 50, 339-342, 2003.
7. Szałowska D., Jeżewska G., Rupieć D., Jakubczak A.: Wielkość ciała a poziom wybranych wskaźników krwi u lisów niebieskich (*Alopex lagopus*). *Symposium naukowe: nauka w polskiej zootechnice XXI wieku*, Lublin, 10-11 września, 327, 1998.
8. Ślaska B., Jakubczak A., Jeżewska G., Prost T., Rozempolska-Rucińska I.: Profil metaboliczny krwi nerek o umaszczeniu standard i pastel. *Konf. Nauk. nt.: Środowisko, zwierzę, produkt*, 22-24 wrzesień, Lublin, 232, 2003.
9. Turczyn B., Skoczyńska A.: Przeciwmiażdżycowe działanie lipoprotein o dużej gęstości. *Podst. Hig. Med. Dośw.*, 56, 4, 499-520, 2002.
10. Vitic J., Stevanovic J.: Comparative studies of the serum lipoproteins and lipids in some domestic, laboratory and wild animals. *Comp. Biochem Physiol.*, B, 106 (1), 223-229, 1993.

STRESZCZENIE

Przeprowadzono badania w celu określenia parametrów profilu lipidowego u lisów (*Alopex lagopus*) utrzymywanych w odmiennych warunkach środowiskowych. Zwierzęta przebywające w fermie stanowiły grupę kontrolną, zaś grupę doświadczalną umieszczono w pomieszczeniu z zachowanym przepływem powietrza zewnętrznego. Lisy przez cały okres badań otrzymywały jednakowe dawki pokarmowe według norm żywienia zwierząt futerkowych i dostosowane do grupy wiekowej. W oparciu o przeprowadzone analizy w surowicy lisów wykazano, iż wielkości elementów profilu lipidowego w obydwóch grupach były na zbliżonym poziomie. Należy więc przypuszczać, że odmiennie warunki utrzymania lisów nie miały wpływu na elementy profilu lipidowego.