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*Comparison of Relative Level of Blood Serum Protein
Fractions in Raccoon-Dogs Taking into Account Their Age
and Reproduction Results*

Porównanie względnego poziomu frakcji białkowych surowicy krwi jenotów
z uwzględnieniem ich wieku i użytkowania rozplodowego

Blood serum proteins play many and important functions during metabolism in an organism. Studies upon proteins behavior in blood serum under the influence of genetical and environmental factors make it possible to understand the growth and development processes occurring in organisms.

Hitherto investigations upon blood serum proteins in fur animals were focused on identification of protein fractions and estimation of their genetical polymorphism.

Serov et al. (9, 10) and Stanisławska (11) described the differentiation of blood serum from silver and polar foxes using electrophoresis on starch gel. Juneja et al. (5), Madeyska-Lewandowska et al. (6, 7) and Brodacki & Kostro (4) estimated the blood serum protein polymorphism in common and polar foxes using electrophoresis on polyacrylamide gel. Variability of blood serum proteins in raccoon-dogs was found by Brodacki et al. (2, 3).

There is scarce literature data on the estimation of blood serum protein content in farm animals. Behavior of blood serum protein fraction level depending on age, sex and physiological state was investigated in hens using the vertical electrophoresis on polyacrylamide gel (1, 8).

The aim of the present paper is to evaluate differences as regarding the relative content of blood serum protein fraction in raccoon-dogs depending on age, sex and physiological state.

MATERIAL AND METHODS

Studies were carried out on raccoon-dogs farm in Jeziora Wielkie. The percentage of blood serum protein fractions in animals of both sexes in 4 groups differing with their age and physiological state was estimated: young raccoon-dogs after weaning at 2 months age ($n = 95$); young raccoon-dogs just after mature winter hair was obtained at 6 months age ($n = 118$); males and females (fertile) from the basic herd during the sexual calmness ($n = 49$); infertile animals during sexual calmness ($n = 16$).

Blood from the vein was taken from each animal and serum was subjected to vertical electrophoresis on polyacrylamide gel. Gel stacks were colored with amide black and then scanned using Sharp JX-330 apparatus connected to computer and using Image Master software by Pharmacia. Therefore electrophoregrams of blood serum protein fractions for every animal were obtained and the percentage of each fraction of totally separated protein was calculated.

Protein fractions separated during electrophoresis into bands on gel stacks or into peaks on electrophoregrams were classified into the following regions: albumins (Alb), post-albumins (Poa), pre-transferrins (Ptf), transferrins (Tf) and post-transferrins (Potf).

Photograph 1 presents bands of blood serum proteins of chosen raccoon-dog separated during electrophoresis as well as respective electrophoregram where every peak corresponds to particular protein fraction (bands on gel) within regions.

In each group of raccoon-dogs, mean, standard deviation and variability coefficients of protein content in particular regions separately for males, females and both were calculated.

RESULTS AND DISCUSSION

As it can be seen in Fig. 1, relative level of albumins in 6-month-old raccoon-dogs was higher than that in 2-month-old ones. Animals of the basic herd during their sexual calm and young ones at full hair maturity were characterized by similar albumins level. Significantly lower level of that protein was found in infertile raccoon-dogs.

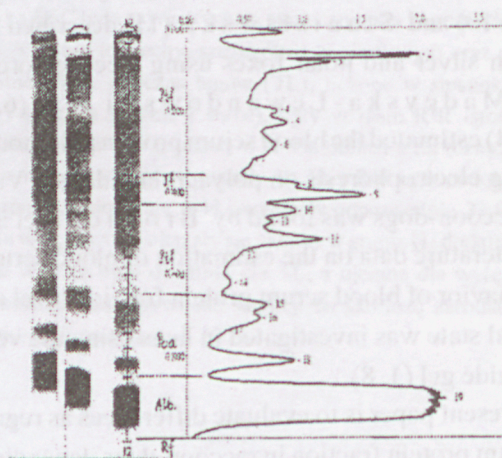


Photo. 1. Distribution of blood serum proteins of chosen raccoon-dogs

Relative content of post-albumins was at a similar level in animals under study regardless of the group.

Percentage of pre-transferrins was clearly higher in 6-month-old animals than that in 2-month-old ones. In animals during their sexual calm, protein level of this region decreased. In infertile raccoon-dogs, relative content of pre-transferrins was quite lower than in those giving the kits.

Transferrins level decreased along with age of animals. In basic herd raccoon-dogs, this protein content was similar as in 6-month-old ones. A clearly lower level of transferrins was found in infertile raccoon-dogs than in other groups.

Content of post-transferrins significantly increased along with the age of young raccoon-dogs. Those from the basic herd and 6-month-old ones did not differ significantly as regarding the post-transferrins level. However, infertile animals were characterized by much higher content of proteins from that region.

In every group under study the sex was not the factor that clearly differentiated the protein fractions level in raccoon-dogs (Tables 1-5).

The level of blood serum protein fractions was characterized by quite high variability ($V = 10-30\%$) in animals under study. Quite high variability of proteins level from a given region among investigated groups was found. It can be supposed that variability of the examined traits was also of a genetic nature. Variability of the performance features can be the reflection of the variability of blood serum protein fractions level. Thus, investigation upon blood serum protein fractions content in raccoon-dogs should be continued in a combination with their performance. Relative content of protein fractions in hens was also characterized by high variability ($V = 13-26\%$) – 12.

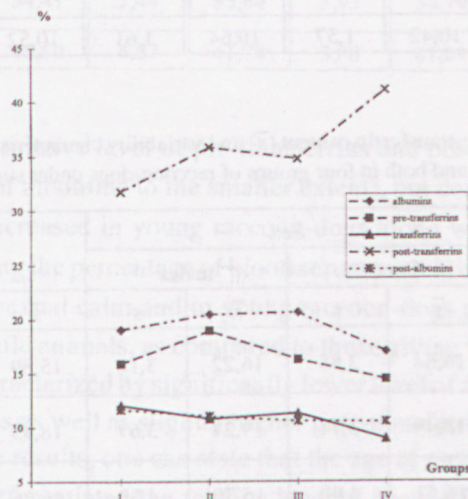


Fig. 1. Percentage of protein fraction content in four groups of raccoon-dogs under study; groups I – 2-month-old raccoon-dogs, II – 6-month-old raccoon-dogs, III – basis herd raccoon-dogs, IV – infertile animals

Table 1. Percentage of albumin content (\bar{x}) and variability characteristics (s, v) in males, females and both in four groups of raccoon-dogs under study

Groups	Sex				Total		
	females		males				
	\bar{x}	s	\bar{x}	s	\bar{x}	s	v
2-month-old raccoon-dogs	19,05	2,24	19,00	2,44	19,03	2,19	11,5
6-month-old raccoon-dogs	20,59	3,18	20,35	2,87	20,45	2,99	14,6
Basic herd raccoon-dogs	20,62	2,88	20,65	2,78	20,63	2,82	13,7
Infertile animals	17,34	2,63	16,66	1,28	17,04	2,11	12,4

Table 2. Percentage of post-albumin content (\bar{x}) and variability characteristics (s, v) in males, females and both in four groups of raccoon-dogs under study

Groups	Sex				Total		
	female		male				
	\bar{x}	s	\bar{x}	s	\bar{x}	s	v
2-month-old raccoon-dogs	11,46	2,01	11,87	1,88	11,64	1,96	16,8
6-month-old raccoon-dogs	10,91	1,54	11,12	1,65	11,03	1,60	14,5
Basic herd raccoon-dogs	10,06	1,95	11,79	4,07	10,59	2,85	26,9
Infertile animals	10,42	1,57	10,64	1,61	10,52	1,53	14,5

Table 3. Percentage of pre-transferrin content (\bar{x}) and variability characteristics (s, v) in males, females and both in four groups of raccoon-dogs under study

Groups	Sex				Total		
	females		males				
	\bar{x}	s	\bar{x}	s	\bar{x}	s	v
2-month-old raccoon-dogs	16,64	3,85	16,22	3,18	15,89	3,56	22,4
6-month-old raccoon-dogs	18,49	3,74	19,27	3,67	18,95	3,70	19,5
Basic herd raccoon-dogs	16,51	4,90	15,70	4,33	16,26	4,70	28,9
Infertile animals	14,95	4,23	13,77	2,21	14,43	3,44	23,8

Table 4. Percentage of transferrin content (\bar{x}) and variability characteristics (s, v) in males, females and both in four groups of raccoon-dogs under study

Groups	Sex				Total		
	females		males				
	\bar{x}	s	\bar{x}	s	\bar{x}	s	v
2-month-old raccoon-dogs	11,97	1,74	12,09	1,76	12,02	1,74	14,5
6-month-old raccoon-dogs	10,66	2,25	10,86	1,92	10,78	2,05	19,02
Basic herd raccoon-dogs	11,14	2,80	11,64	4,57	11,29	3,40	30,1
Infertile animals	8,81	2,25	9,04	2,54	8,91	2,30	25,8

Table 5. Percentage of post-transferrins content (\bar{x}) and variability characteristics (s, v) in males, females and both in four groups of raccoon-dogs under study

Groups	Sex				Total		
	females		males				
	\bar{x}	s	\bar{x}	s	\bar{x}	s	v
2-month-old raccoon-dogs	31,96	3,70	31,52	3,45	31,77	3,58	12,3
6-month-old raccoon-dogs	36,13	5,56	35,65	5,84	35,85	5,71	15,9
Basic herd raccoon-dogs	34,41	5,44	35,64	5,95	34,79	5,57	16,0
Infertile animals	40,59	4,37	41,74	3,88	41,09	4,07	9,9

Summing up, the relative level of pre-transferrins and post-transferrins increased (as well as that of albumins to the smaller extent), but content of transferrins and post-albumins decreased in young raccoon-dogs along with their age. Clear differences as regarding the percentage of blood serum protein content in basic herd animals during their sexual calm and in young raccoon-dogs at full hair maturity were not found. Infertile animals, as compared to those giving the kits during their sexual calm, were characterized by significantly lower level of albumins, pre-transferrins and transferrins as well as slightly higher post-transferrins level.

On the basis of the results, one can state that the age of raccoon-dogs and their physiological state differentiated the relative level of protein fractions in animals under study. Also in poultry, the quantitative examinations of blood serum protein fractions proved that the relative level of protein fractions depended on age, and

more strictly, on an individual development stage, physiological state, but also on sex (1, 8). The highest changes of protein fractions levels were observed till the sexual maturity of animals.

CONCLUSIONS

1. The percentage of blood serum protein fractions in raccoon-dogs depended on their age and physiological state.
2. Relative levels of blood serum protein fractions appeared to be the traits of relatively high variability.
3. The results point to the need for further investigations upon the blood serum protein fractions level in raccoon-dogs in combination with their performance.

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STRESZCZENIE

Określono procentową zawartość frakcji białkowych (albumin, postalbumin, pretransferyn, transferyn i postransferyn) surowicy krwi jenetów obu płci u 4 grup różniących się pod względem wieku i stanu fizjologicznego: jenetoty młode w wieku 2 i 6 mies. oraz jenetoty płodne i niepłodne stada podstawowego w okresie spokoju płciowego.

Wiek jenetów i ich stan fizjologiczny zróżnicowały względny poziom frakcji białkowych surowicy krwi. Poziom frakcji białkowych charakteryzowała stosunkowo duża zmienność. Uzyskane wyniki wskazują na celowość badań zawartości frakcji białkowych surowicy krwi jenetów w powiązaniu z ich użytkowością.