SOME PECULIARITIES OF YOUNG HARP SEALS BLOOD COMPOSITION

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Results of investigations of chemical and cellular blood composition of harp seals containing in captivity for long time are submitted. After year of stay in captivity the loss of sharp individual differences in the biochemical status of animals is marked. The most appreciable differences between seals, adapted to a captivity successfuly, and not survived in new conditions, are found in cell content of blood, namely in the ratio of lymphocytes and neutrophils number. At the seals, which have lost, the so-called "physiological decussation", being characteristic age feature of the cell content of mammalian blood was not observed. This fact allows to assume, that the loss of the above mentioned characteristics can be considered as drop of vitality level, bringing in a result to death of animals.

Keywords: pinnipeds, harp seal, care in captivity, blood

Previously we examined blood cellular composition and metabolic features of harp seals (*Pagophilus groenlandicus*) during early postnatal ontogenesis [4, 7]. However, the formation of the hematopoietic system continues in the later stages of individual development. In this paper we present some results of blood parameters evaluation of harp seals at the age from 4 months to 3–4 years in connection with their adaptive capabilities.

Materials and methods of research

Blood of four harp seal pups brought from Kandalaksha Bay of White Sea at the age of 3 months was investigated. The first year seals spent in stationary oceanarium, and subsequently they were relocated to experimental station of MMBI in Kola bay of Barents Sea. Blood was taken from the extradural vein as described by Geraci [5] in the syringe with heparin. The first blood sampling was done after 1 month of animals stay in captivity. Obtained samples were investigated by means of routine haematological and various biochemical techniques [6].

Results of research and their discussion

At the beginning of observation period, animals state differed from the normal. This was, among other things, indicated by data of blood cell count and indices of natural resistance of the animals: sorption capacity of erythrocytes, lysozyme and haptoglobin in the blood plasma (Table).

As a result of further tests of blood cellular composition it was found that the most significant changes during observation period involved the absolute (per 1 μl) number of eosinophils (Fig. 1). This index is sensitive indicator of adrenal cortex condition, whose hormones are involved in the development of stress.

Hematological parameters of harp seal pups for the first time of stay in captivity

Age	Seal N	ESR, mm/hr	E, 10^6/μl	Hb, g/l	L, 10^3/μl	SCE, %	LYZ, g/l	Hp, g/l
4 month	1	1	4,5	212	13,2	27,0	27,03	0,38
	2	32	3,7	192	12,2	56,8	56,76	0,25
	3	0,5	5,4	244	6,8	24,3	24,33	0,35
	4	0,5	3,8	218	12,8	37,8	37,84	0,35
4 month 2 week	1	2	4,4	234	15,8	23,1	23,08	1,00
	2	36	3,9	182	14,8	7,69	7,69	1,75
	3	1	4,9	224	9,0	7,7	7,69	1,5
	4	39,5	3,2	174	12,0	30,8	30,77	1,70
4 month 3 week	1	2	4,0	222	11,1	11,2	11,16	0,18
	2	32	3,6	230	13,2	14,5	14,47	1,72
	3	0,5	5,2	228	6,5	10,5	10,53	0,92
	4	37	3,4	202	14,2	19,7	19,74	1,57
5 month	1	2	5,3	238	9,0	23,1	23,1	0,20
	2	15,5	3,8	224	11,3	48,6	48,61	0,40
	3	1,5	4,3	232	10,1	30,6	30,56	0,80
	4	55	4,2	190	5,7	26,4	26,39	0,95

Notes:

ESR – erythrocyte sedimentation rate; E – erythrocytes; Hb – hemoglobin; L – leukocytes; SCE – sorption capacity of erythrocytes; LYZ – lysozyme; Hp – haptoglobin.

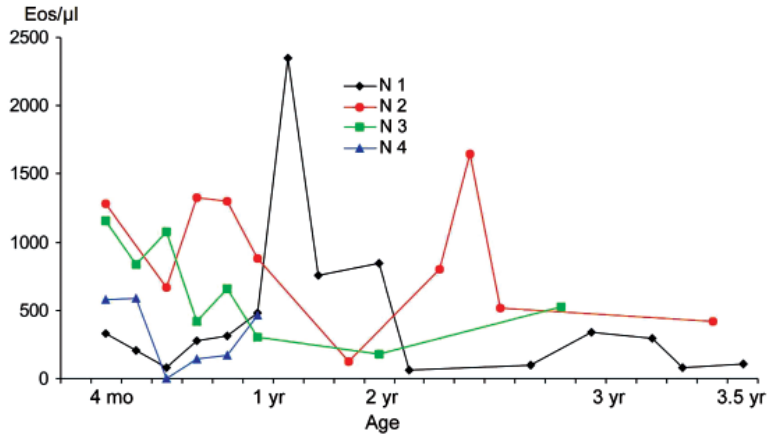

Fig. 1. Eosinophils content in harp seale pups in different age periods

Drop of eosinophils number by two times and more is regarded as reliable indication of development of stress response Phase II [1]. Eosinophil counts differed significantly in the animals under study. In fact, in seals № 1 and 4 the initial level was lower, and decline was greatest (down to 0%).

Capturing, transportation, placement in an enclosed space (in this case, baths) are known factors causing stress-reaction and associated shifts in the blood composition in wild animals, including marine mammals. The first blood research was performed after a month of seal delivery in oceanarium. Hence, the "acute" period of impact of above mentioned factors appeared to have been over, although the glucose level was higher according to the first test. In the course of observations, intensive therapy of animals with anti-helminth drugs was conducted, those drugs being also capable of affecting the total count and composition of leucocytes.

In terms of the dynamics of the changes in the relative lymphocyte and neutrophil count between the pairs of animals, some significant differences were revealed. The same group included seals № 1 and 2 (that successfully passed the adaptation period and still living), the second, comprised № 3 and 4 (that died after 34 and 18 months of captivity, respectively) (Fig. 2).

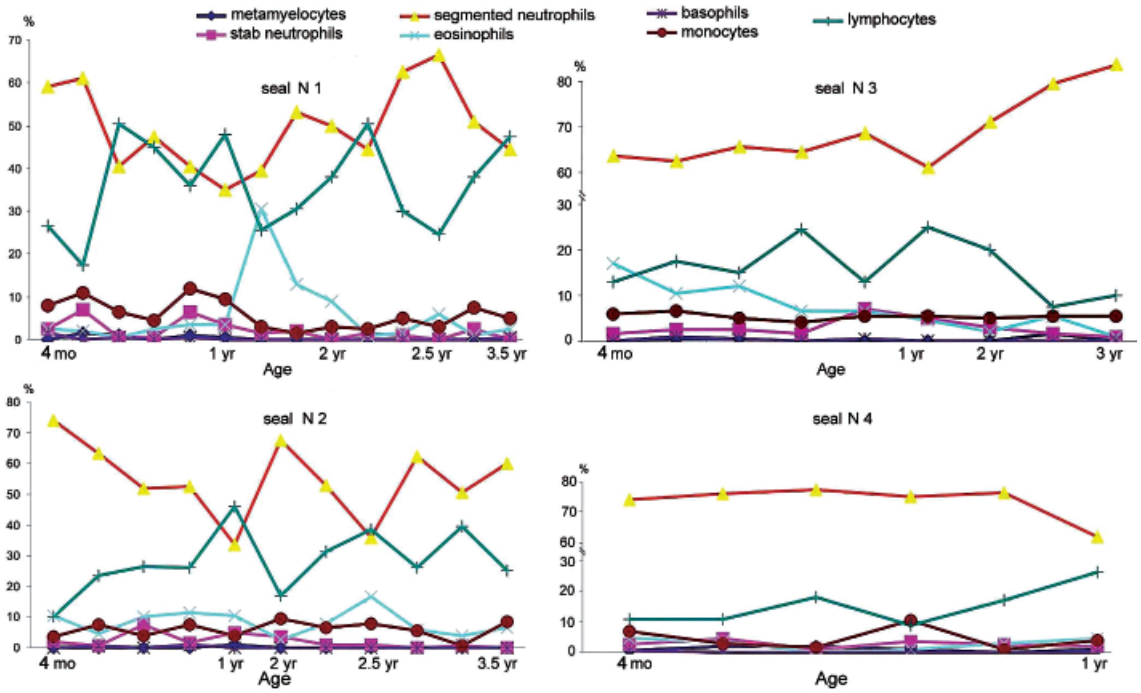

Fig. 2. Age dynamics of harp seal pups blood cell composition

It is known that the age features of the blood composition includes equaling in certain periods of the number of lymphocytes and neutrophils, which was referred to as so-called "physiological cross" or "physiological decussation". In humans, this phenomenon is recorded on the 4th day of life and at 4 years of age [2]. Physiological increase of lymphocyte number is noted in other terrestrial animals, including dogs [3]. Subsequently, the neutrophil profile of the blood is established finally, and its normal composition remains stable. Naturally, for other mammalian species with different lifetime and ontogenetic features, the terms of "cross" may differ. In harp seal pups first "physiological crossing" is marked at the age of 2–3 weeks during period of milk feeding [7]. This phenomenon is observed in seals № 1 and 2, but is absent in seals № 3 and 4 (Fig. 2).

The set of parameters that we used in biochemical blood count of the harp seal pups includes some major metabolism indices:

1) protein – total protein (TP), albumen (Alb), α-globulins (Alpha), β-globulins (Beta), γ-globulins (Gamma), urea (Urea);

2) lipid – total lipids (TL);

3) carbohydrate – glucose (Glu);

4) mineral – calcium (Ca) and phosphorus (P).

Because some individual indices are interlinked via metabolic paths, change in some of them, normally is associated with changes in other parameters. In this respect the levels of various blood indices make a peculiar "metabolic profile" of the organism. Fig. 3 shows that profiles gently change with age, but sharp changes are recorded in seal № 3 one month before death. The most pronounced were changes in right-hand part of the profile, characterizing status of protein metabolism.

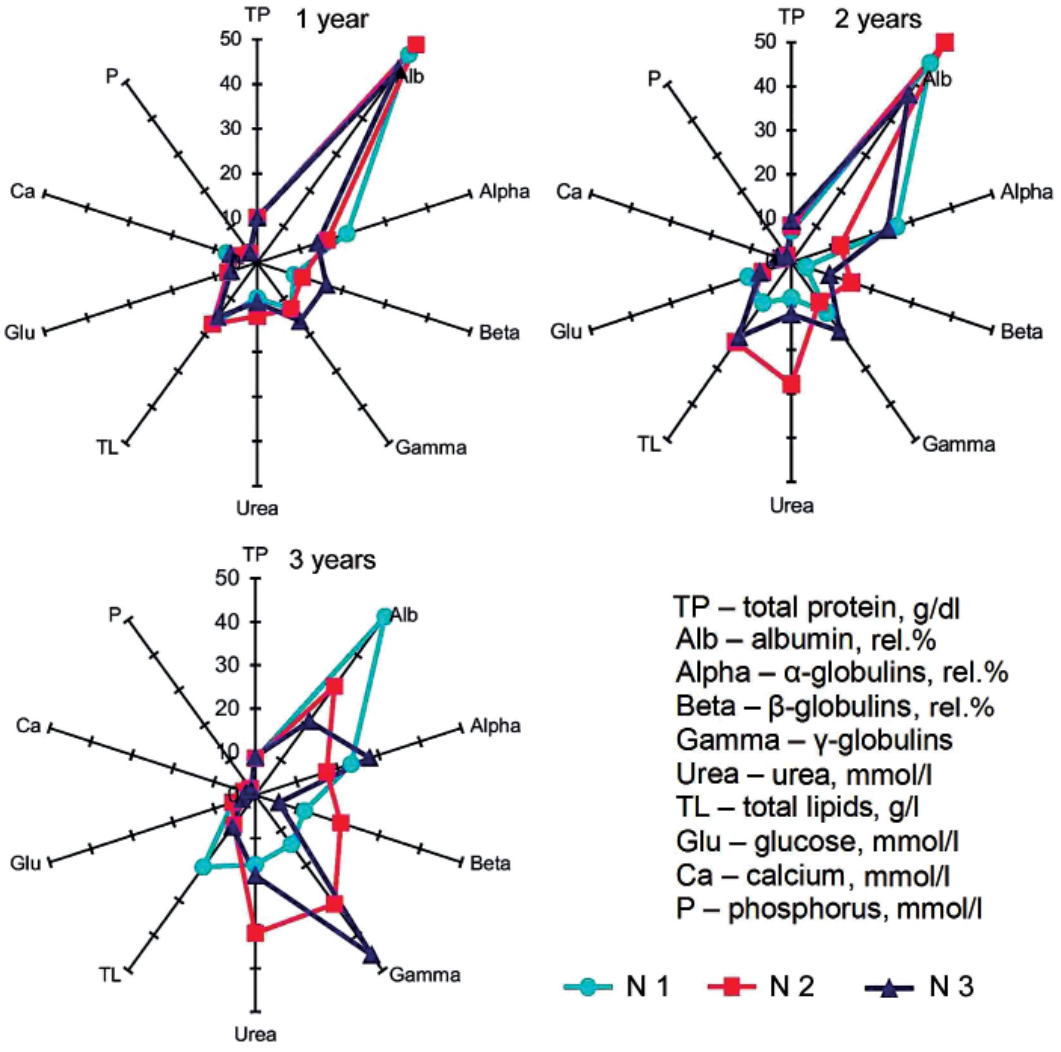

Fig. 3. Biochemical parameters of the metabolism basic types in seals of different age and health status

Thus, the maintenance of seals first in a stationary oceanarium, and subsequently in cages under conditions close to natural permitted tracing the rehabilitation of the animals, their condition being initially assessed as anomalous. The following regularities can be revealed in terms of dynamics of the blood indices in seals.

A year after putting in captivity, the blood indices approached the values characteristic of the normal physiological conditions. During the subsequent observation period, a leveling of some particular indices in different animals was recorded, whereas during the first three month of captivity, some well-defined individual features in the blood plasma were revealed.

Rehabilitation period in harp seal pups was no less than 3 months. After a year of captivity, lack of sharp individual distinctions in the biochemical status was revealed, which must have been determined by similar and more comforting conditions compared with free-ranging (absence of enemies, regular feeding, maintenance, and veterinary care).

Conclusion

When comparing the variability of the cell composition of the blood in survivor seals vs. those that died, it was noted that some trouble indices were observed in the latter as early as the first months of their life. At the same time, the chemical composition of the blood plasma did not show differences of similar level; they appeared much later. The dynamics of the cell composition of the blood in the course of the observations was sharply different in terms of the ratio of the level of lymphocytes and neutrophils. In the seals that died at different dates had shown no "physiological decussation", which is characteristic age feature of the cell composition of mammal blood. This fact gives grounds to believe that the loss of the above characteristic features can be regarded as a decline of viability, which finally proves fatal. Hence, during the early period of postnatal development when assessing and predicting of the condition of seals, cell composition characteristics may prove more informative compared with that of its chemical components.

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