Loboiko Y. V., candidate of agricultural sciences
Lvov S. Z. Gzhicky named National University of Veterinary Medicine and Biotechnologies

INDICATORS OF NONSPECIFIC RESISTANCE OF EARLINGS CARP WITH INVASION BY ECTOPARASITES

A reviewer – doctor of veterinary sciences D. F. Gufriy

The data on lyzocymic and bactericidal activity of serum and blood phagocytic activity of neutrophils by different intensity of infestation by ectoparasites. The decrease lyzocymic, bactericidal and phagocytic activity of carp serum by lesions ectoparasites Lernaea cyprinacea and Dactylogyrus vastator compared with clinically healthy fish.

Keywords: *carp, ectoparasites, lyzocymic, bactericidal and phagocytic activity, Lernaea cyprinacea, Dactylogyrus vastator.*

Statement of the problem. The successful development of fish farming as an industry depends on the physiological state of the fish and their natural defense mechanisms. The natural resistance of fish – is an innate ability of the body to resist the corrosive effects of pathogenic factors of biotic and abiotic nature, including infectious and parasitic diseases and their metabolic products (exo- and endotoxins). Currently more and more important in the regulation of the immune system of fish acquire technological impacts on their habitat, causing suppression of innate and acquired immunity, the development of invasive disease [3, 4].

One of the most pressing problems for growing carp in western Ukraine is to reduce their resistance, due to the proliferation of a number of parasitic diseases, especially lerneosis and daktylohirosis [7].

Aims and objectives of research. The aim of this work was to study the performance of non-specific resistance of blood of earlings carp with invasion by ectoparasites.

Materials and methods. For the purpose of determination of non-specific resistance of blood at varying degrees carp with invasion by ectoparasites in aquarium conditions, which used spontaneously infested with dactylogyrus and lernaea pathogens.

Period of acclimatization of fish was 14 days at a water temperature of 16-18°C. Before the experiment was conducted parasitological study of fish and defined indicators of their infestations. This was formed twelve groups of fish to 6 individuals each, weight 38,0 ± 4,8 g four groups of fish (control and three experimental) for damage with ectoparasites *L. cyprinacea, D. vastator* and a mixed infestation. For lesions *L. cyprinacea* fish first group was the control, the second – with intensity of infestation to 0,08 lernaea (g bw), third – from 0,11 to 0,26 lernaea and fourth – more than 0,26 lernaea at g bw fish. For lesions *D. vastator* fish first group was the control, the second – with intensity affected dactylogyrus to 0,26, third from 0,29 to 0,53 dactylogyrus and fourth – more than 0,53 dactylogyrus at g bw. For mixed infestations fish of first group was the control, the second – with intensity of infestation with lernaea to

0,08 and to 0,26 dactylogyrus, third – with intensity 0,29-0,53 lernaea and 0,11-0,26 dactylogyrus and fourth – more than 0,26 lernaea on g bw and 0,53 dactylogyrus on g bw. Ichthyoparasitology analysis was performed by the method of partial parasitological dissection by I.E. Bykhovskaya-Pavlovskaya [1]. Identification of parasites was determined by "Determinant of freshwater parasites of fish fauna of USSR" [6].

The intensity of infestation (II) was determined by counting the number of parasites on the body and gills of studied fish.The fish kept in aquariums with a capacity of 40 dm^3 artificial aeration at a temperature of 18-20°C. Caring for fish and their feeding was carried out according to the relevant rules and rations. Throughout the period of study observed the behavior and clinical condition of fish.

The studies used blood samples obtained from the heart of earlings carp. In the blood of fish examined bactericidal [5] lysozyme [2] and phagocytic [8] activity.

The results of studies. Bactericidal activity of serum (BASK) is an integral factor in the natural resistance of humoral type and indicates the blood's ability to cleanse itself. It is caused by the presence in serum of complex substances – complement, antibodies, lysozyme, properdyn able to disarm or neutralize microbial cells.

By studying the pathogenic effect of ectoparasites on the body of fish we found that in infected wih lernaea of earlings lysozyme activity of carp serum slightly decreased compared to the control (Table 1).

For various degrees of infestation along with a decrease in lysozyme activity reduced bactericidal activity. The main cells involved in the process of phagocytosis is neutrophilic granulocytes. With the increase in the number of parasites observed decrease in phagocytic activity likely in the 4th group 1,2 times (P<0,05) compared to controls.

1. Indicators of nonspecific resistance in blood of earlings carp, infested with Lernaea cyprinacea, % (M ± m, n = 6)

Indicators	Groups of fish			
	Control	to 0,08 ind. / g bw	0,11-0,26 ind. / g bw	> 0,26 ind. / g bw
	1	2	3	4
Lysozyme activity, %	38,24±2,12	38,12±2,36	36,19±2,16	35,57±2,21
Bactericidal activity, %	29,16±2,27	29,79±2,65	27,61±2,41	26,78±2,48
Phagocytic activity, %	40,14±1,62	39,48±1,96	35,74±1,65	33,16±1,67*
Phagocytic index, units	10,08±0,44	9,31±0,57	9,02±0,85	8,41±0,42*
Phagocytic number, units	5,34±0,58	4,68±0,29	3,25±0,54*	3,12±0,41**

Note: * – P < 0,05, ** – P < 0,01.

In order to study the intensity of phagocytosis, we calculated the phagocytic index and phagocytic number. Probable decrease in phagocytic index was found in the 4th experimental group of fish – by 1,3-fold (P<0,05). At the same time observed a slight decrease in the number of phagocytes in the 3rd and 4th experimental groups 1,6 (P<0,05) and 1,7 (P<0,01) times, respectively.

For infested of fish with ectoparasites *D. vastator* noted a slight decrease of lysozyme and bactericidal activity by the increase in the degree of invasion (Table 2).

The possible reduction of phagocytic activity of 1,2-fold (P<0,05) was observed for the invasion of *D. vastator* fish in the 4th group. However, in this experimental group noted a possible decline phagocytic index and phagocytic number of 1,3 (P<0,01) and 1,6 (P<0,05) times, respectively.

2. Indicators of nonspecific resistance in blood of earlings carp, infested with Dactylogyrus vastator, % (M±m, n=6)

Indicators	Groups of fish			
	Control	to 0,26 ind. / g bw	0,29-0,53 ind. / g bw	> 0,53 ind. / g bw
	1	2	3	4
Lysozyme activity, %	37,62±2,89	37,17±2,42	36,58±2,37	35,89±2,53
Bactericidal activity, %	28,54±2,35	28,94±2,35	27,67±2,42	26,12±2,26
Phagocytic activity, %	39,51±1,36	36,48±2,05	36,56±1,72	34,21±1,28*
Phagocytic index, units	11,23±0,49	10,22±0,48	9,56±0,62	8,56±0,49**
Phagocytic number, units	4,92±0,54	4,86±0,30	3,57±0,42	3,09±0,31*

Note:* – P < 0,05, ** – P < 0,01.

For mixed infestation of fish with *L. cyprinacea* and *D. vastator* lisozyme and bactericidal activity significantly decreased in fish 4th group (table 3), respectively, 1,2 (P<0,05) and 1,3 (P<0,05) times.

Phagocytic activity also significantly decreased in the 3rd and 4th experimental groups of fish of 1,2 (P<0,05) and 1,3 (P<0,05) times, respectively.

For mixed infestations of fish with ectoparasites possible decline observed phagocytic index in the 4th group 1,5 (P<0,01) times and phagocytic number in the 3rd and 4th experimental groups was 1,9 (P<0,05) times.

The immune system in fish, as in higher vertebrates, provides self-regulation through direct contact of cells (macrophages, neutrophils, cytotoxic T-lymphocytes) and by humoral factors (lysozyme, complement). The particular importance for the normal life of fish play the ectoparasitic deseases that significantly affect the immune system and resistance of fish.

3. Indicators of nonspecific resistance in blood of earlings carp, with mixed infestations, % (M±m, n=6)

Indicators	Groups of fish			
	Control	to 0,08 ind. / g bw; to 0,26 ind. / g bw	0,11-0,26 ind. / g bw; 0,29-0,53 ind. / g bw	> 0,26 ind. / g bw; > 0,53 ind. / g bw
	1	2	3	4
Lizotsymna activity, %	39,04±2,14	37,04±2,18	35,12±2,21	32,89±1,48*
Bactericidal activity, %	31,18±2,24	29,12±2,33	26,18±2,12	24,15±1,63*
Phagocytic activity, %	39,68±2,19	37,92±1,89	33,78±1,28*	31,56±1,65*
Phagocytic index, units	11,23±0,68	10,33±0,48	9,21±0,76	7,68±0,59**
Phagocytic number, units	5,78±0,82	4,75±0,41	3,12±0,65*	3,05±0,47*

Note:* – P < 0,05, ** – P < 0,01.

Conclusions and recommendations for further research. At high infestation with ectoparasites (>0,26 lernaea on g bw and >0,53 dactylogyrus on g bw) was observed probable decline in nonspecific resistance of earlings carp.

In view of the results obtained requires further study the impact of ectoparasites on the processes of immune protection of fish.

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