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VETERINARY SANITARY EXAMINATION AND HELMINTOSIS COMPARATIVE MONITORING OF FISH OF WATER SOURCES OF KORGALZYN DISTRICT, AKMOLA REGION

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Abstract

This article presents the results of studies on helminthological diseases of carp species living in the rivers Nura, Tengiz, Birtaban, Shalkar, Uyaly, Sholak, Alkasor of the Korgalzhyn region. 226 studied fish samples were subjected to comparative monitoring using helminthological methods.

When examining the fish of the reservoirs of the Korgalzhyn district of the Akmola region, 41.1% of the fish were found unfit for organoleptic indicators.

As a result of laboratory studies, fish samples taken from the Sholak, Alkasor and Uyaly rivers were recognized as unsuitable, while the indicators of the studied fish from the Nura river and lakes Shalkar, Tengiz, Birtaban were within the normal range.

According to the study, 6.4% of diplostomiasis in Lake Shalkar and 28.6% of opisthorchiasis in Lake Alkasor are affected by helminthiases. 16.6% postdiplostomiasis in the lakes Shalkar and Birtaban, 10.5% opisthorchiasis in the Nura River. In Lake Sholak, ligulase was 9.1%.

Key words: Fresh water fish; monitoring; opisthorchosis; helminths; epidemiological situation; zoonosis; Korgalzhyn district.

Basic position and Introduction

Fish meat can be a reservoir of many invasive diseases that threaten humans, such as diphyllobotryosis, opisthorchosis, clonorchosis, and metagonimia. Liverworms of the family Opisthorchiidae are considered causative agents of serious diseases all over the world. Opisthorchids Opisthorchis felineus, O. viverrini, Clonorchis sinensis, and Metorchis bilis infect the liver of mammals, including humans [1]. Therefore, great attention is paid to the quality of the fish, as well as compliance with regulatory legal documents.

Trematodes carried by fish are an important cause of diseases in Kazakhstan. The number of cases of opisthorchiasis (infection with parasites of the opisthorchiidae family) in humans reached 2521 reported cases (17 cases per 100,000 population) in 2002 and gradually decreased to 1225 cases in 2011 (7.4 cases per 100,000 population) [2].

Opisthorchiasis is a dangerous parasitic disease of humans and fish-eating mammals, caused by the trematode Opisthorchis felineus (Plathelminthes, Trematoda), also known as the feline or liver worm. Infection with this parasite occurs when eating fish infected with parasites of the Cyprinidae family (order Cyprinidae). Therefore, when eating slightly salted or undercooked (fried or boiled) fish, the risk of human infection with this pathogenic parasite is very high [3].

The fight against zooanthroponotic helminthiases, which are widespread in the Republic of Kazakhstan, is one of the state tasks in the field of health and veterinary medicine. On the territory of Kazakhstan, there are natural foci of many dangerous parasitic diseases, which requires the veterinary service to take effective measures to combat, and prevent the spread of these diseases to other regions of Kazakhstan [4].

Since parasites show great potential for adapting to environmental changes, it is important to understand that one approach to detecting parasites is not enough. With the development of aquaculture, the amount of fish consumed for human nutrition increases, and therefore the risk of human infection with invasive diseases, especially opisthorchiasis, ligulosis, diphyllobothriasis, etc., increases [5].

In addition, it is known that fish in the early stages of development are most sensitive to the effects of toxic environmental factors, and prone to mass death from infections and invasions when exposed to pollutants [6, 7].

Infection of fish with helminths is typical in spring and summer. Usually, the disease is registered among fry and juvenile fish in spawning ponds. Adult fish are less intensively infected [8].

Nematode parasites of the family Anisakidae infect late hosts, piscivorous birds and mammals, through secondary intermediate hosts such as first intermediate hosts, copepods and fish. However, in people who consume raw or undercooked fish, it can lead to a nematode infection called anisakidosis [9].

The most common are trematodes, cestodosis, and nematodes caused by various parasitic worms. These parasites are found in fish in

natural water bodies, as well as in ponds and spawning grounds. The most common microorganisms in fish and fish products [10].

The most dangerous helminthiasis among trematodes is opisthorchiasis. Opisthorchiasis is a biogelmintic caused by Opisthorchis felineus, a trematode belonging to the Opisthorchidae family. Infection of humans, cats, dogs, foxes, Arctic foxes, pigs occurs when eating fish of the carp family infected with opisthorchiasis larvae [11].

Material and methods

Fish sampling was carried out on the rivers Nura, Teniz, Birtaban, Shalkar, Uyaly, Sholak, and Alkasor of the Korgalzhyn region. A total of 226 specimens of fish were examined for helminthological diseases (carp, perch, silver carp, pike perch, carp, pike, and tortas).

The research work was carried out in the in May-July NGO "Fishery", in the city of Nur-Sultan, the Kazakh Agricultural Technical University named after Saken Seifullin, the Faculty of Veterinary Medicine and Livestock Technology, the Department of Hunting and Fisheries and the laboratory of the Department "Veterinary Sanitation" and the "National Reference Center veterinary medicine" in Nur-Sultan.

The study of diseases such as ligulosis and opisthorchiasis was carried out by cutting and dissecting the obtained material, in which the presence of tongues and other helminths in the abdominal cavity of fish was studied, studied by placing them in compression glass [12].

The following laboratory research methods were used:

- to detect eggs of nematodes and cestodes - using the Fulleborn method [13], the Kotelnikov-Khrenov method [14], and other flotation methods in various modifications;

- detection of trematode eggs - by sedimentation with sequential washing.

To quantify the degree of damage to fish by parasites, we used such indicators as the intensity and extensiveness of infection, as well as the index of abundance of parasites.

Laboratory research: Bacterioscopy. Determination of the concentration of hydrogen ions (pH) . Qualitative reaction to hydrogen sulfide. Determination of the content of aminoammonium nitrogen. Reaction with copper sulfate in broth, reaction with peroxidase. Reaction to gaseous ammonia (according to Eber) . Determination of ammonia with Nessler's reagent[15].

Results

Table 1 - Organoleptic indicators of fish

Reservoir	Indicators					
	Mucus	Scales	Eye	Mouth	Gills	Consistency

River Nura n=34	Abundant, transparent, odorless	Smooth, shiny, hard to get	Convex, clean, transparent cornea	Closed	The color is bright red, the mucus is viscous and transparent	Tight; fish does not bend; meat is difficult to separate from bones
Lake Teniz n=21	Transparent, odorless	Shiny, hard to extract	Protrudin, clean	Closed	Bright red, clear mucus	The fish bends slightly, the meat barely separates from the bones
Lake Birtaban n=36	Fluffy, natural fishy smell	Shiny, snugly fitting to the body	Protrudin, transparent	Semi-open	Bright red, cream transparent	Meat is difficult to separate from bones
Lake Shalkar n=42	Abundant, transparent, odorless	Smooth, shiny, hard to get	Convex, clean, transparent cornea	Closed	The color is bright red, the mucus is viscous and transparent	Elastic, the fish bends slightly, the meat barely separates from the bones
River Uyaly n=32	Cloudy, gray color	Easily torn	Down, transparent	Half-open	Bright red, creamy, cloudy	The fish bends slightly, the meat barely separates from the bones
Lake Alkasor n=7	Transparent, odorless	Shiny, hard to extract	Convex, clean	Closed	The color is bright red, the mucus is transparent	Tight; fish does not bend; meat is difficult to separate from bones
Lake Sholak n=54	Slightly cloudy, natural fishy smell	Shiny, stretches easily	Clean, slightly lowered, transparent cornea	Half-open	The color is dark red, the mucus is viscous, indistinct	Elastic, the fish bends slightly, the meat barely separates from the bones

As can be seen from Table 1, the indicators of fish taken from the rivers Nura and Shalkar, Teniz and Birtaban lakes were fresh. Mechanically intact, gills are red, eyes are transparent, intact, and the smell is characteristic of live fish. The scales are shiny, close to the skin, the skin is spotless and close to the muscles. The fins are rigid, the abdominal cavity is not swollen, and the internal organs are easily separated.

The organoleptic characteristics of fish from the Sholak and Alkasor lakes and the Uyaly river were questionable. Fish from Lake Shortan had cloudy mucus, scales

were easily removed. The gills were dark red in color, the mucus was viscous and cloudy, and the gill covers were not tightly closed.

Table 2 - Physical and chemical indicators of fish

Reservoir	Indicators				
	Bacterioscopy	pH	Eber ammonia reaction	Hydrogen sulfide reaction	Peroxidase reaction
River Nura n=34	The smear is poorly colored, absent in deep layers, on the surface of up to 10 microbial bodies	6,8±0,02	negative	negative	Filtered blue is colored green
Lake Teniz n=21	There are no microbial bodies in the deep layers, up to 15 in the surface	6,6±0,05	negative	negative	Filtered blue is colored green
Lake Birtaban n=36	There are no deep layers, and up to 12 microbial bodies in the surface	6,6±0,08	negative	negative	Filtered blue is colored green
Lake Shalkar n=42	The smear is poorly colored, absent in deep layers, on the surface of up to 10 microbial bodies	6,7±0,04	negative	negative	Filtered blue is colored green
River Uyaly n=32	Up to 20 m/d in deep layers, up to 35 microbial bodies in the surface layer	6,8±0,04	Weak positive	positive	The filter remained unchanged; the reaction is negative
Lake Alkasor n=7	Up to 25 m/d in deep layers, up to 40 microbial bodies in the surface layer	6,9±0,09	Weak positive	positive	The filter remained unchanged; the reaction is negative
Lake Sholak n=54	The smear is well colored, in deep layers up to 9 microbial bodies, on the surface up to 20 microbial bodies	7,1±0,05	Weak positive	positive	The filter remained unchanged; the reaction is negative

As can be seen from Table 2, biochemical parameters of fish examined from Nura river and Shalkar, Teniz and Birtaban lakes were within the normal range. Thus, smears were poorly stained, no microbial bodies were found in deep layers, up to 15 microbial bodies in surface layers, pH was normal, peroxidase reaction was positive, ammonia and hydrogen sulfide were negative.

At bacterioscopy of smears from marks in samples of fish from lakes Sholak, Alkasor and river Uyaly smears were well stained, up to 25 microbial bodies in deep layers, up to 40 microbial bodies in surface layers, pH index was doubtful, reaction on peroxidase was negative, filtered blue-green color was not stained. The reaction of ammonia was weakly positive-forming a quickly disappearing cloud, in hydrogen sulfide-positive, a small brown spot appeared on the paper (Table 2).

Table 3 - Infection of fish with helminthiases in reservoirs of the Korgalzhyn region

Reservoir	Type of fish	Number of fish		Type of parasite	Extensiveness, %	Intensity, экз.
		Researched	Invasive			
Nura River	Carp (Carassius)	7	Not detected	-	-	-
	Walleye (Sander lucioperca)	8	Not detected	-	-	-
	Taban (Abramis brama)	19	2	Metacercariae of the family *Opistorchidae*	10,5	1-2
Sea Lake	Torta (Rutilus rutilus)	10	Not detected	-	-	-
	Pike (Esox lucius)	11	Not detected	-	-	-
Birtaban Lake	Silver carp (Carassius gibelio)	6	Not detected	-	-	-
	Pike perch (*Sander lucioperca)*	24	4	*Posthodiplostomum cuticola*	16,6	1-2
	Perch (Percafluviatilis)	6	Not detected	-	-	-

Lake Shalkar	Torta (Rutilus rutilus)	5	Not detected	-	-	-
	Perch (Percaflu viatilis)	31	2	*Diplostomum spathaceum*	6,4	1-2
	Pike (Esox lucius)	6	Not detected	-		
Uyaly river	Carassius gibelio (Carassius gibelio)	32	4	*Posthodiplostomum cuticola*	12,5	1-2
Lake Alkasor	Torta (Rutilus rutilus)	7	2	Metacercariae of the family *Opistorchidae*	28,6	1-2
Lake Sholak	Perch (Percafluviatilis	7	Not detected	-		
	Carassius gibelio (Carassius gibelio)	16	2	*Posthodiplostomum cuticola*	12,5	1-2
	Pike (Esox lucius)	9	Not detected	-		
	Cyprinus	22	2	*Ligutidae*	9,1	1-2

Fish in Shalkar Lake and Sholak Lake are infected with helminths, and the extensiveness of *Posthodiplostomum cuticola* is 12.5, and the intensity is 1-2. Single eggs of *Posthodiplostomum cuticola* with the extensiveness of 12.5, intensity 1-2 (figure–1). The mechanism of transmission and life cycle of the helminth *Posthodiplostomum cuticola* is not fully understood. Helminth eggs must mature in freshwater before they are ingested by fish, and the eggs have been shown to be larval-free, in which case the fish can become an accidental intermediate host without further infection of the definitive hosts (fish-eating birds).

Figure 1 - Fish infected with Posthodiplostomum cuticola

When studying perch in Lake Shalkar, cercariae diplostomum cercariae were found in the eye with an extensiveness of 8.3% and an intensity of 28-32 points. 10.5% are infected with metacercariae of trematodes of the family Opistorchidae of the flounder of the Nura River with an infection rate of 1-2 specimens. Diplostomes are common diseases of pond fish in Kazakhstan. Most natural reservoirs are main centers of diplostomic invasion. The main carriers of pathogens of diplostomiasis are fish-eating birds (gulls, terns, mergansers), bringing an invasive source into fishery ponds. In our studies, the percentage of infection was negligible, 8.3%, but the intensity of invasion was high.

According to the research results, metacercariae of trematodes of the diplostomum family were more common in the eyes of fish, Posthodiplostomum cuticola in the skin and subcutaneous tissue, and plerocercariae of the Ligutidae family – in the abdominal cavity.

In order to study compliance with safety requirements for human health in terms of parasitism, the selection and volume of fish are carried out in accordance with the following requirements:

- Guidelines 3.2.1756-03 “Prevention of parasitic diseases. Epidemiological control of parasitic diseases”.
- State standard 7631-2008 “Fish, fish products and products from them. Method for determining organoleptic and physical indicators.
- State standard 31339-2006 “Fish, fish products and products from them. Acceptance Rules and Sampling Methods"

Discussions

Organoleptic indicators of all fish samples studied were at a normal level. During the study of samples, invasive diseases were identified in fish of lakes of Korgalzhyn district, i.e. opisthorchiasis and diphyllobotriosis.

It is known that these types of invasive diseases are dangerous for the human body. Therefore, fish caught in these lakes will definitely cause diseases in humans if they enter the human body without passing a veterinary sanitary examination. Given the fact that in some

cases the population catches fish directly from these lakes and uses carp as food, the fish of these lakes is unambiguously dangerous to the health of the population. It turned out that fish affected by invasive diseases have low sensory and biochemical indicators.

Taking into account these points, it is necessary to carry out a strict veterinary and sanitary examination of fish taken from lakes in these regions. It is necessary to conduct propaganda work on the fact that it is dangerous for the population to use food sequence without processing unexplored fish.

The scales are shiny, the eyes are soft, the mucus is clean, with a characteristic smell. The gill covers are located close to each other, and the color of the gills is from red to dark red, in some specimens there are remnants of silt and debris under the gill covers. The internal organs are not damaged, they are clearly visible, and the abdomen does not swell. Physical and chemical parameters were within normal limits.

Conclusion

Microscopic examination of surface smears revealed only cocci and bacilli; no microbes were found in the deeper layers of the smears. The pH of all samples was constant from 6.61 ± 0.001 to 6.78 ± 0.001. When peroxidase was detected, the gill filtrate turned blue-green and brown, which indicates the good quality of the studied samples. When determining ammonia with Nessler's reagent, the extracts obtained from the samples acquired a greenish-yellow color and remained transparent.

According to research data, 6.4% of diplostomiasis in Lake Shalkar and 28.6% of opisthorchiasis in Lake Alkasor are affected by helminthiases. In lakes Shalkar and Birtaban, postdiplostomiasis accounts for 16.6%, opisthorchiasis - 10.5% in the Nura River. In Lake Sholak, ligulase was 9.1%.

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Аннотация

В данной статье представлены результаты исследований по

гельминтологическим заболеваниям карповых видов, обитающих в реках Нура, Тенгиз, Биртабан, Шалкар, Уялы, Шолак, Алкасор Коргалжынского района. Сравнительному мониторингу с использованием гельминтологических методов подвергли 226 исследованных проб рыб.

При осмотре рыб водоемов Коргалжынского района Акмолинской области по органолептическим показателям 41,1% рыб были признаны негодными.

Пробы рыбы, отобранные из озер Шолак, Алкасор и реки Уялы, в результате лабораторных исследований признаны негодными, в то время как показатели изученной рыбы из реки Нуры и озер Шалкар, Тенгиз, Биртабан находились в пределах нормы.

По данным исследования, гельминтозами поражено 6,4% диплостомозов в озере Шалкар и 28,6% описторхозов в озере Алкасор. 16,6% постдиплостомоз в озерах Шалкар и Биртабан, 10,5% описторхоз в реке Нура. В озере Шолак лигулаза составила 9,1%.

Ключевые слова: Пресноводная рыба; мониторинг; описторхоз; гельминты; эпидемиологическая ситуация; зооноз; Коргалжынский район.

Түйін

Бұл мақалада Қорғалжын ауданына қарасты Нұра, Теңіз, Біртабан, Шалқар, Ұялы, Шолақ, Алқасор өзен-көлдерінде мекендейтін тұқы тектес балықтардың гельминтологиялық ауруларына жүргізілген зерттеу нәтижелері келтірілген. Жалпы зерттелген 226 балық сынамасына салыстырмалы мониторинг жұмыстары жасалып, гельминтологиялық әдістер қолданылды.

Ақмола облысы Қорғалжын ауданы су көздері балықтарын сезімдік көрсеткіштері бойынша зерттегенде балықтардың 41,1% жарамсыз деп танылды.

Шолақ, Алқасор көлдерінен және Ұялы өзенінен алынған балық сынамалары зертханалық зерттеу нәтижесінде жарамсыз деп танылып, ал Нұра өзені және Шалқар, Теңіз, Біртабан көлдерінен зерттелген балықтардың көрсеткіштері қалыпты шектерде болды.

Зерттеу бойынша балықтардың гельминтоздарға шалдығуы Шалқар көлінде диплостомоз ЭИ 6,4%, Алқасор көлінде описторхоз 28,6%. Шалқар және Біртабан көлінде постдиплостомоз 16,6%, Нұра өзенінде описторхоз 10,5%. Шолақ көлінде лигулез 9,1%-ды құрады.

Кілт сөздер: тұщы су балығы; мониторинг; описторхоз; гельминттер; эпидемиологиялық жағдай; зооноз; Қорғалжын ауданы.