

ANNOTATION

**dissertation work of Zhumabayev Askhat
on the topic «Veterinary and sanitary safety of fish in the reservoirs of the
West Kazakhstan region» submitted for the degree of
Doctor of Philosophy (PhD) in the educational program
8D09102 – «Veterinary sanitary»**

Relevance of the research topic. Every year, the food safety problem becomes increasingly urgent, as ensuring the safety of food products and raw materials plays a key role in preserving human health and determining the gene pool. Ensuring high quality and safety of food products is an essential condition for maintaining food independence. It is a priority task of the state policy in the field of healthy nutrition in the Republic of Kazakhstan. In addition, parasitic diseases lead to a decrease in the quality of fish products. Infected fish are stunted, and the development of clinical signs of helminth infestation makes them unfit for human and animal consumption unless special decontamination is carried out. In modern conditions, due to human impact on the environment, water bodies receive a significant amount of pollutants of various degrees of toxicity, which negatively affect living organisms inhabiting water.

Such factors include the widespread use of various means of protection in agriculture, insufficient treatment of wastewater from industrial, municipal, and domestic enterprises, and industrial waste. They also release toxic substances, radionuclides, and heavy metal salts into the environment from mining enterprises. These processes lead to increased pollution of water bodies used for fisheries with toxic compounds harmful to aquatic organisms.

With the increasing impact of anthropogenic factors on the environment, unusual changes are forming associated with the excessive content of harmful substances of high toxicity, such as lead, cadmium, selenium, arsenic, mercury, and others. Due to their wide distribution in the hydrosphere and high toxicity for aquatic organisms, including fish, the study of these substances becomes especially relevant.

This dissertation study aimed to is to determine the veterinary and sanitary safety of fish in WKR water bodies and fish products sold in retail outlets in Uralsk city, determine fish infestation, determine the content of antibiotics and radionuclides, examine the chemical composition of fish meat, and develop a method for eliminating heavy metal compounds from fish.

Research objectives:

1. Determination of the degree of fish contamination by residual amounts of radionuclides and heavy metal salts in natural fishery water bodies in the West Kazakhstan Region.

2. Study of contamination of fish and fish products from fish nurseries of WKR and trade outlets of Uralsk city by residual antibiotic content.
3. Study of distribution of invasive fish diseases in water bodies of West Kazakhstan region chemical factors.
4. Determination of nutritional value, amino acid, fatty acid, vitamin and mineral composition of fish meat.
5. Development of a method for the elimination of heavy metal salts from the fish organism.

Materials and research methods. Research work was carried out based on higher school Veterinary and biological safety and in the laboratory “Testing Centre” of WKATU named after Zhangir khan. The testing center is accredited in the Republic of Kazakhstan's accreditation system by the requirements of GOST ISO/IEC 17025-2019 "General requirements for the competence of testing and calibration laboratories," under certificate number KZ.T.09.E0858, dated March 15, 2022. Studies on residual antibiotic levels, heavy metal salts, and radionuclide content in fish were conducted at the West Kazakhstan branch of the RSE on the REM 'Republican Veterinary Laboratory' of the CVCN of the Ministry of Agriculture of the Republic of Kazakhstan. The Sample was collected by visiting fishery water bodies in the West Kazakhstan region.

The main provisions for defense:

1. To determine the degree of contamination of fish with residual amounts of radionuclides and heavy metal compounds in natural fishery water bodies in WKR
2. To study the contamination of fish and fish products from fish nurseries of WKR and trade outlets of Uralsk city by residual antibiotic content.
3. To study the distribution of invasive fish diseases in water bodies of the West Kazakhstan region using chemical factors.
4. Determination of nutritional value, amino acid, fatty acid, vitamin and mineral composition of fish meat.
5. Development of a method for the removal of heavy metal salts from fish meat.

Description of the main results of the study.

To study the infestation of fish from water bodies of West Kazakhstan oblast, 1726 specimens of fish and fish products were sampled. The study of fish revealed ligulosis (Ligulidae) with intensity of infestation 5.8% and intensity of infestation - 2 specimens, with the main lesions observed in crucian carp (*Carassius gibelio*). The invasive disease postodiplostomosis (Diplostomatidae) was also detected with an invasion rate of with intensity of infestation 10.6% and intensity infestation rate of 6 specimens, mainly bream (*Abramis brama*) and redfin (*Scardinius erythrophthalmus*).

Anisakidae larvae (Anisakidae) were detected in 8 fish specimens of stud fish (*Aspius aspius*) in retail outlets of Uralsk city with an of with intensity of

infestation 28% and an intensity of infestation of 8 specimens. Anisakidae were diagnosed in 8 out of 98 fish samples examined. Opisthorchiasis (Opisthorchidae) was detected in intensity of infestation 7 specimens of fish (*Leuciscus idus*) in the river Bagyrlay, with an with intensity of infestation of 17% and intensity of infestation 7 specimens.

According to the results of parasitological examination of fish caught from water bodies of WKR for research, despite compliance with the established quality requirements, fish products are recognised as conditionally fit for food consumption due to detected parasitoses such as anisakidosis (Anisakidae), postodiplostomosis (Diplostomatidae), ligulosis (Ligulidae) and eustrongylidosis (Dioctophymidae).

When assessing the quality of fish meat, the physicochemical parameters in 61 samples met the standards. However, in five samples, slight flocculent precipitates were detected in the extracts during the reaction with 5% copper sulfate. Nessler's number was 1.1 ± 0.01 , the reaction for peroxidase was negative, the extract was immediately coloured brown-brown, pH was 7.1 ± 0.01 , indicating doubtful freshness. Based on the results of laboratory studies of fish products from retail outlets in the city of Uralsk, all samples (51 samples) met the standards.

According to the results of the study of ichthyofauna of reservoirs of West Kazakhstan region, it was found a wide distribution of residual amounts of lead compounds in fish samples, with concentrations in muscle tissue in the range of 0.02-1.15 mg/kg. Cadmium levels in the samples ranged from 0.001 to 0.245 mg/kg, with lead concentrations not exceeding the Maximum Permissible Level (MPL), while cadmium levels exceeded the MPL by 0.045 mg/kg. Mercury and arsenic were not detected in the tested samples.

Residual quantities of radionuclides in fish and fish products of the West Kazakhstan region showed that the average degree of contamination with caesium-137 ranged from 0.2 to 6.37 Bq/kg, while the concentration of strontium-90 ranged from 0.1 to 10.62 Bq/kg. However, all analysed samples did not exceed the maximum permissible levels (MPL).

When five samples of smoked coho salmon (*Pelecus cultratus*) purchased from Ayazhan market were examined, the residual levomycetin content was found to be 0.076 ± 0.012 mg/kg within the permissible limit. Out of 91 samples of fish and fish products examined, residues of antibiotics belonging to the group of levomycetin and tetracyclines were detected in six samples, which constituted 12% of the total number of samples examined. At the same time, the residual concentration of chloramphenicol and tetracyclines (0.05 ± 0.0014 mg/kg) did not exceed the maximum permissible levels. Antibiotics such as levomycetin and tetracyclines are actively used in fish farms to control infectious diseases, as well as in the storage of fish products. In conclusion, it can be noted that the level of residues of tetracycline and levomycetin in fish products complies with the established norms (GOST 31903-2012), which indicates proper control over the use of antibiotics in the production process of fish products.

Justification of the novelty and importance of the results obtained.

Methodological recommendations titled "On the Parasitological Study of Fish (Anisakidosis, Opisthorchiasis, Postodiplostomosis, Ligulosis, Eustrongyliasis)" have been developed, providing data on the prevalence of fish invasions in the water bodies of the West Kazakhstan region, as well as monitoring the content of toxic substances in fish that are hazardous for human consumption. This includes "Monitoring the Safety of Fish and Fish Products Regarding the Content of Heavy Metal Salts, Radionuclides, and Antibiotics from the Water Bodies of WKR."

A total of 11 scientific works were published on the topic of the dissertation, including 1 article in peer-reviewed scientific journals indexed in the Scopus database, 4 in publications recommended by the Committee for Control in Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, and 3 in the proceedings of international scientific and practical conferences. Two recommendations were developed and published, and one protective document was obtained in Kazakhstan.

A method for removing heavy metal salts from fish bodies, "Method for Removing Cadmium from Fish Raw Materials," was also developed and registered as utility model No. 8012 on April 28, 2023.

Description of the doctoral student's contribution to the preparation of each publication.

All results and conclusions presented in the dissertation were obtained and formulated with the candidate's direct involvement, following the doctoral student's individual research plan. The doctoral student mastered all research methods, actively participated in discussions, preparation, and formatting of scientific articles, as well as the publication of the obtained results in domestic and international journals.

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Scope and structure of the dissertation.

The dissertation is presented on 124 pages of computer-typed text. It includes an introduction, a literature review, research materials and methods, results of the author's own research, discussion, and conclusion. The study references 214 literature sources and contains 28 figures, 12 appendices, and 19 tables.