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Pathogenic Helminths of Domestic Birds in Azerbaijan and their Potential Threat to Human Health

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Helminthiasis constitute a widespread group of parasitic diseases affecting both domestic and wild birds and represent a significant constraint to poultry production by causing considerable economic losses. These parasites adversely affect the growth and development of birds, reduce productivity, and, in severe cases, may lead to mortality. The diverse geographical and climatic conditions of Azerbaijan provide favorable environments for the dissemination of helminths and their intermediate hosts. This review analyzes the principal pathogenic helminths recorded in domestic birds in Azerbaijan, their biological characteristics, distribution patterns, pathogenic effects on avian hosts, and their potential implications for human health. A synthesis of available literature indicates that *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria* spp., *Syngamus trachea*, *Raillietina* spp., and *Echinostoma* spp. are among the most frequently encountered helminths in the country. Particular attention is drawn to the zoonotic significance of trematodes belonging to the genus *Echinostoma*. Existing data highlight the necessity for more

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comprehensive and systematic investigations of the helminth fauna of domestic birds in Azerbaijan.

Helminth infections of birds are among the most widespread parasitic diseases worldwide and are of considerable importance from both veterinary and public health perspectives. Various helminth species parasitize the digestive, respiratory, and other organ systems of birds, thereby negatively affecting their physiological condition, productivity, and reproductive performance. High levels of infection may result in substantial economic losses in poultry production.

The Republic of Azerbaijan is characterized by remarkable landscape diversity, climatic heterogeneity, and a wide range of biogeographical conditions. The variety of ecosystems present within the country creates favorable conditions for the completion of helminth life cycles and the survival of their intermediate hosts. Consequently, the investigation of regional patterns in the distribution of avian helminthiasis remains an important scientific and practical issue.

Recent studies have demonstrated that chickens, ducks, geese, and turkeys raised in small-scale rural households are more frequently exposed to helminth infections. This increased susceptibility is primarily associated with free-range management systems, which facilitate contact with contaminated soil, infective stages of parasites, and intermediate hosts.

Helminths infecting domestic birds can generally be classified into three major groups: nematodes, cestodes, and trematodes.

Nematodes represent the most common helminths infecting domestic birds. Among them, *Ascaridia galli* is the causative agent of avian ascariasis and primarily inhabits the small intestine of chickens. Heavy infections may result in digestive disturbances, weight loss, and decreased productivity (1).

Heterakis gallinarum predominantly inhabits the ceca and plays a crucial role in the transmission of several protozoan pathogens, particularly *Histomonas meleagridis*. Therefore, its pathogenic significance extends beyond its direct effects on the host (2).

Species of the genus *Capillaria* inhabit various sections of the digestive tract and may induce inflammatory lesions under severe infection conditions. *Syngamus trachea*, commonly known as the gapeworm, parasitizes the trachea of birds,

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causing respiratory distress and occasionally mortality, especially among young birds (3).

Cestodes of the genus *Raillietina* are among the most common tapeworms infecting domestic poultry. Their life cycles involve various arthropods serving as intermediate hosts. Infection can result in damage to the intestinal mucosa, impaired nutrient absorption, and general debilitation.

Among domestic waterfowl, trematodes of the genus *Echinostoma* are of particular importance. Their life cycle involves aquatic mollusks and other aquatic organisms as intermediate hosts. Several *Echinostoma* species are capable of infecting humans, making them significant from a zoonotic perspective (4).

The diversity of climatic and landscape zones across Azerbaijan has a direct impact on the distribution of helminths. In humid subtropical regions, particularly within the Lankaran-Astara zone, elevated humidity promotes the prolonged survival of helminth eggs and larvae in the environment.

In areas rich in water bodies, trematode infections are more commonly observed in ducks and geese due to their feeding habits, which involve mollusks, crustaceans, and other intermediate hosts. In contrast, soil-transmitted nematodes predominate in lowland and foothill regions.

While free-range management systems significantly increase the risk of helminth transmission, infection rates are generally lower in modern intensive poultry production facilities employing closed housing systems (5).

Most helminths of domestic birds exhibit a high degree of host specificity and are incapable of completing their life cycles in humans. Nevertheless, certain species may pose potential public health risks.

The most significant zoonotic helminths belong to the genus *Echinostoma*. Human infection may occur through the consumption of inadequately cooked aquatic food products containing infective stages of the parasite. Clinical manifestations may include gastrointestinal disorders, abdominal pain, and other digestive symptoms.

Some species of the genus *Capillaria* are also regarded as potential zoonotic parasites. However, transmission of avian *Capillaria* species to humans appears to be relatively uncommon.

In contrast, *Ascaridia galli*, *Heterakis gallinarum*, and

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Syngamus trachea are generally considered to pose minimal risk to human health. Nevertheless, their economic impact on poultry production remains substantial.

Systematic investigations of the helminth fauna of domestic birds in Azerbaijan began during the early 1960s. The pioneering contributions in this field were made by the distinguished helminthologist N.M. Shirinov. In 1962, he reported ten helminth species recorded for the first time from domestic geese and ducks in Azerbaijan. This study represented a milestone in the investigation of helminths infecting domestic waterfowl within the country. In the following year, Shirinov published a more comprehensive analysis addressing the helminth fauna of domestic geese and ducks, associated helminthiases, and measures for their control. These studies demonstrated the richness of the helminth fauna of waterfowl across different ecological regions of Azerbaijan and emphasized the important role of environmental factors in shaping parasite communities (6, 10–11).

Between the 1960s and 1980s, helminthological research in Azerbaijan developed largely within the framework of the Soviet helminthological school. During this period, the complete helminthological dissection method developed by K.I. Skryabin was widely employed for the identification of nematodes, cestodes, and trematodes inhabiting various organs of birds. Research efforts focused primarily on taxonomy, biology, and epizootiological characteristics of avian helminths (7–9).

Following the 1990s, the overall volume of helminthological studies declined; however, investigations into the prevalence of helminthiases in poultry farms continued in several regions. These studies revealed the widespread occurrence of ascariasis, heterakidosis, and capillariosis among domestic birds.

Interest in avian helminthology has increased again in recent years. In particular, studies conducted in western regions of Azerbaijan in 2023 demonstrated the extensive distribution of ascariasis among poultry and highlighted the importance of preventive and control measures.

Research published in 2025 investigated the prevalence of helminthiases and other parasitic diseases among domestic chickens in the Shaki and Gakh districts. The results revealed that ascariasis, heterakidosis, and capillariosis are widespread in both backyard and farm-based poultry systems.

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Infection rates were shown to depend significantly on bird age and management conditions. In the same year, extensive helminthological surveys conducted in the Mountainous Shirvan economic region identified five nematode species, one cestode species, and one trematode species in domestic chickens. Among these, *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria obsignata*, and *Syngamus trachea* were found to be the most prevalent. Furthermore, hematological and biochemical studies carried out in 2025 demonstrated that helminth infections exert significant adverse effects on the physiological condition of domestic chickens. Notable alterations in blood parameters were observed in birds infected with *Capillaria obsignata*, *Heterakis gallinarum*, and *Raillietina tetragona*.

Overall, research on domestic bird helminths in Azerbaijan has evolved considerably since 1962, progressing from basic taxonomic descriptions to modern ecological, epizootiological, and physiological investigations. Existing evidence indicates that the helminth fauna of domestic birds is highly diverse across the country's various ecological regions. Nevertheless, comprehensive assessments of helminth distribution in relation to climate change, anthropogenic influences, and zoonotic risks remain important priorities for future research (4, 12).

The available literature demonstrates that helminthiasis remains an important veterinary concern in domestic birds throughout Azerbaijan. The most frequently reported helminths include *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria* spp., *Syngamus trachea*, *Raillietina* spp., and *Echinostoma* spp. Their distribution is strongly influenced by the ecological and geographical diversity of the country. Although most of these parasites primarily affect bird health and productivity, certain trematodes possess zoonotic potential and may pose risks to human health. Therefore, continuous monitoring of helminth infections, implementation of effective preventive measures, and comprehensive regional surveys are essential for improving both poultry health and public health protection.

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