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Acanthocephalan infestation in fishes- A review

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ABSTRACT

Fish are a diverse group of gill-bearing aquatic animals without limbs. They can suffer from various diseases, with parasitic infestations being a major issue. The fishing industry is important because it provides a large portion of our animal protein, boosts our economy by contributing to the GDP, and earns foreign exchange for the country. However, fish can carry parasites, like worms, which can harm their health and cause problems for aquaculture, where fish are farmed. They can also spread diseases to humans and animals and even cause fish to die. One type of worm, called acanthocephalans, is especially troublesome because it infects both freshwater and ocean fish.

Keywords: Parasite, Acanthocephalan, Helminth, Animal diseases, Larval parasitic

Introduction

Acanthocephala, a relatively minor yet significant group of parasites, shares traits with rotifers and predominantly inhabits the intestinal walls of freshwater and marine fish globally. Their distinctive feature is a hooked proboscis used to anchor onto the host's intestine, where they absorb nutrients directly. Their body structure includes multiple pores and canals, serving protective and absorptive functions [1].

Acanthocephalans are dioecious, with reproductive organs occupying much of their body. Mating occurs within the host's intestine. These parasites are found in both marine and freshwater fish and belong to various genera such as Echinorhynchus, Acanthocephalus, and others [2].

Examples of these parasites include Pomphorhynchus laevis, commonly found in multiple freshwater fish species, and *Corynosoma australe,* prevalent in temperate and subantarctic waters of the Southern Hemisphere, maturing in seals [3]. Juvenile stages of these parasites have been observed in various teleost species, such as *Micropogonias furnieri* in the Argentine Sea.

In different regions, such as Yemen and Nigeria, various species like *Serrasentis sagittifer* and *Acanthogyrus tilapiae* have been documented infecting fish species like *Thunnus tonggol* and *Oreochromis niloticus* [4]. In Japan's Lake Biwa, six species of acanthocephalans have been identified, with Acanthocephalus *opsariichthydis* and *Echinorhynchus cotti* among the most common [5].

Life cycle

Acanthocephalans have life cycles involving multiple hosts one is definitive host and second is intermediate host for their developmental and resting stages. Here's a simplified explanation:

At the strart of development, eggs containing acanthor larvae are released by the female. These eggs are eaten by an arthropod, often a crustacean. Inside the arthropod, the acanthor hatches and changes into an acanthella. The acanthella then moves through the arthropod's gut wall and becomes a cystacanth stage in its body cavity, which is infective.

When this cystacanth is consumed by the final host, such as a fish, it sheds its cyst wall, extends its proboscis, pierces the gut wall, and starts to feed and grow. Eventually, it develops its sexual organs. After mating, the male uses secretions from its cement glands to block the female's vagina, preventing further matings. Inside the female, embryos develop, and the life cycle begins a new when eggs are released again.

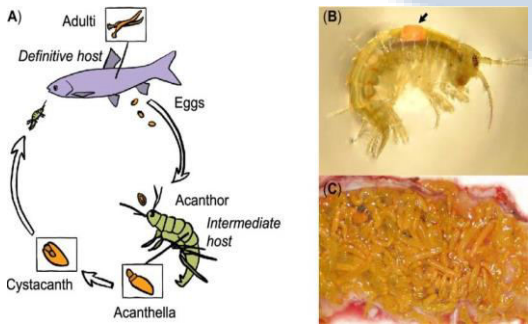

Fig. 1: Life cycle of Acanthocephalon

Pathogenicity

Numerous studies highlight the pathogenicity of Acanthocephalans in fish. Generally, infections by Acanthocephalans cause minimal pathology when parasites attach to the external mucosal layer. However, in species like Pomphorhynchus, deeply embedded parasites can lead to severe conditions, such as granulomas and subsequent fibrosis [6]. The hooked proboscis of Acanthocephalans anchors the worm to the fish's intestinal wall, which can damage the intestine and overall health of the fish.

In some instances, the hooks penetrate the intestinal wall, causing perforation, extensive inflammation, peritonitis, and systemic clinical changes, which can be fatal [7]. The inflammation in infected fish is mainly driven by granulocytes and macrophages, depending on the host species, proboscis hook structure, and parasite tegument. These parasites can also cause gut occlusion and have been reported to migrate to unusual location [8]. In their larval stages, Acanthocephalans cause local changes in visceral organs such as the liver and spleen during low to moderate infections, while heavy infections in juvenile fish result in extensive granulomas, fibrosis, and eventual atrophy of parts or entire organs [9].

Diagnosis

he diagnosis of acanthocephalan infections in fish can be done by dissecting the fish and stretching its intestine in normal saline, then carefully opening it with needles. Adults can be identified by the hooks on their proboscis, which can be preserved and made visible. If free-floating adult parasites are not available, placing intestinal parasites in water creates osmotic turgor, detaching their proboscis from the intestine.

Positive identification of acanthocephalans can be made if the spines at one end of the larva are visible. Eggs of these species are usually clear, although some may be brown due to fecal staining as they pass through the host's intestinal tract. Fecal samples from the fish can also be examined under a microscope at 10x and 40x magnification to detect larvae.

Control

Parasitic infections can cause severe damage to the fisheries industry by affecting the health of fish. Early diagnosis of the larval stages of parasites, for which fish are the final hosts, is essential for successful elimination and prevention. For valuable or brood stock fish, individual treatment is preferred. Preventative measures include maintaining proper hygiene to eliminate infective hosts and regularly checking pond water to remove crustaceans, which serve as intermediate hosts. Administering anthelmintic drugs, such as Fenbendazole, by injection or Bithionol orally at a dose of 0.2 g/kg of fish is recommended for controlling infections.

Conclusion

Acanthocephalan infestations in fish are a significant ecological issue, affecting fish health, behavior, and population dynamics. These parasitic worms can cause severe damage, reduce fitness, and increase mortality in their hosts. Effective management strategies, such as monitoring fish health and implementing biosecurity measures, are crucial to mitigate these impacts. Continued research is essential for better understanding and controlling these parasites, ensuring the health and sustainability of fish populations and aquatic ecosystems.

Further research is needed to understand the life cycles, transmission pathways, and ecological impacts of acanthocephalans, and to develop innovative approaches for controlling and preventing infestations.

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