

A Veterinary Guide to the Fish Gastrointestinal Tract

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KEYWORDS

- Gastrointestinal tract • Gastroscopy • Buoyancy disorder • Taurine deficiency
- Prebiotics • Probiotics • Thiaminase

KEY POINTS

- Advanced diagnostic techniques can be practically modified and directly applied to fish patients for identifying gastrointestinal ailments.
- Prebiotics and probiotics may treat and prevent infectious diseases, enhance oral medication and vaccine uptake, and can better maintain healthy and normal gastrointestinal flora in fish.
- More research investigating the normal intestinal flora of fish, oral pharmacokinetics for both drugs and vaccines, optimal nutritional requirements for various species, and the role of mucosal immunity on protection against common fish pathogens serves to improve the veterinary approach for a broader and more comprehensive understanding of fish gastroenterology.

Key objectives

- Expand on veterinary comparative anatomic knowledge of the fish gastrointestinal tract
- Show through case management the use of modern diagnostic tools for identifying gastrointestinal problems in fish patients such as dysphagia and buoyancy disorder
- Introduce additional concepts of veterinary gastroenterology concerns regarding the piscine patient regarding toxins, nutritional deficiencies, prebiotics and probiotics, and zoonotic agents
- Update differential chart with specific infectious disease examples

INTRODUCTION

Gastroenterology in osteichthyes (bony fishes), which comprise most species of veterinary concern, such as salmon, koi, and catfish, and in chondrichthyes

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(cartilaginous fishes), which include sharks, rays, and skates, continues to be a growing area for research and new clinical treatments.¹ Advanced diagnostic techniques can be practically modified and directly applied to fish patients for identifying gastrointestinal ailments. Prebiotics and probiotics may treat and prevent infectious diseases, could enhance oral medication and vaccine uptake, and can better maintain healthy and normal gastrointestinal flora in fish. More research investigating the normal intestinal flora of fish, oral pharmacokinetics for both drugs and vaccines, optimal nutritional requirements for various species, and the role of mucosal immunity on protection against common fish pathogens serves to improve the veterinary approach for a broader and more comprehensive understanding of fish gastroenterology.

Although no unique veterinary specialty is recognized for fish medicine or aquatic animal health in the United States, veterinarians have been expanding their experience, increasing their knowledge, and contributing to the veterinary literature for the last several decades to advance medicine and surgery for aquatic vertebrates and invertebrates. Several professional organizations have been created to support aquatic veterinarians, including the American Association of Fish Veterinarians, the World Aquatic Veterinary Medical Association, and the International Association of Aquatic Animal Medicine.

There are 3 extant classes of fish, which include agnatha (jawless fishes), chondrichthyes, and osteichthyes, with 60,229 described species and subspecies, and 32,590 species scientifically validated.²⁻⁴ Clinically, veterinarians may serve or consult with a wide variety of clients, including hobbyists or pet owners, laboratory researchers, pet and pharmaceutical industries, fisheries managers, public aquaria and zoologic gardens, public health, ornamental aquaria aquaculture, mariculture, and food production aquaculture. When presented with morbidity or mortality of an individual animal or population, often, a thorough medical history can provide invaluable information for making an expedient diagnosis; for population health, a quick diagnosis is critical for managing disease outbreaks, which can cause catastrophically high morbidity/mortality.

THE PISCINE GASTROINTESTINAL TRACT

Fish comprise the 3 largest extant classes of vertebrates, and, given the great diversity across these classes, comparative similarities and differences in the piscine gastrointestinal tract are highlighted. For veterinarians to better understand aquatic animal health, the most basic veterinary foundation begins with understanding fish anatomy and physiology.

The piscine gastrointestinal tract begins with apprehension of food through the teeth, mouth, and pharynx, and then progresses down the esophagus, stomach, intestines, and pyloric ceca, with waste elimination out the cloacae, vent, or anus. The liver, pancreas, and gallbladder are vital to digestion, as in other vertebrates. Although the swim bladder has a role in buoyancy control for many teleost species, embryologically, it is derived from the esophagus.¹

OVERVIEW OF ANATOMY

Some of the earliest comprehensive works on understanding the gross anatomic and histologic differences of the gastrointestinal tract in fish were published in the 1930s. This series of research compared the gastrointestinal tracts of bottom-dwelling, predaceous, and planktivorous fishes. The following sections highlight anatomic differences among these groups.

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