

# Selected Emerging Infectious Diseases of Ornamental Fish

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## KEYWORDS

- Koi herpesvirus • Ranavirus • Megalocytivirus • *Francisella* • *Cryptobia iubilans*
- *Exophiala*

## KEY POINTS

- Emerging infectious diseases of fish include various viral, bacterial, parasitic, and fungal diseases, including goldfish herpesvirus, koi herpesvirus, Ranavirus, Megalocytivirus, Betanodavirus, *Francisella*, *Cryptobia iubilans*, and *Exophiala*.
- Although many emerging diseases do not have proper treatments or cures, exceptional husbandry and biosecurity is recommended for the prevention of all infectious diseases.
- As molecular techniques and diagnostics improve, more emerging diseases will be discovered, expanding our understanding of important diseases in ornamental fish.

## INTRODUCTION

An emerging disease is one that has appeared in a population for the first time or that may have existed previously but is rapidly increasing in incidence, geographic range, or identification. The following discussion focuses on important emerging infectious diseases that affect ornamental fish in the aquarium and aquaculture industries. The following diseases were selected based on their clinical significance in ornamental fish medicine. Several of these diseases are listed by the World Organization for Animal Health (OIE) (**Box 1**).

## VIRAL DISEASES

Because of the changing nature of viral taxonomy and classification, all viruses are named and discussed using the current nomenclature from the International Committee on Taxonomy of Viruses (ICTV) at the time of writing (ICTV 2011 Master

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**Box 1**  
**OIE listed diseases of fish 2013**

Epizootic hematopoietic necrosis<sup>a</sup>  
 Epizootic ulcerative syndrome  
 Infection with *Gyrodactylus salaris*  
 Infectious hematopoietic necrosis  
 Infectious salmon anemia  
 Koi herpesvirus<sup>a</sup>  
 Red sea bream iridoviral disease<sup>a</sup>  
 Spring viremia of carp  
 Viral hemorrhagic septicemia

<sup>a</sup> Discussed in this article.

Species List Version 2). Novel and unassigned viruses are discussed as applicable. Major emerging viral diseases of ornamental fish can be separated into distinct families, including Alloherpesviridae, Iridoviridae, and Nodaviridae.

### ***Alloherpesviruses***

Herpesviruses are enveloped, doubled-stranded DNA viruses with an icosahedral capsid. Herpesviruses show strong host specificity but some have the ability to infect multiple species with varying clinical signs. The order Herpesvirales can be broken down into 3 distinct families based on the types of animals they infect: Herpesviridae that infect mammals, birds, and reptiles; Alloherpesviridae that infect fish and amphibians; and Malacoherpesviridae, which contains the single recognized herpesvirus of bivalve mollusks (Oyster herpesvirus).<sup>1</sup> The family Alloherpesviridae can be further divided into 2 clades, one consisting of viruses from cyprinid and anguillid hosts and one consisting of viruses that affect ictalurid, salmonid, acipenserid, and ranid hosts.<sup>2</sup>

Cyprinid herpesvirus 1 (CyHV-1 or Carp pox) typically results in self-limiting hyperplastic cutaneous lesions; a full description of the virus and clinical signs can be found elsewhere.<sup>3,4</sup> Cyprinid herpesvirus 2 (CyHV-2) and cyprinid herpesvirus 3 (CyHV-3) are important emerging diseases of major concern for the ornamental fish trade and are discussed in further detail later.

### ***Cyprinid herpesvirus 2***

CyHV-2 (goldfish herpesvirus or herpesviral hematopoietic necrosis virus) was first described as a herpesvirus from an outbreak of disease in goldfish (*Carassius auratus*) in the autumn of 1992 and the spring of 1993 in western Japan.<sup>5</sup> Since then, the virus has been isolated from goldfish collections worldwide, including a recirculating aquaculture system on a small goldfish farm in California<sup>6</sup> and in hobby and breeder ponds in Delaware and Ohio.<sup>7</sup> The virus has been found internationally in Taiwan, Australia, and southern England.<sup>8–10</sup>

Prevalence studies in the United States have shown viral detection by polymerase chain reaction (PCR) from goldfish production facilities in all areas of the country. In a sampling of apparently healthy 6-month-old goldfish from 18 commercial farms across 3 East Coast states, 14 farms (78%) were found to have detectable levels of

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