

Koi Herpes Virus Disease—the Basics

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The pleasure and serenity brought to so many of us has been realized exponentially over the past decade. Koi ponds of all sizes and designs have been constructed by hobbyists everywhere in order to bring home the peace and beauty we all so enjoy. Landscapers assist in building this piece of nature into our own yards and gardens. Breeders and dealers are meeting the need for more of the “living jewels.” In growing numbers, artists are, in so many ways, capturing and immortalizing the true grace and elegance of koi. Unfortunately, our koi are now under threat of a deadly disease. Koi herpes virus (KHV), a viral disease highly contagious to fish, may cause significant morbidity (sickness and disease) and mortality (death) in common carp (*Cyprinus carpio*).

KHV is currently classified as a DNA-virus. Recent scientific work shows strong evidence that KHV is indeed a herpes virus, based on morphology (form and structure) and genetics. KHV disease has been diagnosed in koi and foodfish carp. Other related cyprinid species such as common goldfish and grass carp seem to be unaffected by KHV. As with other herpes viral infections, KHV is believed to remain in the infected fish for life, thus exposed or recovered fish should be considered as carriers of the virus.

KHV disease may cause 80-100% mortality in affected populations, and fish seem *most* susceptible at water temperatures of 72-81 F (22-27 C). Out breaks may occur at lower temperatures, but the signs and symptoms may take longer to manifest.

Clinical signs of KHV are often non-specific. Onset of mortality may occur very rapidly in affected populations, with deaths starting within 24-48 hours after the onset of signs. KHV infection may produce severe gill lesions and high mortality rates. Sometimes, secondary bacterial and parasitic infections may mask the obvious problem of a viral infection. Behaviorally, affected fish often remain near the surface, swim lethargically, and may show respiratory distress and uncoordinated swimming. (These are signs of the gill's decreased ability to work effectively.)

External signs of KHV may include gill mottling with red and white patches, bleeding gills, sunken eyes, pale patches or blisters on the skin.

Methods of transmission include direct contact with infected fish, with fluids from infected fish, and/or with water or mud from infected systems. Depending upon water temperature, fish that are exposed and susceptible may become infected and either develop the disease and die or become carriers of the virus. Again, goldfish and other fish in the carp family are not susceptible to KHV disease, and they do not appear to act as carriers of the virus.

The virus appears to have an incubation period of 14 days following the introduction of infected fish to naïve fish. Again, this may be temperature dependent. Incubation may be longer indicating that appropriate temperature and possibly a second

trigger may be necessary for outbreaks to occur. Mortality related to KHV disease typically occurs between 64F and 81F (18-27C). Almost no mortalities occur below 64F, and there have been no reported occurrence of the disease at or above 86F (30C).

Positive diagnosis of KHV requires the assistance of a fish health specialist and a fish disease diagnostic laboratory.

It is important to differentiate KHV from other viruses that may cause disease in common carp and koi. The other two viral diseases in common carp are spring viremia of carp (SVC) and carp pox.

Spring viremia of carp disease is caused by an RNA virus and has been reported in common carp (such as koi), grass carp, bighead carp, silver carp, Crucian carp, and common goldfish.

SVC usually causes disease when water temperatures range between 41F (5C) and 64F (18C), unlike KHV, which typically causes outbreaks at higher temperatures. SVC Shows clinical signs typical of those seen with many septicemias. Signs include distended abdomen (dropsy), exophthalmia (popeye), inflamed and protruding vent, uncoordinated swimming, weak respirations, and gill and skin hemorrhages.

Carp pox disease, or cyprinid herpesvirus, is caused by a different herpesvirus that has a wide geographic distribution and affects common carp and koi. Carp pox disease usually causes smooth raised growths on skin and fins of older fish. Water temperatures above 68F help reduce the growths, but do not eliminate the virus from the fish. In mature fish, the virus is typically a non-lethal, self-limiting disease.

There is no known treatment for KHV. This points to the critical need for research if we hope to preserve our koi hobby. Antiviral drugs are not currently available to treat KHV or any other viral disease in cultured fish. Studies have shown that fish may develop a natural resistance following viral exposure if water temperatures are increased to 86F (30C). This technique only marginally preserves survival rates. There is concern that fish exposed to the virus previously or those exposed at high water temperatures may become *carriers* of the virus, even though they do not develop clinical signs. These carrier fish may spread this disease to new fish that have not been exposed before.

Currently, there is no vaccine for KHV. Because KHV outbreaks have caused large losses, and because there is still concern over the possibility that survivors are carriers, anyone with koi that have been diagnosed with KHV must consider eliminating their entire population as a good option. This approach should be followed by disinfection of all materials, equipment, and systems that have contacted the infected fish. Viral particles may be active in the water for at least four hours.

Quarantine is the most dependable method to avoid introducing KHV to a naïve population. To apply quarantine effectively, all new fish must be kept in a separate tank

from the resident fish. Resident fish, your current collection, should be fed, handled, and maintained before the new fish. The quarantined fish require nets and other equipment used only for them. Fish should be quarantined for a minimum of thirty days, and longer is better. In all actuality, new koi should be quarantined and observed for four to six weeks. At the end of the quarantine period, place a few of your established koi with the new koi and watch them for any signs of disease or abnormal behavior. You may want to do this at varying temperatures in order to expose the possibility of a latent virus. This “test” can help determine if placing the new fish with the existing population will cause any health problems. Quarantine is not an area where we want to rush, trust that someone else has done it for us, or become impatient.

Finally, know your dealer. Ask questions about unexplained losses, or any other problems. A reputable dealer will answer you honestly. Look around the dealer’s ponds and note anything questionable, like sick fish, fish that just don’t look right. Ask questions about the source of their fish and what their quarantine protocol is.

When we look at the value of our ponds and koi, a few questions may be time well spent. KHV is not to be taken lightly, and it will not go away on its own. As keepers of koi, we must act with diligence, knowledge, and prudence in order to maintain our living hobby.