

## Current facts about KHV – as of August 2018

by Spike Cover

It is very contagious to Koi and common carp.

KHV can and does establish latency in Koi and common carp.

There is no cure for KHV disease or latency. That said, active disease can often be arrested by raising the temperature of the fish to  $\geq 86^{\circ}\text{F}$  and holding them at this temp. for several days. Survivors will almost certainly be carriers.

Latency is apparently wide-spread in domestic Koi, food carp, feral Koi and wild common carp.

Latency appears to be possible w/o the requirement for full-blown disease to have occurred. This means that carriers can show up in stocks that have not experienced a disease outbreak.

There is no commercially available vaccine for KHV

Other species can carry the virus and can shed viral particles that can infect Koi and common carp but those other species do not exhibit clinical signs of the disease

Only active KHV disease is easily identifiable. It is diagnosed by clinical signs and a positive PCR test on gill tissue, a vent or gill swab or on a fecal sample.

The viral DNA of latent carriers can be detected by what is currently a research-only test on lymphocytes (specific blood white cells).

Latency can be inferred by testing Koi blood for anti-KHV antibodies or for KHV virus neutralization properties. Anti-KHV antibodies can be detected in Koi for up to one year post infection. There is a commercially available test for this done by UC Davis. Virus neutralization testing can be done at the Univ. GA, Athens and possibly others.

Stress can sometimes cause latent carriers to break with active disease. Thus carriers can sometimes be identified by stressing and observing them (for several weeks) for signs of the disease. If such signs appear, a proper PCR test can confirm (or rule out) the presence of the disease.

### What can customers reasonably expect from Koi dealers?

Dealers should offer only Koi to their customers that are free of active KHV disease.

Dealers cannot screen fish definitively for latency, i.e., for the presence of viral DNA in the fish, as a commercially available test for such latency is not currently commercially available.

Stressing fish and observing them for subsequent signs of KHV disease is one way to possibly uncover latent carriers. However no specific level of stressing has been determined to be adequate to uncover all carriers. This technique is the only somewhat economical method currently known to be even partially successful for screening fish on a large scale. Shipping stress has been shown to be significant enough to sometimes (maybe often) induce latent carriers to break with the disease. Unfortunately, this is not always the case.

Dealers can sample Koi from various sources for anti-KHV antibodies and, if that test is positive, they can infer that KHV latency exists within that population. This requires that dealers keep Koi from

various sources separated. Adequate sampling to detect most carriers requires numerous samples and would likely be costly and likely economically prohibitive unless the population size was large enough to spread the cost of testing over many fish ... see Table 1 below (from "Computer Program for Sample Sized Required to Determine Disease Incidence in Fish Populations" by Frank Ossiander and Gary Wedemeyer, 1973, J. Fish Res. Board Can. 30: 1383-1384).

**TABLE 1.** Sample sizes (*n*) needed to detect at least one carrier fish in populations (*N*) at the given disease incidence (*M*), 95% confidence level.

Population size ( <i>N</i> ) <sup>a</sup>	Percentage disease incidence to be detected ( <i>M</i> )						
	0.5	1.0	2.0	3.0	4.0	5.0	10.0
50	46	46	46	37	37	29	20
100	93	93	76	61	50	43	23
250	192	156	110	75	62	49	25
500	314	223	127	88	67	54	26
1,000	448	256	136	92	69	55	27
2,500	512	279	142	95	71	56	27
5,000	562	288	145	96	71	57	27
10,000	579	292	146	96	72	57	27
100,000	594	296	147	97	72	57	27
1,000,000	596	297	147	97	72	57	27
1,000,000 <sup>b</sup> or more	600	300	150	100	75	60	30

<sup>a</sup>For intermediate population sizes, use sample size for next larger population listed.

<sup>b</sup>Sample sizes calculated from the Poisson probability distribution.

Individual fish can be tested for the presence of anti-KHV antibodies for greater confidence relative to those specific fish. This would likely apply to more expensive fish.

### What can hobbyists do to protect themselves?

Understand the disease and what is possible and not possible relative to identifying diseased fish and latent carriers.

Understand what the dealer(s) from whom they purchase fish do to screen for KHV disease and latent carriers.

Buy only from dealers that practice good biosecurity, quarantine and disease screening.

Practice good biosecurity and quarantine at home. This includes quarantining all new Koi and those returning from shows or other trips outside the hobbyist's control.

### Where can testing be done?

Note 1: This information may not be current. Please check with the lab prior to collecting, preparing or sending samples.

- PCR testing (for active disease)

- RAL (Research Associates Laboratory)  
14556 Midway Road  
Dallas, TX 75244  
972-960-2221  
Contact: Ernie Colaizzi (or whoever answers the phone)  
email: [rallab@aol.com](mailto:rallab@aol.com)
- UC Davis VMTH, Central Laboratory Receiving, Room 1033  
1 Garrod Drive, Davis, CA 95616  
Phone: 530-752-8684, fax 530-752-5055  
Lab Manager: Samantha Maps, email: [smmapes@ucdavis.edu](mailto:smmapes@ucdavis.edu)  
website: [http://www.vetmed.ucdavis.edu/vmth/lab\\_services/clinical\\_labs/](http://www.vetmed.ucdavis.edu/vmth/lab_services/clinical_labs/)
- Oregon State University  
Dr. Ling Jin  
Oregon Veterinary Diagnostic Laboratory  
134 Magruder Hall  
Corvallis OR 97331-4801  
<https://vetmed.oregonstate.edu/diagnostic>  
<https://vetmed.oregonstate.edu/diagnostic/available-tests>
- Florida -  
Dr. Aissa E. D. Sylla, M.S., Ph.D.  
Biological Scientist IV-SES  
Molecular Biology Section  
Kissimmee Animal Disease Diagnostics Laboratories  
Florida Department of Agriculture and Consumer Services  
Division of Animal Industry  
Bureau of Diagnostic Labs  
2700 N. John Young Pkwy  
PO Box 458006  
Kissimmee, FL 34745  
Office: 321 697-1411  
Fax: 321 697-1467  
Email: [syllaa@doacs.state.fl.us](mailto:syllaa@doacs.state.fl.us)  
<http://www.freshfromflorida.com/Divisions-Offices/Animal-Industry/Consumer-Resources/Diagnostic-Laboratory-Testing-Services>

Here is some other info that may be useful relative to Florida:

Live Oak Diagnostic Testing Laboratory

Drawer "O"

Live Oak, FL 32064-0898

Phone: (386) 330-5700

Fax: (386) 330-5710

- ELISA testing (for anti-KHV antibodies)
  - UC Davis - see contact info above
- PCR testing for latency (viral DNA in lymphocytes)

- Oregon State University – research testing only and not commercially available
- Serology testing (for the inferred presence of anti-KHV antibodies)
  - University of Georgia, Athens  
Infectious Diseases Laboratory  
110 Riverbend Rd  
Riverbend North, Rm. 150  
University of Georgia  
Athens, GA 30602  
Phone: (706) 542-8092  
FAX: (706) 583-0843  
www.idl-uga.com or [www.vet.uga.edu/idl](http://www.vet.uga.edu/idl)

### Conclusion:

KHV appears to have become virtually ubiquitous. So killing our way out of the problem is no longer a viable option. The logical alternative is to learn to manage the disease with the tools we have. And, if better tools become available in the future, we can adjust our strategy accordingly.