

Mass Mortality of Koi and Common Carp

The pattern of the recent epidemic in koi and common carp in Indonesia is consistent with that of an infectious disease, but there is as yet no definitive aetiological diagnosis. The Regional Aquatic Animal Health Advisory Group of NACA in its first meeting (November 2002) decided to list "Koi mass mortality" under "Unknown diseases of serious nature" in the Quarterly Aquatic Animal Disease (QAAD) report, to assist in the collation of data from the Asia-Pacific region starting in 2003.

To assist the National Coordinators (NCs) and Chief Veterinary Officers (CVOs) in regional disease reporting, information about the new listed disease is provided in three parts:

1. Executive Summary of the "emergency disease control task force"
2. Information sheet (developed from the report of the emergency disease control task force)
3. Brochure developed by Directorate of Fish Health and Environment, Government of Indonesia

Part 1: Executive Summary

An Emergency Disease Control Task Force on a Serious Disease of Koi and Common Carps in Indonesia was organised by NACA in June 2002 at the request of the Government of Indonesia. The Task Force (consisted of international and local experts and a number of participating laboratories and organizations) conducted an emergency assessment of the disease situation in July through field observations (*i.e.*, field visits, local/district officials and farmer interviews) and laboratory examinations (*e.g.*, histopathology, virology, PCR, and EM) of collected samples.

The Task Force collected vital information about the disease occurrence, but could not make a confirmatory diagnosis of the aetiological agent/s involved in the disease under consideration.

The Task Force findings revealed that an infectious agent/s is involved in the current outbreak (based on epidemiological observations such as sudden onset, rapid spread, specificity to koi and common carp, analogy with Koi herpes virus (KHV) outbreaks), that the disease was introduced to Indonesia through fish importation and spread into other areas through fish movements. The observed pathology did not reveal a diagnosis of the earlier suspected KHV, no virus could be isolated nor virions observed through electron microscopy. However, KHV was detected by PCR from all case samples which indicates that KHV might have played a role in the observed mortalities.

This serious disease outbreak in Indonesia will have a huge trade implication that will affect the high value koi carp and the regionally important food fish common carp. A careful diagnosis is essential and this will be the subject of future follow-up work as a matter of priority. The Task Force findings recommends that this serious outbreak of koi and common carp be called '*Mass mortality of koi and common carp*' until a clear association with KHV or any other specific disease can be established.

Part 2: Information Sheet

2.1 Background Information

In June 2002, Indonesia was faced with a serious disease outbreak among koi and common carp populations. In view of the epizootic nature of the disease, potential spread to neighbouring Asian countries and the economic impact, an Emergency Disease Control Task Force on a Serious Disease of Koi and Common Carps in Indonesia was organised by NACA. The Task Force conducted an emergency assessment of the disease situation in July 2002.

2.2 Case Definition

The proposed case definition for outbreak of disease in a pond / tank / cage was "An outbreak of disease amongst common carp or koi starting after March 2002 causing >25% mortality within one week of the appearance of signs. Affected fish show gill and skin damage, while some may show no other visible signs.

2.3 Clinical Signs

Characteristic clinical signs were severe branchial hemorrhage and necrosis, and hemorrhages on the body surface. The affected populations, which were limited to koi and common carp, were also suffering from non-specific secondary infections of bacterial, parasitic and fungal origin.

2.4 Epidemiology

The level of morbidity and mortality (50-100%) reported by farmers far exceeded what is considered as normal, and therefore the problem was designated as a disease outbreak. The pattern is typical of a propagating infectious disease; starting in one location, and subsequently spreading both locally and over long distances. The disease clearly affects both koi and common carp. From the available epidemiological evidence such as pattern of spread and host range, it was concluded that the disease is caused by a directly transmitted infectious agent. Following evidences strongly suggest that the cause is viral, and may be Koi Herpes Virus.

- The host specificity and pattern of mortality is the same as that described for KHV in earlier outbreaks (*analogy*).
- The observation in one experiment that the disease recurred in recovered fish once they were stressed is typical of latent herpes virus behaviour, and unlikely in any of the other pathogens under consideration (*experimental*).
- The failure of response to treatment with antibiotics reported in a number of cases probably provides a weak evidence that the cause may not be bacterial (*response to treatment*).

2.5 Pathology

Pathology was seen mainly in the gills in the form of necrotising branchitis, lamellar epithelial degeneration, focal areas of necrosis and exfoliation. Evidence for bacterial and protozoan parasitic infections were also common. Hypertrophied nuclei with marginated chromatin and flocculent eosinophilic inclusions that are typical for KHV infections were not detected in the gill, kidney or spleen.

2.6 Virology and Electron Microscopy

Tissue extracts inoculated onto the KF-1 cell line, the cell line most appropriate for the isolation of KHV, did not result in any observable cytopathic effect (CPE). No evidence of viral particles was found in gill samples

2.7 Polymerase Chain Reaction (PCR)

PCR analyses using single round PCR for KHV revealed 4 samples to be strongly positive for KHV and three samples as weakly positive. PCR tests carried out using two pairs of primer sets showed some samples to be positive for KHV with both pairs of primers.

2.8 Conclusions

The Task Force investigations revealed that there is supporting evidence based on epidemiological observations (*e.g.*, sudden onset, rapid spread, specificity to koi and common carp, analogy with KHV outbreaks) that an infectious agent/s played a role in the observed mortality and that it has been introduced to Indonesia through fish importation and spread into other areas through fish movements. It is difficult at this stage to confirm the identity of the aetiological agent/s involved in the disease outbreak under consideration. Typical KHV pathology (*i.e.*, nuclear changes in gills and internal tissues such as kidney and spleen) was not observed both in histopathology and electron microscopy.

The absence of typical KHV pathology, failed viral isolation, and non-observance of typical virions through electron microscopy should not rule out KHV involvement, and 'absence of evidence should not be misinterpreted as evidence of absence'. The detection of KHV by PCR from case samples indicates that KHV might have played a role in the observed mortalities.

In view of the potential trade implication of this serious disease outbreak affecting the high value koi carp and a regionally important food fish common carp, a careful diagnosis is essential and this should be the subject of future follow-up work as a matter of priority. It is therefore concluded that this serious outbreak of koi and common carp be called '*Mass mortality of koi and common carp*' until a clear association with KHV or any other specific disease can be established.

Part 3: Brochure developed by the Directorate of Fish Health and Environment, Government of Indonesia

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3.1 Koi Herpesvirus (KHV) in Koi and Common Carp

Koi herpesvirus (KHV) disease, well known as herpes disease in common carp, is an infectious disease in koi and common carp caused by KHV. The disease is very virulent and causes mass mortality (80-90%) within 1 week. Incubation period of the disease is 5-7 days. The disease is very contagious among koi and common carp but not to humans. There is no effective drug for KHV disease

3.2 Characteristics of KHV Disease:

- Only affects koi and common carp (*Cyprinus carpio*).
- Clinical signs: the gill is pale, whitish or badly damaged (see the pictures).
- Sometimes shows hemorrhages in the tail and fins and blister-like lesion in the skin.



3.3 Prevention is the Best Measure:

- Avoid using seed and broodstock originated from infected area, even though the seed price is very cheap.
- Disinfect infected pond and contaminated equipment using 30 ppm chlorine.

3.4 Isolation of Outbreak Area:

- To prevent the spread of the outbreak to other pond, close infected ponds as soon as possible.
- Conduct immediate harvest and burn or bury infected fish in the soil.
- Don't clean infected fish or discharge uneaten portion (head, viscera, etc) to common water body such as irrigation canal, stream, river, reservoir and lake, because diseased fish is the main source of infection.
- Don't bring or send any carp from outbreak area to non infected area.

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Selected References on KHV

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