Epidemiology of Viral Diseases in Fish and Shellfish: Epidemiological Study of Viral Diseases in Fish and Shrimp at Hatchery and Grow-Out Phases*

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Introduction

Aquaculture has become an important and prioritised activity in fishery industry. With the increase in activity, fish health has turned into an important research area to control disease outbreak, e.g. due to live fish movement (for seed, brood stock, recreation) and culture environment degradation. The objectives of the programme were to identify and determine the pathogenicity of fish and shellfish viruses in commonly cultured fish and shellfishes (carps, catfishes, tilapia, sea perch , tiger shrimp and freshwater giant prawn); and to develop a diagnostic test kit for the disease.

Materials and Methods

Fish and shellfish samples were collected during farms visit and from clinical cases submitted by contacts/clients (Dept. of Fisheries, Dept. of Veterinary Services and fish/shellfish culturist). Water samples and *in situ* parameters were also taken. Fish and shrimps samples were processed accordingly and examined for the presence of infectious agents by cell culture, microbiology, histopathology and TEM. The isolated infectious agents were propagated, purified and identified through biochemical and biophysical characterisation. They were stored accordingly for further use. Monoclonal antibody and PCR primer for the isolated agent were also developed. The shrimp project was also aimed to evaluate the correlation between the incidence of White spot syndrome virus with culture management and environmental parameters.

Results and Discussion

A new variant of cyprinid herpesvirus (MCHV) was isolated from locally bred Japanese Koi carp (*Cyprinus carpio*). The disease grossly induced soft, whitish papilloma on the body. Purified virus has a diameter of 250 nm, with a capsid size of 100 nm. The virion contains approximately 28 viral proteins. The virus could be grown in fish cell lines not of cyprinid origin, which is a unique property. Cross- species infection of the virus was also successful, i.e. it could cause infection in other non-carp cyprinid, which is a first report. The optimum *in vitro* culture temperature was at 25°C, which is comparatively higher than its Japanese reference strain CHV-1. The virus grew well in BB cells (Ictalurid fish cells) and could attain a maximum titer of 10^5 $TCID_{50}$/ml. Unique immunogenic sites are currently being explored. MAb against MCHV, recognising two specific viral proteins, showed positive reaction against CHV-1 but not against CCV (an ictalurid herpesvirus) and SHV-2 (Salmonid herpesvirus). In situ hybridisation using a specific CHV-1 gene probes was also found to react with MCHV-infected papiloma tissues. Comparison of nucleotide sequences for sequence homology was also carried out on specific CHV genomes and homologous genes after amplification with PCR. In shrimp virus study, eight viruses were found present in the cultured tiger shrimp (*Penaeus monodon*). They were Systemic ectodermal and mesodermal baculovirus (SEMBV) or also known as white spot disease syndrome, Yellowhead virus (YHV), Infectious hypodermal and hematopoietic necrosis virus (IHHNV), Baculoviral midgut gland necrosis (BMN), Hepatopancreatic parvo-like virus (HPV), *Penaeus monodon* singly enveloped nuclear polyhedrosis virus (PmSNPV), *Penaeus monodon* digestive organ necrosis flavi-like virus (PmDONFV) and *Penaeus monodon* entomopox-like (PmEPV). Some of these agents were of first record of incidence and/or a new variant. These viruses were associated with the recent and previous serious disease outbreaks in hatchery and grow-out farms. Preliminary study on SEMBV infectivity revealed that oral and cohabitation could transmit the virus. The virus could also be detected in mudskipper, tilapia and white shrimps. These animals are considered as either mechanical or biological host.

Conclusions

The study has elucidated several new or unreported, but yet important diseases or disease agent in fish and shellfishes culture. These disease agents are presence unnoticed in the host. The possibility of heavy mortality and of great economic loss in the cultured animal is very high. As the observation and identification of the disease agent were made through routine conventional examination, further research is recommended to be undertaken in development of fast identification technique such as for screening and diagnostic examination.

Benefits from the study

This study provides important database of disease agents and diseases present in some important commercial aquatic species. The database could be used as a stepping-stone to R&D of new products e.g. microbial identification kit or new technique for better and sustainable aquaculture.

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None.

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