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Popular Article

Decapod Iridescent Virus 1 (DIV1): An emerging threat to the shrimp industry

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Abstract

Shrimp farming represent the rapidly growing aquaculture sector because of its growing international demand and market price. Intensification of culture practice increase the stress and susceptibility to new pathogen, affecting the sustainability of shrimp farming. Infection with Decapod iridescent virus 1 (DIV1) or shrimp hemocyte iridescent virus (SHIV) is highly fatal emerging disease reported recently from china and currently it also included as 'an OIE listed pathogen'. Decapod iridescent virus 1 having double stranded DNA and it belongs to iridoviridae family. Clinical sings including hepatopancreatic atrophy with colour fading, and empty stomach and guts has been observed in *Penaeus vannamei*. Biosecurity system for the industry is the principle of prevention and control of DIV1 infection in shrimp farming.

1. Introduction

The shrimp industry has been beset by many devastating diseases in the last three decades, which has caused severe production and economic losses and even caused the collapse of the industry in some countries. These include viral (WSSV, TSV, YHV), bacterial (luminous vibriosis, AHPND), and parasitic (EHP) diseases. Decapod iridescent virus 1 or DIV1, is another emerging shrimp viral disease and threatening the shrimp industry in China, one of the top shrimp producers in the world.

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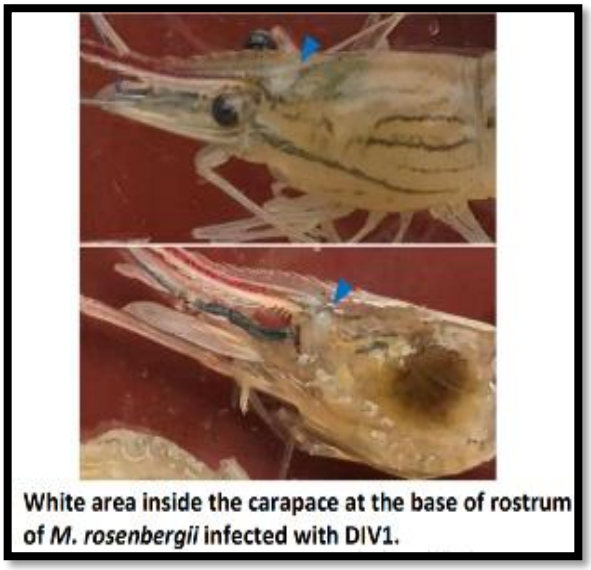
First detected as early as 2014 from *Cherax quadricarinatus* samples in Fujian Province, and temporarily named the new virus as *Cherax quadricarinatus* iridovirus (CQIV). It is also known as Shrimp hemocyte iridescent virus (SHIV) based on the infected tissues and susceptible species Qiu et al. (2018). The disease has occurred in farmed *Penaeus vannamei* and giant freshwater prawn *Macrobrachium rosenbergii* in some provinces of china (Chen, 2020). The virus infects all stages of shrimps (PLs, juveniles, adults) mainly during low temperature seasons and has been observed to affect the Pacific white shrimp, crayfish, and giant freshwater prawn Qiu et al. (2018). The main target organs for DIV1 infections are hematopoietic tissue, gills and hepatopancreatic sinuses. High mortality of up to 80% has been reported in farmed *P. vannamei*.

2. Signs of the Disease

Clinical signs of infected *P. vannamei* are not typical, including slightly reddish body, pale and hepatopancreatic atrophy with colour fading, empty stomach and guts, softshell, and a reddish discolouration in the body were observed. A unique gross sign of DIV1 can be observed in diseased *M. rosenbergii,* which exhibit a typical and whitish area under the carapace at the base of rostrum. The white head condition may be due to the white area under the carapace of the rostrum base, hence the name "Whitehead" disease. Moribund individuals sink to the bottom in deep water and dead individuals can be found every day, with a cumulative mortality up to 80%**.** In addition to the above signs, black body and black edge of the abdominal shell of dead individuals of infected *P. monodon* also observed.

Faded hepatopancreas of *P. vannamei*, infected with DIV1



White area inside the carapace at the base of rostrum of *M. rosenbergii* infected with DIV1.

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3. Epidemiology

Infection with SHIV has been responsible for high mortalities (over 80%) in farmed *P. vannamei* and *M. rosenbergii* populations in China since 2014 but there are currently no reports of this disease in India. Infection is horizontal via cannibalism of infected shrimp or through contact with infected faeces. Reverse gavage infection experiments in *P. vannamei* resulted in 100% cumulative mortality within 2 weeks. Injection challenges exposing *P. vannamei, C. quadricarinatus*, and *Procambarus clarkii* to SHIV also resulted in 100% cumulative mortalities. Infected *M. rosenbergii* exhibit distinctive clinical signs called white head disease, characterised by a distinct white triangle area under the carapace at the base of the rostrum. This effect is a result of the pale colouration of diseased haematopoietic tissue. The virus is found mainly in haematopoietic tissue located above the stomach and at the base of antennae, pereiopods and other appendages. However, SHIV infection is systemic and the virus is also found in the haemocytes, gills, hepatopancreas, pereiopods, and muscle.

4. Suggested Preventive Strategies

Suggested Preventive Strategies the establishment of biosecurity system for the industry is the principle of prevention and control of DIV1. Surveillance program, broodstock/postlarvae quarantine, and health certification for the disease are urgently needed in major shrimp producing countries. For these purposes, regional or national capacity building for DIV1 testing and proficiency testing should be carried out as soon as possible. In addition, notification and reporting of any outbreak or viral detection should be promoted. There is no typical clinical sign for infected penaeid shrimps. Alternatively, giant freshwater prawn *M. rosenbergii* can be used as an indicator species for suspected cases, as a typical white hematopoietic tissue can be observed in the diseased prawns. Confirmatory diagnosis should rely on molecular detection methods. Unlike WSSV, DIV1 can easily cause lethal infection to the species of genus Macrobrachium. Thus, polyculture with different crustaceans (e.g. *P. vannamei* and *M. rosenbergii*) will bring high risk of DIV1 transmission and should not be recommended. However, as diseased shrimp can be removed by predatory fish, polyculture of shrimp with a small number of fish is recommended for prevention of the disease. A high-density nursery of postlarva with a second testing before stoking to the grow-out pond can be considered as a quarantine approach to increase biosecurity. Studies have shown that live polychaete used as feed for broodstock has been found positive for DIV1, and may pose risk of introducing the pathogen. Therefore, it is suggested that shrimp breeding and hatchery

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facilities should use an alternative feed or adopt some treatment approaches to decontaminate live feeds prior to use.

5. Conclusion

Shrimp is the most exported commodity among the crustaceans. DIV1 may cause significant risk and loss to international shrimp export. Even though it is reported only in China, Thailand; Care must be taken during the transboundary movement of Shrimps, and strict screening for DIV1 must be carried out in quarantine facilities. Strict biosecurity measures in shrimp farms are essential in preventing the transmission of DIV1. Awareness among the shrimp farmers should be created since they are the main stakeholders in Shrimp farming. New diagnostic methods and kits can be developed

6. References

Arulmoorthy, M. P., Vijayan, R., Sinduja, K., Suresh, E., & Vasudevan, S. (2022). Infection with Decapod iridescent virus 1: an emerging disease in shrimp culture. *Archives of Microbiology*, *204*(11), 685.

Qiu, L., Dong, X., Wan, X.Y., Huang, J. (2018). Analysis of iridescent viral disease of shrimp (SHID) in 2017. In Analysis of Important Diseases of Aquatic Animals in China in 2017 (in Chinese). Fishery and Fishery Administration Bureau under the Ministry of Agriculture and Rural Affairs, National Fishery Technical Extension Center, Eds., China Agriculture Press, Beijing, pp. 187-204, ISBN 978-7-109-24522-8.

Chen, X., Qiu, L., Wang, H.-L., Zou, P.-Z., Dong X., Li, F.-H., Huang J. (2019). Susceptibility of Exopalaemon carinicauda to the infection with Shrimp hemocyte iridescent virus (SHIV 20141215), a strain of Decapod iridescent virus 1 (DIV1). Viruses, 2019, 11(4): 387. doi: 10.3390/v11040387.

Manimozhi, E., Martina, P., & Mushtaq, Z. (2021). An emerging shrimp pathogen: Decapod iridescent virus (DIV1). *The Pharma Innovation Journal, SP-10 (11)*, 850-854.

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