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Education Series

Decapod Iridescent virus 1 (DIV1)

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Shrimp get sick too. Decapod Iridescent virus 1 (DIV1) is a recently emerged infectious agent causing high mortality in *Penaeus vannamei*. DIV1 can affect late-postlarvae, juvenile and subadult shrimp, mainly during low temperature seasons. The very recent emergence of the virus has not allowed sufficient research to link external effects such as environmental, nutritional, physiological or pathological stressors to influence the susceptibility and level of mortality of the viral disease. 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*.

DIV1 virus has additionally been detected in wild specimens of *P. monodon* caught in the Indian Ocean. As with other pathogens, it is thus highly recommended to screen every batch of wild-caught *P. monodon* broodstock destined for use in commercial shrimp aquaculture facilities for DIV1 viral load by molecular based tests like PCR.

The Shrimp **MultiPath Xtra** PCR test will help to confirm DIV1 infections as well as provide information to producers about presence and/or absence of this virus and other shrimp pathogens frequent in culture systems, in a precise, reliable and quantitative way (number of pathogens per sample).

Causative agent of Decapod Iridescent virus 1 Disease. Originally called *Cherax quadricarinatus* iridovirus (CQIV) or Shrimp Hemocyte Iridescent virus (SHIV) and now classified within the proposed genus *Decapodiridovirus* within the family Iridoviridae, was first reported in juvenile White shrimp *P. vannamei* and crabs in Chinese aquaculture settings in 2014. DIV1 has a characteristically large icosahedral shape that can reach a diameter of around 150 nm. The virion particle contains a linear double-stranded DNA. This family of viruses has a broad spectrum of hosts including invertebrates (insects) and poikilothermic vertebrates (fish, amphibians, and reptiles).

Whilst the virus has no impact on human health or food safety, and any affected shrimp are safe for human consumption, it does have a significantly detrimental effect for shrimp farmers, due to massive mortalities.

Shrimp species susceptible to DIV1 infection include penaeid shrimp such as *P. vannamei*, *P. monodon* and *P. chinensis*. The virus has also been detected by PCR in frozen samples of krill and polychaetes from China, as well as in freshwater shrimp *Macrobrachium rosenbergii*. The screening and detection of DIV1 in shrimp broodstock feed is critical, as it will enable farmers to only feed high-quality virus free polychaete feed to shrimp and avoid infection of postlarvae by vertical transmission from feed to shrimp.

Clinical signs of DIV1 in Penaeid shrimp are hepatopancreas atrophy with pale or yellowish discoloration, and empty stomach and midgut. Additionally, some dying shrimp show slightly whiteish coloration of the abdominal muscle as shown in the image right. Shrimp **MultiPath Xtra** PCR is able to confirm DIV1 infections whilst also giving information on the presence and/or absence of other pathogens in the culture system, in a quantitative manner.



Questions?

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Early detection using Shrimp MultiPath Xtra PCR testing, can give farmers early notice (up to 8 days based on virus incubation time research under *in vitro* tests) to mitigate viral spread and disease outbreak, maximizing production outputs. This allows farmers to take appropriate action during a farming cycle. Early detection of DIV1 in a shrimp pond, enhances the timely application of control strategies, such as increasing aeration, reduction of feed supply, and increasing of biosecurity measures in infected ponds (special management cycles for affected ponds to minimize spread, use of separate and subsequently quarantined cast nets and equipment, establishing physical barriers and inform neighboring farms about the presence of this infection), and give priority to harvest infected ponds over healthy ponds on the farm. If DIV1 is detected in grow-out ponds, disease expression risk may be reduced by avoiding physical-chemical parameter abrupt changes and keeping environmental conditions as stable as possible.

Target life-history stages for accurate early detection include late PL stages, juveniles, sub-adults and adults. While DIV1 is vertically transmitted, it is also a plausible assumption to detect the virus in samples of eggs and larval stages (Nauplius, Zoea or Mysis).

Target organs for sensitive PCR detection of DIV1 are whole PL or PL heads; and in juvenile or pre-adult shrimp, gill filaments and hepatopancreas. Gill filaments can be sampled non-lethally, whilst hepatopancreas can only be taken lethally.

Sampling and preservation of tissues for PCR tests should be done in labelled vials or tubes with screw cap seals and fixative should be 70-95% laboratory grade ethanol or RNALater; freezing samples will also preserve virus DNA. Tissue size can be 2-5 mm² in size (50 mg approx.). Sample equipment must be sterilized using appropriate methods between sample tubes.

Sampling numbers and Health Management Plans should be established with your health expert who will factor in postlarvae source, climate, farm size and location, company structure, risk factors and market channels for sale of product, etc. There is also the option to pool samples for DIV1 testing to maximize value for money with PCR testing.

Longer term solutions to DIV1 control include breeding for tolerance and resistance, PCR-based exclusion programs, surveillance and the use of developing "RNA interference antiviral" techniques (RNAi). Early pathogen detection and risk mitigation through the use of Shrimp MultiPath Xtra is also a foundational approach to solving DIV1 pond consequences.

Contact Genics at info@genics.com if you would like to discuss these options for your operation or visit www.genics.com for further details.

Watch the [instructional video](#) on Shrimp **MultiPath** and **MultiPath Xtra** target organ dissection.



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Did you know...

We have an extensive range of other pathogen information resources.

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