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Education Series

Yellow Head Virus variant 1 and 7 (YHV1 & YHV7)

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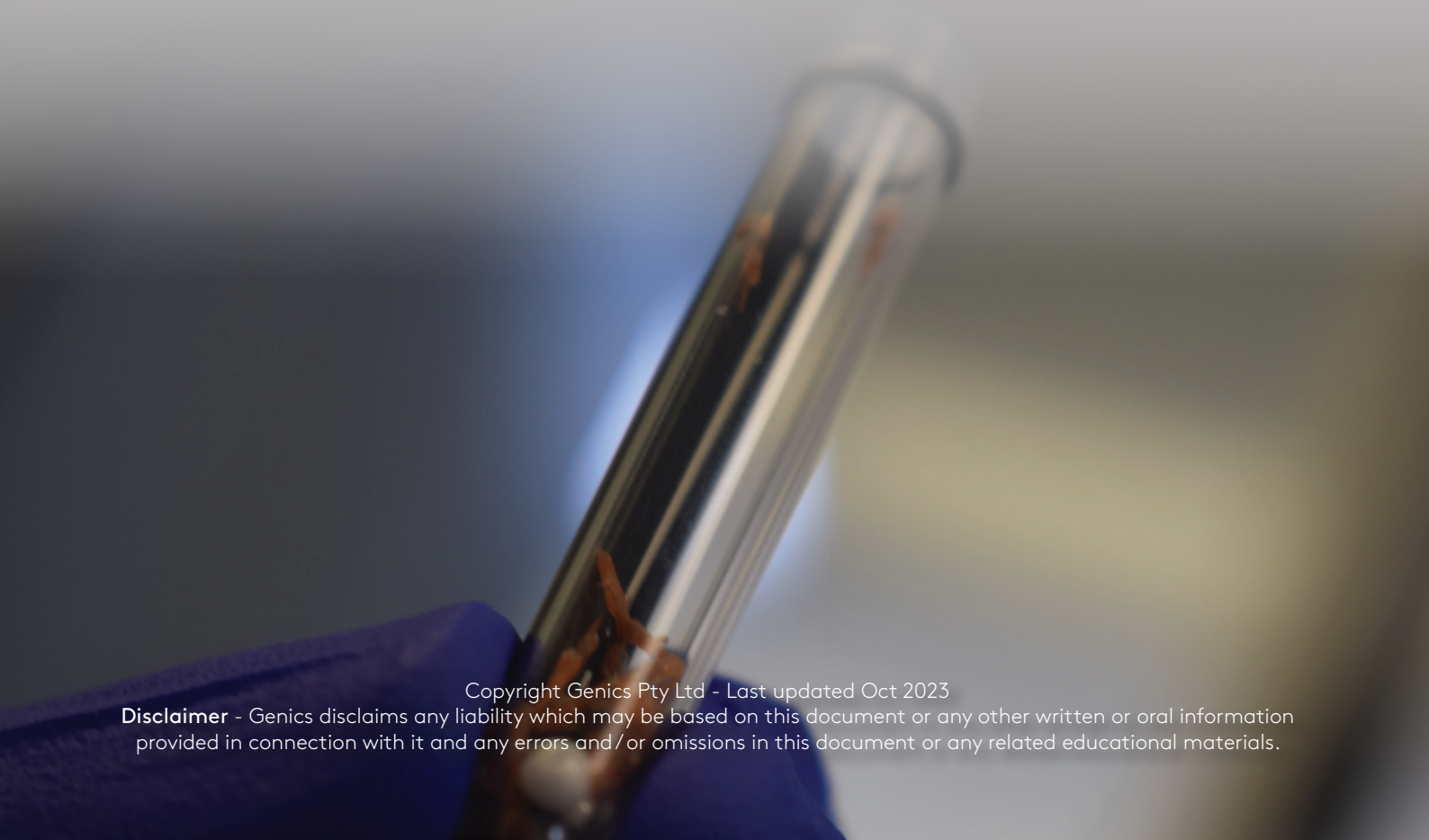

Shrimp get sick too. Yellow Head Virus genotype 1 (YHV1) is a bacilliform, enveloped positive sense (+) ssRNA virus, member of the genus *Okavirus*, family *Roniviridae* within the order Nidovirales. It was first recognized in the early 1990s and was the cause of mass mortalities of cultured *Penaeus monodon* in Thailand. The disease it causes received the name due to the light yellow colouration of the dorsal cephalothorax area and the general pale appearance of the infected shrimp. The yellow look is a consequence of an enlarged yellow hepatopancreas.

Yellow Head Virus 1 can reach mortalities of 100% in *P. monodon* within three to five days of the appearance of gross signs of infection, which makes it a devastating disease. Infection with YHV1 is listed as a notifiable disease by the World Organisation for Animal Health (WOAH).

Postlarvae around 20 to 25 days, to subadult are highly susceptible. Mortalities usually occur during the early to late juvenile stages in rearing ponds. It is worth noting that *P. monodon* postlarvae younger than 15 days are resistant or able to tolerate YHV1, and that the onset of the disease has been associated with the stress of moulting.

YHV1 has 10 genotypes discovered so far, where genotype 2 is known as Gill Associated Virus (GAV) and is covered in a separate pathogen guide; from genotype 3 to 6 there is no reported evidence of association with disease; genotype 7 has been detected in diseased *P. monodon* in Northern Australia, and genotype 8 has been detected in diseased *Penaeus chinensis* in China. Genotypes 9 and 10 are the most recently described, with little known about them.

The causative agent of Yellow Head Disease is Yellow Head Virus genotype 1 (YHV1). Transmission of YHV1 can happen horizontally by injection, ingestion of infected tissue, immersion in membrane-filtered tissue extracts or cohabitation with infected shrimps. Vertical transmission can also occur from both male and female parents, it is believed this can happen through surface infection or by contamination of tissue surrounding fertilized eggs. Transmission has also been demonstrated experimentally by injection of extracts of jelly shrimps (*Acetes* spp.) collected from infected ponds.

According to several reports about YHV1 viral ecology, it has been demonstrated that high virus infection levels and disease outbreaks, can be promoted by physiological stress produced by sudden water parameter changes in dissolved oxygen, pH or environmental factors. These may influence shrimp susceptibility and level of mortality during the viral disease.

Shrimp species susceptible to YHV1. It has been described that YHV1 mainly affects and can cause high mortality in *P. monodon*. Other susceptible species include *P. vannamei*, *P. stylirostris*, *P. aztecus*, *P. duorarum*, *Macrobrachium sintangene*, *Palaemon styliferus* and *Palaemon serrifer*. Until proven otherwise, it should be assumed that most penaeid shrimps worldwide are susceptible to infection with YHV1.

Clinical signs of YHV1 include yellowing of the cephalothorax and general bleaching of the body; white, yellow or brown gills; and yellow soft, swollen hepatopancreas, compared with brown hepatopancreas in healthy shrimp. At the farm level aggregations of dying shrimp near the water surface at the edge of the rearing pond or tank will occur, abnormally high feeding rate of infected shrimp for several days and then abrupt cessation of feeding; and mass mortality (up to 100%) occurring 2 to 4 days after cessation of feeding. Shrimp chronically infected with YHV will display normal appearance and behaviour.

Early detection using Shrimp MultiPath™ can give farmers time to mitigate disease spread and maximize production outputs. It is important to establish early YHV disease mitigation strategies. They may include viral exclusion programs, in order to confirm when broodstock or postlarvae are positive to YHV. It can be used for early rejection of infected shrimp batches before stocking in maturation or grow-out ponds. If YHV is detected in commercial farms, disease expression risk may be reduced avoiding physico-chemical parameter abrupt changes that stress shrimp population, and also keeping environmental conditions as stable as possible.

Target life-history stages for accurate early detection include larvae (mysis), postlarvae, juveniles, subadults and adults. Moribund shrimp from pond edges are the preferred source of samples for diagnosis during disease outbreaks. When juveniles or subadults are obtained from ponds suspicious of YHV infection, it is desirable to sample sick shrimp for further PCR tests. Nevertheless, it has been suggested that healthy shrimp from suspicious ponds may also give positive results for YHV detection tests, which is favorable for confirmatory disease diagnosis. Due to vertical transmission of the YHV, it would be possible to find this virus in eggs as well.

Target organs for sensitive Shrimp **Multi**Path™ detection in moribund suspicious shrimp infected with YHV1 are gills and lymphoid organ. In surveillance of juvenile or adult shrimp that look normal, lymphoid organ is the selected tissue. Gills or haemolymph can be taken non-lethally, which must be considered if a farmer is testing valuable broodstock.

Sampling and preservation of tissues for Shrimp **Multi**Path™ should be done in labelled vials or tubes with screw cap seals and fixative should be 70% laboratory grade ethanol. Tissue size can be 2-5 mm^2 in size. 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 take into account factors such as postlarvae source, climate, farm size and location, company structure, market channels for sale of product, etc. There is also the option to pool samples for Shrimp **Multi**Path™ testing to maximize value for money with PCR testing.

Longer term solutions to YHV1 include breeding for tolerance and resistance, Shrimp **Multi**Path™ exclusion programs, the use of double stranded RNA (dsRNA) to inhibit YHV infection. Early pathogen detection and risk mitigation through the use of Shrimp **Multi**Path™ is also a foundational approach to solving YHV pond consequences.

It is worth noting that according to the WOAH (World Organisation of Animal Health), infected products can be treated at 60°C for 15 minutes to inactivate the pathogen.

Contact Genics through info@genics.com if you would like to discuss these options for your operation.

Learn how to dissect your shrimp for testing

Visit our new Educational page here to learn how to:

- Sterilize your equipment before sampling
- Selecting the correct ethanol for tissue preservation
- Identifying and sampling shrimp target organs for SMP testing

Questions?

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YHV

Did you know?

Shrimp rarely harbour only one pathogen and farmers often don't know which ones they are. This is a significant economic risk for farmers. **Genics has solved this problem** with Shrimp **Multi**Path™. It's the ultimate early warning system for farmers, **detecting 16 pathogens in a single test** that is unparalleled in today's industry for its sensitivity and accuracy.