

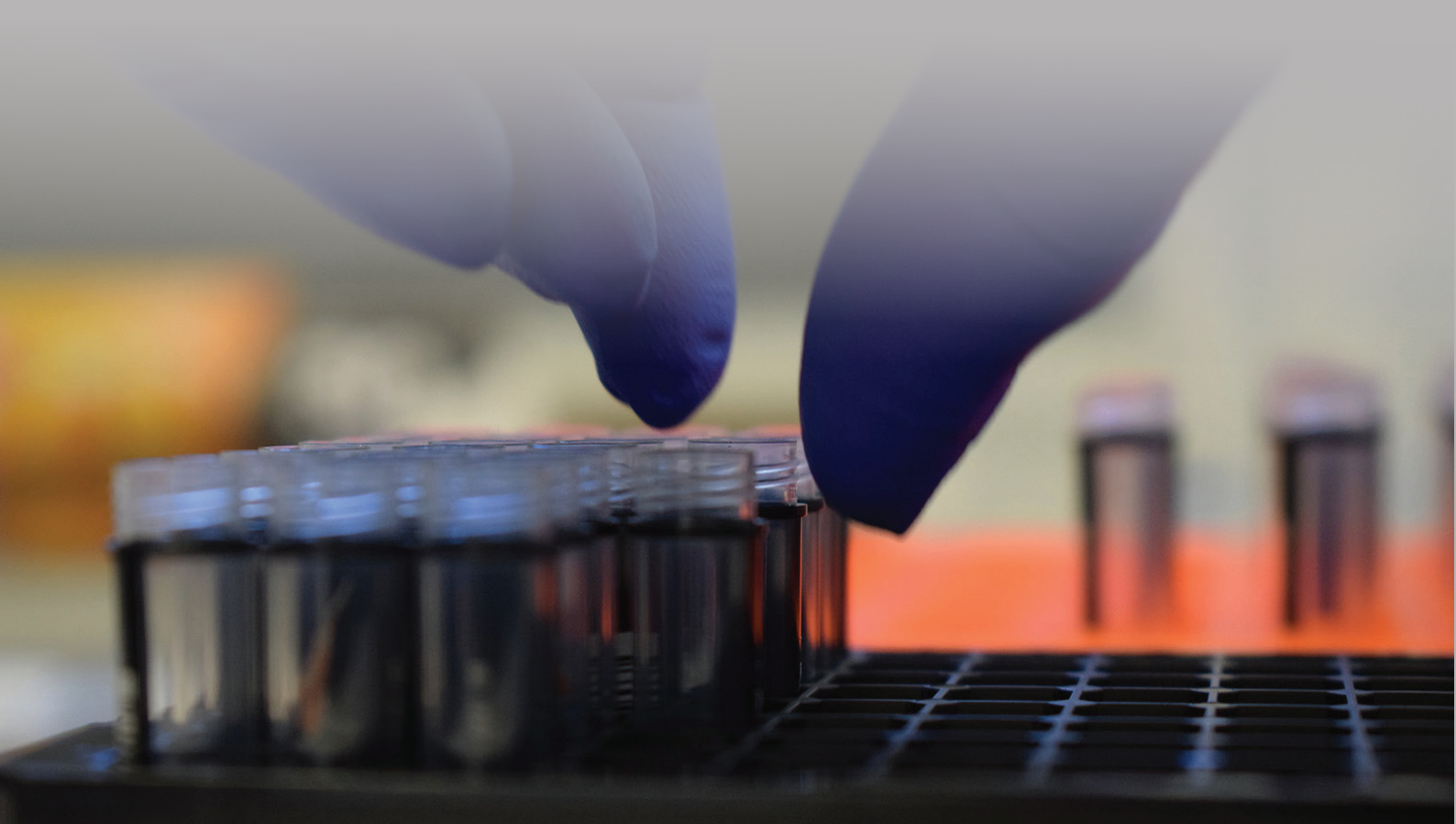


# GENICS

Education Series

*Penaeus vannamei* solinvivirus (PvSV)

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**Shrimp get sick too.** In recent years there have been some newly described viruses that might be affecting shrimp production. These are the Wenzhou shrimp virus 8 (WzSV8), *Penaeus vannamei* picornavirus (PvPV) and *Penaeus vannamei* solinvivirus (PvSV). These three viruses have slightly different sequences, so it is not yet clear if they represent discrete species or variations of one species. Different variations of them have been found in Thailand, China, Indo-Pacific and Brazil. Whatever the case, given the limited information available, here we will focus on *Penaeus vannamei* solinvivirus (PvSV), and available information as of early 2023.

The first of these three pathogens described was the WzSV8 in 2015 from the Americas and the Indo Pacific region. Then in 2021 the PvPV was deposited in GenBank, obtained from *P. vannamei*. Finally, the PvSV was added to GenBank (international database of genetic codes) in 2022 from Brazil.

It is believed that the WzSV8 does not have high virulence. However, PvSV has been found in association (dual-infection) with a strain of IMNV (Infectious myonecrosis virus) and the occurrence of mortalities in Brazil since 2016. It has been discovered so far that PvSV has a tissue tropism that is similar to other solinvivirus's where the midgut epithelia of insects are infected, but it is different in that it affects muscle tissue. It replicates in the hepatopancreas and has tissue tropism very similar to the WzSV8 from Thailand. Given that clinical signs are usually associated with bacterial diseases, farmers in Brazil generally suspected and tested for other pathogens that cause enteric disease, until the virus was described. PvSV is characterized by causing an enteric and systemic infection. At the moment this guide was written, the PvSV was widely distributed in Brazil, covering seven states in the northeast region.

**The causative agent of infection with PvSV** is a virus from the Solinviviridae family, which is relatively new, having most members still unclassified. The Solinviviridae contain species of viruses that are known pathogens of ants and infect the midgut epithelium. PvSV is the first solinvivirus to infect penaeid shrimp and it is a new genus within the family. Some of these viruses cause chronic infections with low mortality and are restrained to one type (midgut epithelium) of tissue while the more virulent species causes systemic infections and acute mortality. The Solinviviridae viruses are related to the Caliciviridae and Picornaviridae, also having linear, non-segmented, positive-sense RNA genomes of around 10-11 kb (kilobases). However, the Solinviviridae differs from the Caliciviridae in terms of genome size and ORF organization. The Caliciviridae have shorter genomes, such as 6.4–8.5 kb genomes with two to three ORFs.

Even though WzSV8 is known to have low virulence, it is quite possible that other variants may be lethal or contribute to mortality combined with other pathogens or factors, as it is the case of PvSV in Brazil. WzSV8 in a pairwise alignment comparison has 92.9% similarity to PvSV.

**Clinical signs of PvSV** are not yet well described, mainly associating the presence of the virus to mortalities in Brazil. The affinity of PvSV to the hepatopancreas and its effect on the tissues makes this organ more susceptible to chronic bacterial infections. The tissue tropism of the PvSV is almost identical to the WzSV8 virus detected in Thailand. WzSV8 has some distinctive lesions that could be used for rapid screening of H&E-stained tissues.

## Questions?

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PvSV

*Penaeus vannamei* solinvivirus (PvSV)

These lesions are circular inclusions within cytoplasmic vacuoles of tubule epithelial cells in the E-cell (embryonic cells) region. It has also been found, unique basophilic, cytoplasmic inclusions within vacuoles in the hepatopancreatic E-cells, sometimes accompanied by a smaller eosinophilic inclusion, referred to as Lightner double inclusions (LDI). It should be considered though, that several tissues positive to WzSV8 by ISH had nuclei with normal morphology in those data which are published.

**Target life-history stages** for accurate early detection of PvSV include postlarvae and juveniles.

**Target organs** for sensitive Shrimp **MultiPath™** detection are the gastrointestinal tract or whole heads of postlarvae.

**Sampling and preservation of tissues for Shrimp MultiPath™** 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<sup>2</sup> 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 nauplii/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 **MultiPath™** testing to maximize value for money with PCR testing.

**Longer term solutions** at this stage should use Shrimp **MultiPath™** exclusion programs. Early pathogen detection and risk mitigation through the use of Shrimp **MultiPath™** is also a foundational approach to solving PvSV pond consequences and minimizing the risk of pathogen spread.

Further characterisation of this and related pathogens is required.

Contact Genics at [info@genics.com](mailto:info@genics.com) if you would like to discuss these options for your operation or visit [www.genics.com](http://www.genics.com) for further details.

## 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
- Identify and sample shrimp target organs for Shrimp **MultiPath™** testing



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 PvSV

### 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 MultiPath™**. It's the ultimate early warning system for farmers, **detecting up to 16 pathogens in a single test** that is unparalleled in today's industry for its sensitivity and accuracy.