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Prevention and control of EHP *(Enterocytozoon hepatopenaei*)

What is it?

Enterocytozoon hepatopenaei is a microsporidian. Formerly classified as protozoa, genomic taxonomy has determined that they are closely related to fungi. There are almost two hundred genera of which about half of which are known to infect crustaceans and fish. It is theorized that there may be thousands of different genera. The most common observed pathology is a gradually increasing whitish discoloration in muscles due to spores that can stunt growth (milky muscle disease), increase other types of problems, and affect the economic value of the crop. EHP is different. It only infects the tubules of the hepatopancreas. This damages the ability of this critical organ to gain nutrition from feed, which leads to many different types of problems. It is widely understood that EHP does not cause mortality but severe growth retardation. This organism is now endemic throughout SE Asia including China, Malaysia, Thailand, Indonesia and Vietnam. It is likely present elsewhere including India and possibly Mexico. Likely anywhere that has imported live feeds from China and animals from areas where EHP is endemic is affected. This organism is very difficult to eradicate. More than likely we will only be able to control the levels of it.

How is it detected?

The pathogen can be detected using gene based detection tools such as PCR and LAMP of feces from broodstock. These methods can also be used with PLs although light microscopy can be used as well although it can be very difficult to visualize the very small spores. Screening broodstock and eliminating PCR positive animals is a useful tool although it will entail screening them individually., a costly practice. In some areas there may not be any animals that are totally free of the pathogen.

How can it be treated?

Microsporidian infections are typically treated with a specific class of drugs that are unlikely to be effective against EHP because of its target tissue specificity. The best approach to dealing with the problem entails a three-prong strategy.

I. Biosecurity in the hatchery
II. Proper pond preparation
III. Proper pond management during the growth cycle

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Total elimination may not be impossible. The best approach is to lessen the loads coming into the ponds and control the levels that the ecosystem allows the production of. As of yet, there are no reports that identify what the director vector in the ponds might be.

Biosecurity in the hatchery

I. Do not use live feeds known to carry EHP and EMS

Pond reared adult broodstock as well as those fed sources of infected live feeds can be infected and can spread EHP and EMS through feces. The use of live animals including polychaetes, clams, warm water squid, locally produced Artemia, etc. in broodstock maturation facilities poses a significant biosecurity risk and should be discouraged. Live feeds such as krill do not pose a risk. If live feeds are used they should be frozen, pasteurized or even irradiated.

II. Clean and disinfect maturation facilities and hatcheries

These facilities should be dried out completely, washed and then disinfected with a caustic solution of sodium hydroxide. It has been suggested that a 2.5% sodium hydroxide solution be employed and all equipment, pipes, tanks, etc. be soaked for at least three hours. After this the remaining caustic solution should be washed away and all of the treated materials allowed to dry for an extended period of time. Rinse before use with acidified chlorine (200 ppm at a pH less than 4.5) The spores are extremely resistant to most treatments and complete elimination will prove challenging. Lowering the load substantially is the goal.

III. Washing and cleaning eggs and nauplii

Long proven strategies for washing and rinsing nauplii with the appropriate mix of fresh water and chemicals (iodine and formaldehyde among others) that may weaken the passive attachment of spores to the egg and nauplii thus lessening the transmission through this route must become routine. This is an effective tool as well for lowering the loads of EMS bacteria that pass from broodstock to PLs.

Proper Pond Preparation

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High organic loads typically relate to spore loads. Likely there is some intermediate vector and until we are sure what it is, you are best off using strategies to properly treat the sediments before stocking. As spores typically are resistant to a wide variety of environmental conditions (this is because they are spores) with different species displaying differential susceptibility the general suggestions are to physically remove any accumulated organic matter and treat the pond bottom is with a very caustic material that will bring the pH to 12 to kill many of the spores. Killing all of them may not be possible.

It has been recommended that earthen ponds be disinfected by a very heavy use of CaO. Use at least 6000 kgs per ha or pond bottom. Ponds need to be completely dry. Plow the quick lime into the dried sediments to 10 to 12 cms. Moisten the sediments to activate the quick lime. If the application is done properly the pH of the soils will rise to 12 or more within days of the application and then gradually return to normal as the CaO becomes CaO_3.

Proper Pond Management

After the soils have recovered, use our PRO4000X tablets or our AQPRO-B or EZ product lines from the early stages of culture to prevent the accumulation of large amounts of organic matter. These can be used alone or in combination with water exchange. The goal is to lessen the amount of accumulated organic matter and thus reduce the potential reservoir for spores that will be ingested and continue to infect shrimp. Consistent use is important at levels that will lessen the amount of organic matter.

Conclusion:

Reducing the load of spores in the production environment by reducing the false vertical transmission of the spores as a result of contaminated surfaces due to spawning in combination with aggressively limiting the reservoirs for spores will reduce the severity and impact of the disease. Consistent use of these methods should lessen the long term impact and reduce the environmental load of spores.

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