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Could the frequent reoccurrence of EMS/AHPNS be the result of an ecological imbalance created by the excessive use of chlorine?

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Shrimp farmers around the world have resorted to whole pond sterilization, often through the use of high levels of chlorine, as a means to control the levels of WSSV and its vectors. This approach has been shown to be marginally effective in some cases and often fails to eliminate those encysted vectors present in sediments. Typically within a few weeks viral loads return to pre-chlorination levels.

Chlorine is a broad-spectrum halogen that kills most bacteria and viruses and is toxic to many animals and plants. It is an effective disinfectant although its use does have some serious potential drawbacks. It is well documented that the use of chlorine actually increases the availability of small sized organic molecules that stimulate microbial growth so while it kills off most of the bacteria it creates a ready source of food for the survivors. How effective chlorine is in killing depends on a number of factors, the most important of which is the organic demand. Organic material binds and inactivates chlorine. Failure to account for this will result in a less than effective kill. The single largest drawback though is that chlorine is quite effective in killing off the natural bacterial flora in the water column but does a very bad job killing off bacteria in sediments and the deeper encysted carriers.

Evidence is accumulating in some areas (such as Hainan Island) that the use of chlorine may not be a good idea. Some farms that have had serious problems with EMS in the past are reporting successful crops by avoiding the use of chlorine and conditioning the ponds properly prior to stocking with shrimp. Killing off the vast majority of the bacteria in the water and those that are in the top layers of sediment creates large voids in the pond ecosystem that can readily be dominated by incoming bacteria (or bacteria that are not killed by the treatment) such as the etiologic agent of EMS, *Vibrio parahaemolyticus*. Given what we understand about the disease process, the role of vectors looms large and viable loads of the bacteria in the water column typically would not reach high enough levels to be problematic. Using chlorine is a drastic process and should be a tool of last resort and not the first choice. Total or near total disruption of the ecosystems in ponds cannot be a good thing.

While it is understandable that farmers will want to do everything that they can to lessen the loads of specific pathogens such as WSSV, the preponderance of evidence

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suggests that the use of chlorine is at best a short-term fix and that it really does not address the problem. The role of stress in many shrimp disease processes is under appreciated and there is good evidence to show that in many cases of WSSV today, vibrios are strongly implicated in secondary infections that ultimately kill the shrimp. Farmers would be far better off using pesticides that are specific for the vectors of WSSV (which are also potential vectors for *V. parahaemolyticus*) and focusing on proper pond preparation and the use of field proven tools such as our tableted bio-augmentation tool, PRO4000X. Focusing on controlling the vibrio loads is likely going to be a much more effective approach to lessening the impact of the disease rather than a wholesale destruction of the natural ecology in the ponds via the use of chlorine.