



Coast Watch...

Walleye eggs 14 days after fertilization

Under the Microscope with VHS

New research to prevent and contain this serious fish pathogen

“The emergence of VHSV [viral hemorrhagic septicemia virus] in the Great Lakes Basin is one of the most serious, if not *the* most serious fish health event that has ever occurred in North America,” says **Dr. Paul Bowser**, Professor of Aquatic Animal Medicine at Cornell University’s College of Veterinary Medicine Aquatic Survey Animal Health Program. “I say that because of the diversity of fish species that is being infected and the degree to which the disease has impacted sportfisheries management.”

VHSV, which causes hemorrhaging, anemia and other signs of illness, has been identified in 28 freshwater fish species in the Great Lakes Basin. In New York, the non-treatable viral fish pathogen poses a potential threat to the sportfishing industry which contributes \$1.4 billion annually to the State’s economy, according to recent U.S. Census Bureau estimates.

Since 2005, the Great Lakes isolate of VHSV (VHSV Genotype IVb) has been linked to illness and significant mortalities in several Great Lakes fish species. The most dramatic mortality event involved the death of several hundred tons of freshwater drum in Lake Erie in 2006. Other fish species suffering serious losses have included round goby, gizzard shad, yellow perch,

muskellunge (a kind of pike), walleye, and smallmouth bass. Up through 2008, the virus was documented in all of the Great Lakes with the exception of Lake Superior. But, in 2009, Bowser says, “VHSV was found in fish from four locations in Lake Superior by two collaborating laboratories—Cornell and the U.S. Geological Survey’s Western Fisheries Research Center (USGS WFRC). Under newly-published OIE (World Organization for Animal Health) criteria, the work at Cornell and the USGS WFRC, combined with the existence of a connecting waterway to a location where VHSV is known to exist (Lake Huron), constitutes a confirmation of VHSV IVb in Lake Superior.” While no significant fish mortality events due to VHSV were observed in any of the Great Lakes in 2008 and 2009, the virus is still present in Great Lakes fish.

“It’s important to note that during 2008 and 2009 fish infected with VHSV IVb were found, but those fish showed no clinical signs of disease,” says Bowser. “Essentially the infection can be found but no mortalities were observed. This is important because it suggests that these infected fish may serve as a reservoir for the virus in the Great Lakes ecosystem. While we don’t fully understand the reasons for the lack of recent mortality events, the potential presence or absence

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of concurrent stressors on the fish may be playing a role.”

In a currently-funded NYSG study, investigators led by Bowser and virologist **Dr. James W. Casey** are using genetic (quantitative RT-PCR) and cell culture techniques to determine whether fish are capable of passing VHSV on to their embryos. The team is evaluating the risk of egg infection from VHSV-infected walleye and zebrafish to identify better bio-safety protocols and effective disinfection methods. These are critically important to natural resource agencies that collect eggs from wild fish stocks and private aquaculture because the spread of the virus to a fish hatchery or an aquaculture facility could be devastating. So far, the virus has not been found in any such facility in North America.

To prevent VHSV infection, fish culturists use a disinfectant solution such as an iodophor to treat walleye and other fish eggs. Iodine is the active ingredient that kills bacteria and viruses. In some fish species there is an earlier step in the egg handling process that must be performed prior to the disinfection process. Fish such as walleye have eggs that are adherent. In nature, this provides the egg with the ability to attach to various substrates in a river or lake. “If a fish culturist were to place a number of fish eggs in a vertical jar incubator,” says Bowser, “those eggs would likely form a big clump because they are naturally sticky.” So, prior to disinfecting the eggs with an iodophor solution, tannic acid is commonly used to remove their adherent quality. The key, though, is to completely wash the eggs to remove all tannic acid before the iodophor disinfection step.

“We found that any residual tannic acid will neutralize the iodophor and the expected disinfection step will not happen because of the interaction between the two,” says Bowser of his research team’s key finding to date. “Prior to our discovery, no one had described this adverse interaction between tannic acid and iodophor.”

One of Bowser’s graduate students, **Emily Cornwell**, was the lead author of a manuscript on this finding, one recently accepted for publication.

“Sometimes the benefit from a research project may come from an unexpected

direction. Our opinion is that this unexpected finding is absolutely critical to any egg disinfection process that involved tannic acid and an iodophor,” says Bowser.

NYSG Fisheries Specialist **Dave MacNeill** is providing outreach of these VHSV findings to his stakeholders concerned about Great Lakes fisheries. MacNeill is working with Bowser to develop a New York Sea Grant fact sheet on the strain of VHSV being studied in the Aquatic Animal Health Program at Cornell. Also, in December 2009, NYSG partnered with Lake Champlain and Pennsylvania Sea Grant programs to run a regional aquaculture workshop in Albany, New York, with a second workshop planned for Lamar, Pennsylvania in June, 2010. These workshops were funded by a grant from the Northeast Regional Aquaculture Center of the USDA.

At these meetings, MacNeill and others provided a summary of the VHSV disinfection containment and prevention protocol developed in Bowser’s lab as well as general bio-security measures that can be taken by the fish culturist.

“VHSV can cause serious fish losses as well as significant economic losses, especially to commercial aquaculture and bait dealers,” says MacNeill. “And so, we are taking steps to inform fish health professionals and hatchery operators about viral spread and containment policy in an effort to protect wild fish stocks and maintain the viability of aquaculture in the Northeast States.”

Based on workshop evaluations, 100 percent of workshop attendees indicated that they would utilize these guidelines in their own fish rearing facilities and share the information with other aquaculture practitioners.

—Paul C. Focazio

Special thanks to Stephanie Specchio from Cornell University’s College of Veterinary Medicine Office of Communications for providing information on Bowser’s VHS research on Lake Superior as well as lab photos from his NYSG-funded study.



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