Assessment of susceptibility to VHSV IVb in juvenile white suckers (*Catostomus commersonii*) via controlled laboratory experimental challenges

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ABSTRACT:

Over the course of this GLFC-funded project, multiple *in vivo* laboratory-based experiments generated new knowledge towards elucidating the susceptibility of the white sucker to a fish-pathogenic rhabdovirus of worldwide significance, Viral Hemorrhagic Septicemia Virus (Genus *Novirhabdovirus*, Family *Rhabdoviridae*). Herein, juvenile white suckers were raised from fry under quarantine conditions in the Michigan State University – Aquatic Animal Health Laboratory (MSU-AAHL). Following small-scale pilot experiments, immersion and injection routes of exposure to VHSV IVb were undertaken. Juvenile white suckers (~16.5 months of age) that were immersed in high concentrations (5.3 x 107 plaque forming units, PFU, per mL) of the virulent Great Lakes Index strain of VHSV IVb (strain MI03GL) did not develop grossly observable signs of VHS, did not experience any mortality (i.e., cumulative percent mortality, CPM, of 0%), and no infectious virus was recovered from the kidney, spleen, heart, gill, or brain tissues of exposed fish (n=30 days post-exposure) despite being held at water temperatures conducive to VHS outbreaks. Likewise, no signs of disease or mortality occurred in mock-exposed (i.e., negative control) immersion fish, nor was VHSV recovered from any fish, as was the case for mock-exposed negative control injection fish. In contrast, behavioral changes (e.g., hyporexia, lethargy, gasping at water surface) and gross disease signs (e.g., hemorrhage, exophthalmia, gill pallor, visceral pallor, ascites) consistent with VHS developed in a subset of white suckers that were injected (2.5 x 107 PFU per fish) with the same VHSV IVb strain, with subsequent CPM ranging from 0 – 33.3% (mean CPM of 16.7%). Notably, grossly observable external lesions generally peaked at approximately 14 days post-injection, after which lesion severity decreased until the end of the experiment (30 days post-injection). Virus was isolated from kidney/spleen/heart tissues and the gills of all mortalities, from the brains of most mortalities, and from the kidney/spleen/heart and gill tissues of one of fifteen fish that were analyzed 30 days post-injection. In all cases, the isolated virus was confirmed as VHSV via reverse-transcriptase quantitative PCR (RT-qPCR). Using RT-qPCR, VHSV RNA was also detected directly in kidney/spleen/heart, gill, and brain tissues of all mortalities; however, only trace amounts of VHSV RNA near or below the estimated detection threshold of this assay were detected in the tissues of a subset of fish that had been injected with high loads of VHSV IVb 30 days prior. In summary, findings from this GLFC-funded study indicate that: a) VHSV IVb can remain infectious, cause disease, and induce mortality in a subset of juvenile white suckers that are injected with large quantities of virus; and b) VHSV IVb did not induce grossly observable signs of VHS or mortality in any juvenile white suckers that were immersed in virus concentrations that greatly exceeded those capable of causing fulminant disease and mortality in other susceptible Great Lakes fish species. Collectively and pending formal risk analyses, results from this GLFC-funded study suggest that white suckers are not highly susceptible to VHSV IVb under controlled laboratory conditions and that this virus likely poses minimal infection risk to white sucker populations in the Great Lakes basin