Physical fitness of wild Pacific sockeye salmon unaffected by piscine orthoreovirus

July 14 2021, by Collins Maina

Migrating sockeye salmon. Credit: Dr. Scott Hinch

The respiratory performance of wild Pacific sockeye salmon functions normally even when infected with piscine orthoreovirus (PRV), according to a new study released today.

The findings by researchers at UBC, Fisheries and Oceans Canada (DFO) and the Ministry of Agriculture, Food and Fisheries are published in *BMC Biology*.

"We saw little to no effect on sockeye salmon's respiratory fitness after PRV-infection and minimal impacts on their ability to sustain the vigorous activity needed to migrate, catch prey and avoid predators," said Dr. Yangfan Zhang, a post-doctoral researcher in UBC's faculty of land and food systems and the department of zoology, and the joint lead author of the study.

The nine-week study found no physiological differences between PRV-infected fish and a control group, injected with a salt solution.

"This means PRV poses a very low risk to British Columbia's population of wild Pacific salmon," Dr. Zhang says.

"The findings highlight that not all animal viruses cause notable harm during infection," says joint lead author, Dr. Mark Polinski, a DFO researcher.

PRV infects most farmed Atlantic salmon and just a small proportion of wild Pacific salmon. The study used sockeye salmon to test the respiratory impacts of wild salmon because they migrate near salmon farms.

"This is the first study to show that sockeye salmon can be a carrier of PRV without untoward physiological effects to their respiratory system," says Dr. Tony Farrell, a professor and Canada Research Chair with UBC's faculty of land and food systems and the department of zoology, and one of the principal investigators on the study.

The research team ran their experiment on a total of 400 sockeye salmon

at the DFO Pacific Biological Station in Nanaimo, BC.

One group of sockeye salmon was injected with a dose of purified PRV to induce a high-dose infection scenario, another with a saline solution, and a third group was injected with the more virulent infectious hematopoietic necrosis virus (IHNV) in a separate positive-control study.

None of the salmon died while carrying the PRV infection. But researchers noted IHNV triggered 30 percent mortality and a temporarily reduced maintenance metabolism, although survivors were able to resolve the infection within weeks.

Researchers also measured the ability of red blood cells infected with PRV to bind oxygen, as well as the metabolic rate—or oxygen uptake—of infected salmon, to evaluate their ability to maximally use oxygen, recover from exhaustion, and function when oxygen is low.

"The experimental PRV infection of sockeye salmon shows that the virus had no substantial impact on their oxygen use during maximum exercise, or when oxygen is low," Dr. Farrell says.

"Pacific and Atlantic salmon can resist a PRV infection without a major metabolic cost," he says, addressing those concerned about the untested impacts of PRV on wild sockeye salmon.

The authors previously performed similar investigations with PRV-infected farmed Atlantic salmon with similar results, published in 2019.

The UBC researchers worked with scientists from the BC Ministry of Agriculture, Food and Fisheries, and Fisheries and Oceans Canada—which funded the study—with collaborative support from the BC Salmon Farmers Association (BCSFA) who did not participate in the study design, data collection, and analysis, preparation of the manuscript,

or decision to publish.

More information: Mark P. Polinski et al, Innate antiviral defense demonstrates high energetic efficiency in a bony fish, *BMC Biology* (2021). DOI: 10.1186/s12915-021-01069-2

Provided by University of British Columbia