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Western Fisheries Research Center (WFRC)

Western Fisheries Science News

Adult cutthroat trout infected with Cutthroat Trout Virus show no sign of disease. Photo by David Leer, Oregon State University

Fish Virus Gives Insights into Hepatitis E

A fish virus characterized by WFRC scientists in cutthroat trout has provided medical researchers with a tool that could help save thousands of human lives, thanks to both its resemblance to and its key differences from the human virus Hepatitis E. WFRC biologists Jim Winton and William Batts and colleagues were the first to characterize the genome of the fish virus, known as CTV. They found that CTV closely resembled the virus that causes Hepatitis E, a potentially deadly emerging human disease that is particularly dangerous to pregnant women. Hepatitis E virus has proven exceptionally difficult to grow in cell cultures, in part because the cells of the human liver that it infects are difficult to maintain in the laboratory. Winton and Batts recognized the potential to use CTV to create persistently infected cultures with established fish cell lines that could be used to test potential vaccines and therapies for Hepatitis E.

A new paper in the journal *Antiviral Research* demonstrates that CTV can indeed provide a powerful tool for studying Hepatitis E. The paper, which Winton co-authored with a team from Belgium, reports the results of successful experiments testing antiviral compounds for their ability to inhibit the growth of CTV in fish cells, an important step forward for medical researchers looking to develop ways to treat and prevent Hepatitis E in humans. In addition to being an (continued on page 2)

Honors

WFRC Article Recognized as "Most Cited" in Fisheries Journal: An article by USGS scientists and co-authors titled "Estimating survival and migration route probabilities of juvenile Chinook salmon in the Sacramento-San Joaquin River Delta" was the most-cited article published in The North American Journal of Fisheries Management over the past three years. For more information, contact Russell Perry at rperry@usgs.gov or 509-538-2299.

In the News

WFRC Filmed for PBS: On July 17, USGS Research Ecologist Jeff Duda hosted a tour of the science field sites in the Elwha River with a film crew from the PBS program Quest. The film crew interviewed scientists from USGS, Lower Elwha Klallam Tribe, NOAA, and Washington Sea Grant for an upcoming national environmental program. For more information, contact Jeff Duda at jduda@usgs.gov or 206-526-6282 x233.

Interview with Wisconsin Watch.org: On August 13, WFRC's Jim Winton was contacted by a writer for the group Wisconsin-Watch.org, to comment on a report that cutthroat trout virus was recently identified in a population of brown trout in Wisconsin. The virus had not been previously identified in fish east of the Mississippi River. The virus is typically found in normal adult trout at spawning and has not yet been identified with disease in any of the four trout species in which it is known to occur. For information, contact Jim Winton at jwinton@usgs.gov or 206-526-6587.

(continued from page 1) available cell culture system and an easy-to-use and inexpensive animal model, CTV also poses no disease threat to researchers. Like most fish viruses, CTV cannot be transmitted to people. That makes working with CTV much safer and easier than working with Hepatitis E would be. "It's great when your initial curiosity about a virus from healthy fish turns out to have important biomedical applications for humans," said Winton. "It really shows how hard it is to fully anticipate where basic scientific research might lead."

Typically acquired from contaminated water, Hepatitis E virus infects tens of thousands of people annually in Asia, Africa and South and Central America. While most infected people clear the virus from their systems without becoming sick, for reasons that are still unclear, the virus often causes full-blown hepatitis and liver failure during pregnancy. As a result, Hepatitis E is responsible for a high fatality rate among pregnant women. The World Health Organization estimates that 56,600 people die from Hepatitis E annually. The only drugs known to treat Hepatitis E require long treatment periods, cause severe side effects and are not safe to use during pregnancy. Thus there are significant gaps in both the understanding of the biology of Hepatitis E and in the search for safe, effective antiviral drugs.

Batts, Winton and their colleagues first published their results in 2011. Soon after, they were contacted by researchers in Belgium who wanted to use CTV-infected fish cell lines to screen potential antiviral drugs for treating Hepatitis E. Results from their initial tests showed that, just as Winton and Batts had hoped, CTV does indeed provide an important model to help study Hepatitis E and test potential treatments and vaccines. A new paper by the Belgian team and Winton in the journal *Antiviral Research* reports the results of experiments that tested several antiviral compounds for their ability to inhibit the growth of CTV in fish cells. It also reports effects of sex steroids on virus replication that provide clues into the basis of the increased mortality from Hepatitis E observed among pregnant women.
In addition to screening potential antiviral drugs using CTV-infected cell cultures, scientists could experimentally infect captive fish with CTV to test potential vaccines *in vivo*. This will allow a whole-animal approach to the testing of potential therapies or vaccines that would be more relevant for human health than tests conducted on cell cultures. For more information contact Jim Winton at 206-526-6282 x328 or jwinton@usgs.gov.

WFRC in *The Columbian*: On August 29 *The Columbian* ran a story about the work of WFRC scientist Ian Jezorek and USGS crew members on the Wind River, WA. The crew conducts fish monitoring to support stream habitat restoration for ESA-listed summer steelhead. The full article is available here: http://goo.gl/w7WLmC For more information, contact Ian Jezorek at ijezorek@usgs.gov or 509-538-2299.

Publications

Validation of Diagnostic Methods for an Important Fish Pathogen: A paper titled "Bench-top validation testing of selected immunological and molecular *Renibacterium salmoninarum* diagnostic assays by comparison with quantitative bacteriological culture" was published in the September 2013 issue of the *Journal of Fish Diseases*. The paper titled is expected to serve as a reference guide for diagnosticians. For more information, visit http://goo.gl/0Xu5cM or contact Diane Elliott at dgelliott@usgs.gov or 206-526-6282.

New Publications on Deadly Fish Virus: Two new studies examining the susceptibility levels and immune response of yellow perch after exposure to a highly invasive viral hemorrhagic septicemia virus (VHSV) strain from the Great Lakes region have been published by scientists from the School of Freshwater Sciences at the University of Wisconsin and WFRC. Summaries of the papers can be found at http://goo.gl/ftlJgh and http://goo.gl/5hxV83. For more information, contact Evi Emmenegger at eemmenegger@usgs.gov or 206-526-6282 x 276.

The Role of Virulence for *in vivo* Superinfection Fitness of a RNA Virus: WFRC scientists Alison Kell, Andrew Wargo, and Gael Kurath have authored a paper in *Journal of Virology* titled "The role of virulence for *in vivo* superinfection fitness of a vertebrate RNA virus." For more information, visit http://goo.gl/o8dMbt or contact Alison Kell at amkell@usgs.gov or 206-526-6282.

USGS Western Fisheries Research Center
6505 N.E. 65th Street
Seattle, Washington 98115
http://wfrc.usgs.gov/ 206-526-6282
To unsubscribe email lhayward@usgs.gov