

## Race Is On to Discover Vaccine to Save Salmon

Jan Burian is determined to stop a killer. As Director of Molecular Biology at Microtek International Ltd. in Victoria, British Columbia, Canada, he is trying to save the lives of thousands of coho salmon infected with a deadly bacterium. Since 1989, when researchers first isolated the pathogen *piscirickettsia salmonis* in coho salmon commercially raised in southern Chile, the bacterium and the rickettsial (SRS) diseases it causes have been observed in several diverse fish species. It has been found in British Columbia, Chile, Norway, Ireland and Taiwan, at both fresh and salt water fish farms. Death rates from this fastidious, intracellular microorganism reach as high as 90 percent at certain sites, striking a devastating blow to commercial hatcheries and fish species.

While SRS diseases impact a broad geographic area, most research has concentrated on the aquaculture community in Chile where all salmonid species are affected by the pathogen. The highest death rates occur in coho salmon cultured in sea water netpens. Infected fish begin to die off six to twelve weeks after being transferred to fresh water, with death rates peaking in the fall and rising again the next spring.

Efforts to control SRS diseases have been stymied because no one has been able to pinpoint the natural reservoir of the bacterium or how it is transmitted. Antibiotics and traditional vaccines that have controlled other infectious and bacterial fish diseases have failed in treating the rickettsial pathogens.

Jan Burian and his research team have worked diligently to develop a new vaccine. Although the process could easily take up to a year to complete, the initial results are excellent according to Microtek's Quality Assurance Manager Stephen Cameron.

But Cameron says developing recombinant fish vaccines is the hallmark of Microtek International Ltd., a leading biotechnology company in the aquatic health market. Integral to Microtek's vaccine research is cell disruption and Burian is rupturing *E. coli* cells to extract recombinant proteins for potential SRS vaccines.

"During bacterium cell disruption we need a sterile environment," said Cameron. "Originally Jan worked with a French press and Gaulin® homogenizer, but they posed contamination and equipment cleaning problems. I had heard about the Microfluidizer® processor and after a demonstration here at our lab, its performance and sterilization features convinced us to get one immediately."



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Microtek uses an M-110EH Microfluidizer® processor in its clean room. Controlled pressure feeds a process stream of the *E. coli* cells through the patented interaction chamber’s microchannels. While being propelled at speeds up to hundreds of meters per second, the stream splits in two, changes direction, then collides with itself to reform a single stream. Shear and impact forces within the interaction chamber typically break over 90 percent of the *E. coli* cells in one pass, gently releasing high yields of intracellular protein for Burian’s vaccine research and development.

What differentiates the Microfluidizer® processor from the French press is its steam sterilization retrofit. Microtek is able to extract sterile proteins and maintain that sterility throughout the cell disruption process. Cleaning the processor requires no disassembly, which makes it very quick and easy to prepare for the next process stream. Cameron says the performance and sterilization features convinced Microtek to consider other applications for the Microfluidizer® processor in the future, but it was the following factor that won him over.

“When we’ve had any problems or questions with the processor, Microfluidics or their local representative, Inland Machinery, have always gotten right back to us with answers,” Cameron said. “They respect that time is very valuable to us in our race to find a vaccine. It’s even more valuable to the fish farmers who are anxious for Microtek to find a way to protect their fish and their livelihoods.”

*Research information about piscirickettsia salmonis was drawn from “The Rickettsia: An Emerging Group of Pathogens in Fish” by John L. Fryer and Michael J Mauel, Oregon State University, Corvallis, Oregon, USA; 1997*



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