

Cryptosporidium

A brief overview of a new technology

Photo Credit: H.D.A Lindquist, U.S. EPA

The occurrence of *Cryptosporidium parvum* and other pathogens in water supplies poses a dangerous problem to the water industry and human health. In 1993, in the single largest water-borne disease outbreak in U.S. history, Cryptosporidiosis sickened 400,000 people in the Milwaukee area and was implicated in the death of 100 individuals. These organisms provide a reservoir of infection, resulting in the excretion of the environmentally stable cysts or oocysts that are impervious to inactivation by many drinking water disinfectants. The pathogen can be transmitted through water or animals and in many cases may seep into surface waters designated for public use through stormwater runoff from farms or sewage areas.

There is no cure for Cryptosporidiosis and the illness threatens children and immuno-compromised individuals the most. Lack of an efficient methodology for detection of *C. parvum* at suspect water sources can further frustrate efforts. According to findings from the Information Collection Rule (ICR), mandated by the U.S. Environmental Protection Agency (EPA), current methods for the detection of *C. parvum* have their drawbacks including difficulty in accurately estimating the numbers of protozoan cysts without testing large quantities of water, inability to distinguish between species of *Giardia* and *Cryptosporidium* that may cause illness and those that do not, the possibility of both false positive and false negative results, and the inability to determine whether the microbes are alive or whether they are able to cause illness. (For more information on the ICR and its reports, visit the EPA's Envirofacts website at www.epa.gov/enviro/html/icr/icr_query.html.)

In November 1998, the EPA held a public meeting for Microbial-Disinfection Byproducts (M-DBP) stakeholders. The meeting brought a number of experts together to discuss state-of-the-art pathogen detection and treatment technologies including statistical methods for analyzing microbial data collected under the ICR and the ICR Supplement Survey Program. The workshop reviewed issues associated with evaluating the occurrence of *Cryptosporidium* in source waters of drinking water supplies. Due to the pending Interim Enhanced Surface Water Treatment Rule and the Total Coliform Rule, discovering improved detection methods has become even more critical. (For more information on the M-DBP Stakeholder Meeting Statistics Workshop, visit www.epa.gov/ogwdw000/mdbp/st2nov98.html#21.)

New technologies developed under the EPA and other federal agency Small Business Innovation Research (SBIR) programs promise greater detection and removal of

companies the federal government has been funding. According to JCP Technologies, the use of nucleic acid-based detection technologies provides the greatest potential for highly specific and sensitive detection of pathogens in drinking water systems. These technologies are driving the development of miniature, portable biosensors. A promising approach to developing the ideal biosensor is micro-fabrication of identification systems that mimic diagnostic schemes utilized in microbiology laboratories. While there is much activity in this area, most efforts suffer from the inability to properly marry microfabrication technology with the molecular biology required for sensitive and specific detection. To eliminate these shortcomings, JCP Technologies is developing an assay that takes advantage of DNA probe specificity with increased sensitivity through coupled branch DNA signal amplification and designing the microfluidic system necessary to perform the assay on a microfabricated silicon chip. Accomplishing these

Therefore, for companies seeking new technologies for the detection of pathogens, the SBIR program provides a fertile source of new products that can be obtained through licenses, joint ventures and other traditional technology acquisition methods. For companies with research and development capabilities, the SBIR program provides an opportunity to leverage federal dollars to further internal research and development program.

SBIR and other competitive awards for R&D to improve technology transfer/commercialization processes and for artificial intelligence tools supporting such work have been won from the National Science Foundation SBIR Program, Department of Education SBIR Program, USDA SBIR Program, SBA, Department of Commerce and Office of Naval Research. R&D results are combined with 20 years of corporate experience to create new products and services and in a continuous quality improvement/Six Sigma process. **WQP**

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Cryptosporidium from public water supplies. The U.S. government's SBIR programs support higher-risk research and development activities at companies with 500 or fewer employees. (For an overview of the U.S. government's SBIR programs, visit www.sba.gov/SBIR/sbir.html.)

Following is a brief overview of one of the technologies emerging from the small

objectives will allow development of MEMS-based biosensors for specific detection and identification of microbial pathogens in drinking water. (For more information, contact Noe Salazar at nsalazar@texas.net; 512-671-1369.)

Under the SBIR legislation, the technologies developed belong to the small companies conducting the research and development.

About the Author

Danielle Duclos is a technical writer at Foresight Science & Technology, a firm specializing in bringing people and technology together. The company's customers range from major corporations and the U.S. government to small firms. Foresight Science & Technology, New Bedford, Mass., is a contractor for EPA, DoD and several other federal agencies tasked with assessing the utility of this new technology work. Foresight maintains an active federally and in-house sponsored research and development program. Additional information can be obtained at www.seeport.com; 508-984-0018, ext. 13.

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