Developing a better, faster diagnostic for cryptosporidiosis

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Young livestock, such as beef or dairy calves, are particularly susceptible to Crypto, which is a crucial zoonotic disease that can become a major public health and veterinary concern. Credit: University of Arizona

Cryptosporidiosis is the leading cause of waterborne diseases among humans in the United States, infecting almost 750,000 people each year, according to the Centers for Disease Control and Prevention. Globally in 2010, nearly 100,000 cases were fatal.

The disease is of particular interest to Dr. Michael Riggs, a veterinarian and professor in the Department of Animal and Comparative Biomedical Sciences at the University of Arizona College of Agriculture and Life Sciences. Riggs researches the immunobiology and molecular pathogenesis of parasitic protozoal diseases of zoonotic importance

including Cryptosporidiosis, or Crypto, which is caused by the microscopic parasite Cryptosporidium. The the parasite infects not only humans, but also domesticated mammals, fish and poultry, and young livestock, such as calves and lambs, are especially susceptible.

For its victims, Crypto creates a multitude of problems. What starts as nausea can quickly bloom into abdominal pain and full-blown diarrhea, followed by a fever and dehydration. In most instances, healthy people recover within two weeks. But for people with weakened immune systems, an extended, persistent infection can be much more dangerous, causing rapid and sometimes life-threatening weight loss and dehydration.

The tiny bug is spread through any contact with infected feces and is frequently contracted via water sources such as mountain streams, public pools or contaminated municipal drinking water. It can be found on babies' changing tables and in the pens of newborn calves.

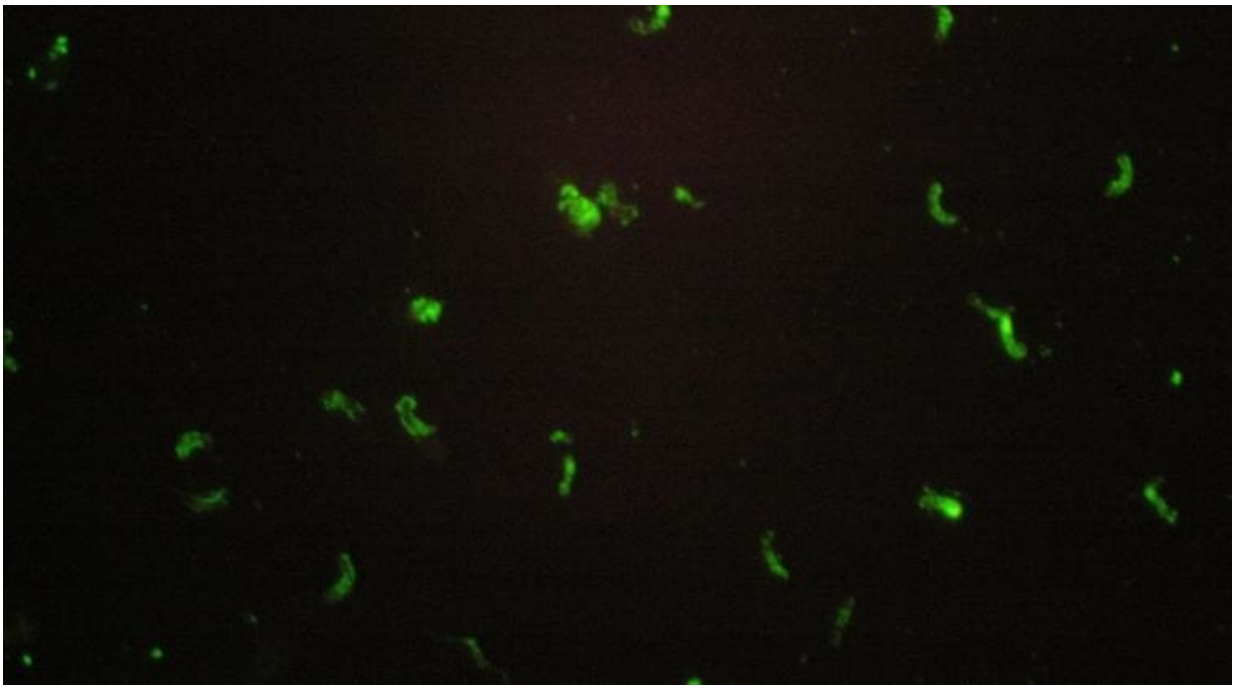
Given the dangers of infection and how quickly the parasite can spread, early diagnosis is key in keeping it under control. To that end, Riggs and UA research specialist Deborah Schaefer have developed a panel of monoclonal antibodies that have proven useful for detecting Crypto.

To maximize the impact of their work, the team has been working with Tech Launch Arizona, or TLA, the office of the UA that commercializes inventions stemming from research. As a result, the UA has licensed the first group of reagents to Kerafast, a Boston-based reagent company. Plans are to continue to add additional reagents in the future.

"Ultimately, the goal is to get this technology out into the world where it can help the most people," said Tod McCauley, senior licensing manager for the College of Agriculture and Life Sciences at TLA. "Kerafast will be a great partner to make that happen."

Toward Faster, More Accurate Diagnosis

Riggs' research concentrates on characterizing immune responses to Crypto – specifically on the development of recombinant vaccines, immunotherapies and drug discovery for Cryptosporidiosis – and improved methods for diagnosis.



An indirect immunofluorescence image of Cryptosporidium parvum. Credit: Michael Riggs

Current means of detecting and diagnosing Crypto present challenges including cost, performance, clinical significance and assessment of co-infection with other pathogens.

In addition, the use of a wide variety of diagnostic methods and the

inconsistent application of techniques makes it difficult to compare results from clinical and veterinary studies. Microscopy, for example, requires simple instrumentation and inexpensive consumables, but the process is laborious and lacks sensitivity and specificity. Molecular methods of detection such as polymerase chain reactions can be used identify the parasite at the species level, but testing for Crypto is not routine in most laboratories.

The reagents developed in Riggs' laboratory offer the opportunity for the creation of a rapid, highly sensitive diagnostic test for Crypto.

"We are now making a characterized panel of mouse monoclonal antibodies available to the community for a variety of applications including rapid, simpler diagnostic assay development, antigen characterization and immunotherapeutic development," Riggs said.

"These antibodies are a useful resource for a broad range of research and development purposes," he continued. "After years of development and characterization, we decided to make them available to others for a variety of applications which are expected to advance the field. TLA has been the perfect liaison to partner with Kerafast and allow this to happen."

McCauley says the university-industry arrangement is doing much more than getting this specific technology out into the marketplace; it represents a relationship and a pathway that will continue to serve both organizations going forward.

"We are exploring ways we can work with Kerafast long term to add additional value to particular reagents and create new research avenues for antibodies through technologies available to create customized antibody sequences."

Kerafast's Director of Business Development Matt Takvorian is likewise optimistic about the opportunity for impact.

"At Kerafast, we are committed to accelerating scientific progress by facilitating access to the unique and useful research reagents developed by academic laboratories," Takvorian said. "We are excited to partner with the Riggs lab to make these antibodies more easily available to scientists worldwide to advance research toward better Crypto diagnosis and treatment. We look forward to continuing to expand our relationship with the University of Arizona to bring more of its lab-made reagents to the wider scientific community."

Provided by University of Arizona