

Researcher seeks novel pathogen detection technology for dairy farming

April 10 2014, by Cheryl Ann Dorschner



Research scientist John Barlow takes milk samples from a UVM cow to test for *Staphylococcus aureus*. Barlow is studying both pathogen and beneficial roles the bacteria may play in artisanal cheesemaking. Credit: Cheryl Dorschner

Stacked 15 high, 1,500 culture plates line the bench of John Barlow's University of Vermont lab. This is the collection of just one day at one Vermont farmstead cheesemaker's farm.

Barlow's large-scale, entire-farm sampling hopes to come up with some novel pathogen detection technology that may be particularly useful to small-scale, on-farm cheesemakers.

His research on various forms of Staphylococcus will fill in the gaps in understanding which are of concern to food safety, which are beneficial in the culturing of cheese and which may affect human health.

The UVM animal scientist's epidemiology research addresses on-farm practices and milk quality using molecular biology to identify pathogens that influence milk quality.

Building on UVM listeria expert Catherine Donnelly's research on how the safety of raw-milk cheeses informs national policy, Barlow's work is year two of a three-year \$300,000 transdisciplinary grant from the USDA National Institute of Food and Agriculture.

"Cathy Donnelly and I are combining efforts. Because of my interest in Staph aureus epidemiology in cows and humans, and their prior findings, I anticipate we will find great information that will help on-farm cheesemakers," says Barlow.

On-farm detective work

On each of up to five Vermont farms that make artisan cheeses, Barlow and his team take milk samples from the mammary glands of all the cows in the herd, swabs of 15 different skin sites from six of the cows, and 15 different environmental samples – from, say, walls and stanchions.

"This results in running about 1,500 culture plates per farm," says Barlow of the project whose goal is to collect from five artisan cheese producing farms. "From this we typically select about 300

Staphylococcus species bacterial isolates for identification and molecular typing."

Back in the Barlow lab in Terrill Hall on campus, Robert Mugabi, a second-year doctoral student in animal science who also has a veterinary degree, examines these for potential virulence characteristics such as the ability to form biofilms and antibiotic resistance genes. In addition, three undergraduate students are working on the project during the spring 2014 semester.

"We are doing a comprehensive survey to look for sources of Staphylococcus aureus and Staphylococcus species," Barlow explains. "Staph aureus is a food safety pathogen of concern, but other Staphylococcus species appear to be important for the cheesemaking process and may play a beneficial role as important normal bacterial flora on the cow skin."

To further complicate matters, some Staphylococci carry antibiotic resistant genes that could affect human health. "These may act as a reservoir for antibiotic resistance on dairy farms," says Barlow.

While it is too early to make conclusions, by using molecular typing techniques Barlow and colleagues are making progress in understanding the source of the sporadic new Staph aureus infections in these herds which generally have a low prevalence of udder infections caused by this pathogen.

"Molecular typing has revealed some novel strains," Mugabi says. "These organisms are pretty fascinating," he adds. "What is interesting so far is when I discovered some new strains, however, there is still a lot to discover that could be important in answering some critical questions in animal health, food safety and public health, given that there is the potential for zoonoses" (that is, infectious diseases transmittable between

species).

Barlow continues to collaborate with Donnelly, and UVM researchers in community development and applied economics, David Conner and Sarah Heiss, are also making major contributions to the social science aspects of the project. "We are proud of the transdisciplinary approach to this project," says Barlow. He and Donnelly are particularly excited about the opportunity to collaborate with Conner and Heiss as they work to understand how the public views artisan cheese farms and raw milk, and how social networks may influence perceptions of food safety.

"In the big picture, we are excited to help artisan cheese producers improve animal health, milk quality and food safety," Barlow says, "and also to help these producers understand how consumers perceive these attributes for Vermont farms and how this affects their perception of [food safety](#) risk and ultimately their purchasing decisions."

Provided by University of Vermont

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