Research News
umanitoba.ca/research

Halting hospital acquired infections

BY SEAN MOORE
Research Promotion

If bacteria held a conference, toxigenic Clostridium difficile would lead a seminar on how to cause visceral damage in innovative ways.

When individual rods of the anaerobe bacterium become stressed and approach death, as they often do on a toilet's porcelain, they use their remaining energy to convert into their spore form.

This robust spore is genetically identical to the parent and able to persist – although it's not metabolically active – in the atmosphere for years, impervious to many chemicals and heat. And when the spore, which is essentially a seed, finds suitable conditions for growth, like a human on antibiotics, it flourishes.

And although medical microbiologist Michelle Alfa admires the effectiveness of this strain's spore tactics, she is nevertheless researching how to kill them, stop their spread in hospitals, and halt their germination.

For the past 15 years Alfa's laboratory at St. Boniface Hospital has investigated how to prevent hospital acquired infections, like C. difficile.

"I think it's unfair," Alfa said, "that a patient can come in for an operation, get put on antibiotics, and then get sick with something they didn't have before they were admitted. We should be able to prevent people from getting C.difficile infections."

Although a few other bacteria produce spores, only toxigenic C. difficile causes potentially lethal sickness; it can corrode the gut's wall leading to septic shock. To help understand the situation, Alfa suggests you view the gut as an ecosystem, which has more microbes in it than the human body has cells. Normal gut flora keeps the spores in check, but antibiotics, which are necessarily common in hospitals, rid a patient of microbial allies, allowing the opportunistic C. difficile to take over.

Alfa, and other research groups, are finding C. difficile to be more common in the community than previously thought. Indeed, it's found in ground pork and beef, and since the optimal cooking temperature does not kill the spore form, it's often ingested.

So of the roughly 100 confirmed cases of C. difficile that annually occur in a hospital the size of St. Boniface Hospital, many may have originated in the community. Still, hospitals generate most cases and Alfa recently completed a study identifying an effective and safe chemical cleaner. (Bleach works well, but its fumes are not hospital-friendly.)

Interestingly, Manitoba and Saskatchewan, for reasons not yet understood, have consistently lower rates of C. difficile than other provinces. Worldwide, rates seem to be increasing. And overall, C. difficile infects more people than all other enteric pathogens – even more than the headline grabbing "superbugs" like MRSA.

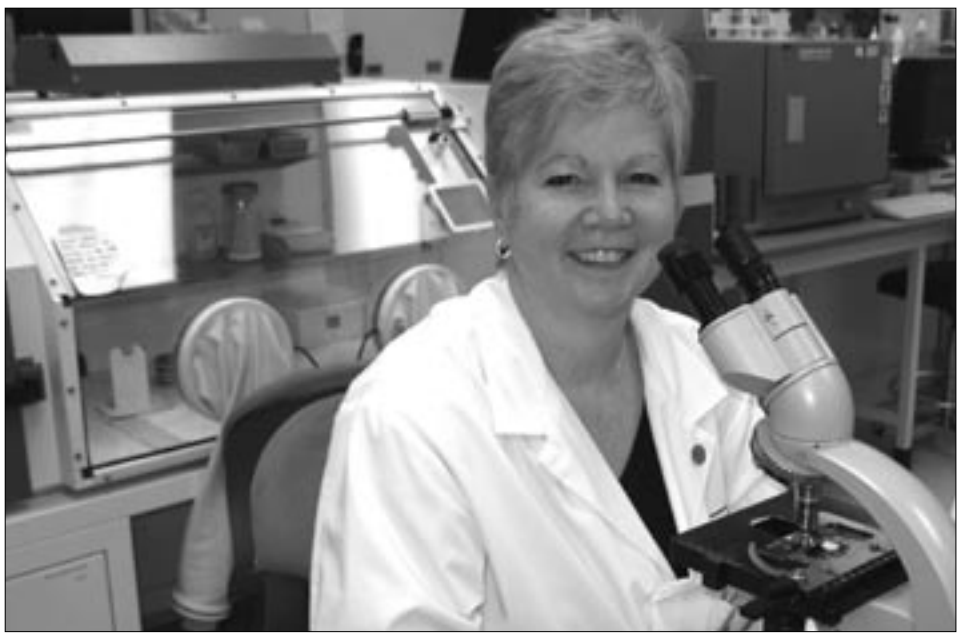

Photo by Sean Moore

Michelle Alfa, medical microbiology, is studying ways hospitals can prevent the spread of harmful baceria.

"C. difficile has been under the radar for a long time. But we're starting to realize that the rates we have, even though they are below the national average, are not acceptable. Since this infection is something you can prevent, it's worth the effort to try to reduce the rates."

Alfa's efforts now focus on investigating functional foods, specifically egg yolks.

"We have evidence that shows we can use antibodies in yolks to neutralize C. difficile's toxins and that in and of itself is very valuable information. It's promising because it doesn't involve antibiotics, but we're not yet at the point where we'll offer it as an alternative therapy to people."

Stress – a contributing factor to diabetes?

BY SEAN MOORE
Research Promotion

The World Health Organization estimates 180 million people have diabetes, a disease commonly attributed to poor nutrition, obesity and inactivity. But researchers are now investigating another possible contributor: stress.

Sharon Bruce, department of community health sciences, researches diabetes within the context of a specific community, paying particular attention to acute and chronic stress levels.

Since 2001, Bruce has been working with the Sandy Bay First Nation, a community of 3,000 located on the west side of Lake Manitoba. A screening study completed by Bruce and Dr. Kue Young in 2003 found that 30 per cent of adult participants had diabetes and five per cent had impaired fasting glucose – putting them at high-risk of getting diabetes.

"We were invited out there because they were interested in learning why their community was hit so hard by the diabetes epidemic. They were wondering whether stress and life conditions had anything to do with diabetes," Bruce said.

Past literature shows – broadly speaking – that living conditions affect health, and stress affects a person's neuroendocrine system, resulting in hyperglycemia and visceral adiposity. So there is a plausible explanation for stress' involvement in the onset of diabetes, but any link would be indirect.

"The causes of diabetes are complex and multifactorial. Although we know that environment is implicated in health outcomes, for example socioeconomic status, the pathways are not well understood. We wanted to better understand the relationship between living conditions they define as stressful and diabetes," said Bruce.

Because existing stress and coping scales did not fully capture life in a First Nation community, Bruce completed in-depth interviews to better understand life experiences in general, and those community members defined as stressful. Based on these interviews, Bruce, colleague Verena Menec, and the Sandy Bay Diabetes Working Group created a contextually relevant stress and coping survey.

"We're certainly not trying to prove a direct link between their environment and disease," Bruce said. "One of our major goals was to describe what people's experiences of stress were in a qualitative way and then see if we could take that and make it a relevant and meaningful questionnaire.

Photo by Sean Moore

Sharon Bruce, community health sciences, is studying diabetes within the context of a specific First Nation community.

"I think we've been able to do that, and now we want to see if there is a relationship between the items we would describe as stress-inducing and disease."

Although the data are still being analyzed, about a quarter of the study population reported high levels of stress (with women reporting higher levels than men). What's more, an important finding for diabetes management is that 40 per cent of study participants feel they lack control over their lives, including their health.

"I really want to emphasize that this is about context and not culture," Bruce said. "There is nothing wrong with their culture or the people. It's the situation and the environment the people live in that has created a lot of the difficulties."

Bruce cannot yet say what, exactly, the solution will be. But, since early findings show community members identify emotional issues as priorities, the team agrees that increased involvement of mental health workers and spirituality seems paramount in diabetes prevention and management.

Bringing Research To Life

Research News is Published
by the Office of the Vice-President (Research)
Comments, submissions and event listings to:
stefaniu@ms.umanitoba.ca
Phone: (204) 474-9020 Fax (204) 261-3475