Research News

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Studying what can kill but likely won't

BY SEAN MOORE
Research Promotion

In recent years a new villain has found its way into campfire tales, but this one, unlike the murderous hitch-hiking-fisherman, is not lurking in every dark wooded corner waiting to kill you.

The villain du jour is *Blastomyces dermatitidis*, and many cottagers fear it. It is a fungus that lives in acidic soils found in parts of Manitoba, Northwestern Ontario, Quebec and the Ohio River Basin – to name a few locations – and if conditions are right this pathogen can infect a person or their pet and potentially cause serious illness.

The fungus releases spores into the air and when they find a favorable environment, like mammalian lungs, they transform into yeast. This yeast can invade tissues and cause pneumonia-like symptoms, and if the pathogen enters the skin it can cause a cutaneous infection. If diagnosed it can be treated and cured.

Little is known about the epidemiology of this fungus, however, this is changing thanks to Health Sciences Centre physician and University of Manitoba Associate Professor John Embil and his collaborators at the Northwestern Health Unit operating from Kenora, Ontario.

Photo by Sean Moore

Microbiologist John Embil studies the epidemiology of blastomycosis, a serious but rare infection caused by a fungus.

Embil and his group are trying to better define the local epidemiology and risk factors for infection with "blasto" as it is also known.

"I don't want to downplay the significance of it," Embil said, "but the chance of someone catching this is only slightly higher than getting struck by lightning. Still, people get hit by lightning and when that happens it's a significant event."

Every year about 16 to 25 people in Manitoba and 50 to 60 people in Northwestern Ontario will get diagnosed with it, out of a population of about two million.

Embil and colleagues recently finished a study that tried to uncover which behaviors are risk factors for infection. In short, there are only two: being a middle-aged person with an outdoor occupation like forester, or having a compromised immune system.

After surveying 100 recovered blastomycosis patients and 200 people in a control group, Embil sifted through the data and found no particular behaviour correlated to an increased risk – even mushroom picking and gardening were of no consequence.

"And there is a myth that if your dog gets it you're going to get it. Well, our data didn't confirm that at all," Embil said.

"The more you're exposed the more likely you'll develop a complication," he said. "Just like the more you drive on the highway the more likely you'll end up in a ditch. There is a cumulative risk."

In the future Embil hopes to examine what genes play a role in the infection's pathology. But in the meantime there is still heaps of fundamental work that needs to be done.

Although *B. dermatitidi* was first described in 1894, little is known about it. No one knows, for example, how prevalent the fungus is in the wild.

In the laboratory, however, Embil notes that blastomycosis is a nuisance to work with – it's fickle and slow growing. The sheer frustration of trying to work with it repels many researchers from investigating it.

"I want to learn about it so that we can put to bed these fears and panics we have about it. I'm not a cottager, but I think the benefits of relaxing at your cabin far outweigh the risks of getting blasto. So I'd say you should relax and go have fun."

Researcher designs the best bridge, again

BY SEAN MOORE
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As boys growing up in Pakistan, civil engineer Aftab Mufti and his brother spent their afternoons building and destroying bridges they made from mud and stone collected from their yard.

They would pit their designs both against each other and the flood of water they let pour forth from the small reservoir they dug. Three or four prototypes a day would succumb to erosion and collapse, and Mufti would observe the results and learn from them.

Aftab's brother went on to be a physician, but Aftab remained passionate about designing bridges and this year he again won the P.L. Prately Award for co-authoring the best paper on bridge design, as judged by the Canadian Society for Civil Engineering.

The paper, which he wrote with Emile Shehata from Wardrop Engineering Inc., was titled Development of Glass-Fiber-Reinforced-Polymer Bridge Deck System.

"I think we won because our research was so thorough, but more so because it was such a novel idea," Mufti said. "Others will build on the idea and make it better, but they will be incremental changes. Ours was a paradigm shift."

Bridge decks have been a focal point of Mufti's work over the years. A bridge deck is the slab of material your vehicle's tires ride over. They are the most damage-prone bridge parts since they take the brunt of load forces.

The steel rods still commonly found inside a concrete deck have poor flexibility compared to the concrete and this unharmonious marriage ultimately results in cracks, then corrosion, then costly repairs.

Mufti, who also directs the Intelligent Sensing for Innovative Structures Canada Research Network (ISIS Canada), has examined two solutions to this problem.

One remedy involves developing new design concepts. He did this in 1993 and won the Pratley Award then for a paper that suggested steel should be removed from the deck and used instead to connect the girders.

The second solution relies on new materials and it won him the 2007 P.L. Pratley Award. The material is a glass fiber reinforced polymer (GFRP), which is light (so is easily and cheaply transported to remote locations like Canada's North) and 10 times stronger than steel.

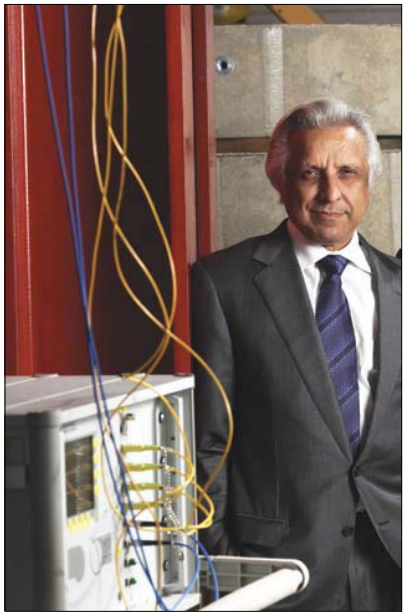
The new bridge deck consists of neither concrete nor steel but 200-millimeter tall triangular filament-wound tubes of GFRP bonded with epoxy resin. Laminates of GFRP then get adhered to the top and bottom. Mathematics suggests such a deck could last for 100 years, far beyond the current 10 to 40 years.

But if nothing corrodes, how do you know when a bridge is old? By using civionics, a term coined by Mufti, which means sensors placed in the bridge constantly provide data on its state.

Civionics is great for all bridges, but it won't be in concrete-free bridges anytime soon because builders, rightly so, are reluctant to take a risks with new materials and methods.

So rather than get the building culture to adopt this new material and design overnight, Mufti prefers to gradually introduce it by, say, using GFRP rods in lieu of steel ones since they do not fatigue, corrode, or rigidly resist loads.

"We do paradigm shift research but implementation should be incremental."



Submitted Photo

Civil engineer Aftab Mufti won this year's P.L. Prately Award for co-writing the best paper on bridge design.

Bringing Research To Life

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