Bacteria study could have agricultural impact

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Wichita State's Chris Rogers, left, and Mark Schneegurt have teamed up on a project to discover if the wide array of bacteria found on Dark-eyed Junco birds is harmful or helpful to plant life. Credit: Tim Hart

Wichita State University microbiology professor Mark Schneegurt and ornithology professor Chris Rogers have discovered that one of North America's most common migratory birds – the Dark-eyed Junco – carries on its feathers a remarkable diversity of plant bacteria, the

greatest ever found on wild birds.

And while many of these bacteria may be harmful to plants, the bacteria could also be of great benefit.

That's what Schneegurt and Rogers, researchers from two different disciplines with one common goal, are working to determine.

"Some of the bacteria we find are beneficial to plants. Some are harmful to plants," Schneegurt says. "How does that balance work out for the plants? That's not clear."

But what is clear is the importance of this research.

Wild birds interact with the environment, contacting soils and plants with their feathers. Those feathers filter the air, gathering particles of soil and plant matter. Because microbes are everywhere in nature, feathers naturally carry a diverse community of microbes. And as for Juncos specifically, these migratory birds can fly 200 or more miles a night, making them highly capable of spreading bacteria over large swaths of land.

Pathogens are notoriously costly for agriculture, so the benefits of preventing possible diseases or, conversely, identifying helpful bacteria, are vital.

"The Juncos are probably good guys in all of this," Rogers says. "It may be that they're spreading pathogens, but theoretically it's possible that they're also beneficial instead of just being negative."

Possible commercial applications

WSU orinthology professor Chris Rogers points out the area on the Juncos where bacteria was most prevalent.

Much of Schneegurt and Rogers' research work was conducted at the WSU Biological Field Station, Ninnescah Reserve. They hope to secure further funding for their project.

Their next step is to test the isolates they've captured on plants such as tomatoes, potatoes, wheat, oat and rye to see if they have qualities of beneficial bacteria or those of pathogens.

A potential benefit may be bacteria that produce growth-encouraging hormones. Another possibility would be bacteria that actually inhibit fungi which are trying to damage the plant.

The pair have also found many isolates that actually degrade bird feathers. Not good for the birds, but of possible interest to biotechnology companies. Schneegurt says these bacteria could be used to break down

enzymes in laundry detergent, as well as other industrial and potential medical uses.

"This is where the basic description of natural phenomenon – in this case communities on bird feathers – can lead to commercial applications," he says.

An innovative approach

Rogers and Schneegurt weren't planning on conducting a study of this scale on Junco bacteria. Last year they were reviewing WSU grad student John "Wes" Dille's thesis, which described the microbial community on Junco feathers.

"We weren't looking for this," Schneegurt says. "We were originally looking to simply describe the community of bacteria found on the bird feathers. It's serendipity."

He and Rogers thought previous work of the scientific community on feather bacteria wasn't as complete as it could be.

"I said, 'I think we could do a better job,' and as it turns out, we did," Schneegurt says.

Why is that? In large part, they say, because of their ability to put their unique skills and knowledge together for this study.

"Here we have a professional long-term ornithologist and a professional long-term microbiologist putting our major backgrounds together to make a major discovery," Rogers says.

Schneegurt says hearing someone else's perspective will inevitably result in better work.

"If you listen to the same guys all the time, you only know what they know," he says. "Iinteractions lead to things you would never imagine happening. That's where real innovation comes from."

Provided by Wichita State University