Prof's squid research may help infections

By Donyelle Kesler
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At a glance, the bobtail squid may seem ordinary. Its tiny body and bead eyes closely resemble a cuttlefish that spends the day hidden, buried under the sand. However, these remarkable squids can create a beam of light produced by bacteria in an organ inside their bodies. For New Mexico State University biology professor Michele Nishiguchi and her team, this provides a model system to examine modes of infection and pathogenesis between animals, bacteria and their habitats.

Since her time as a postdoctoral student, Nishiguchi has been studying the bobtail squid and the symbiotic relationship they have with bioluminescent bacteria, while also looking at how global climate change affects squid and bacterial populations and diversity.

"By examining these squids, we are able to see how interactions between the bacteria and the animals are similar to pathogenic bacteria like cholera that affect humans," Nishiguchi said. "However, unlike cholera, the bacteria found in these squids are not harmful to its host."

Understanding how these non-pathogenic bacteria affect and interact with host tissues may make it easier to understand how pathogenic or harmful bacteria interacts with human bodies and ways to remedy strains of bacterial infections. The bobtail squid, also known as dumpling squid, is nocturnal and emerges at night to hunt for food. The bacteria allows the squid’s silhouette to match the amount of moonlight hitting their bodies, camouflaging their shadow to prey and predators. Each morning at dawn, the squid expel nearly all of the bacteria into the water, where it is used to colonize newly hatched juvenile squid. The remaining five percent kept in the squid’s light organ then multiplies throughout the day to be used for the next night.

In Nishiguchi’s lab, the bacteria isolated from different squids can be mutated and analyzed while colonizing juvenile squid to determine how the symbiotic relationship between these animals and the bacteria differs on a genetic level. This also allows the group to test the same strain of bacteria in different environments.

“We have begun to utilize computational approaches to predict how bacteria are capable of adapting not only to new host species, but also to different environments over large geographical distances,” Nishiguchi said. By building these interconnecting networks, we hope to provide a more detailed picture of how bacterial infections are spread throughout the world, a phenomenon that is highly dependent upon bacterial adaptation."

Currently in Nishiguchi’s lab, both undergraduate and graduate students play a role in the studies being conducted, including two technicians, two postdoctoral students, seven graduate students and eight undergraduate students. Each year the students in Nishiguchi’s lab also have the opportunity to travel and conduct fieldwork in places like France, Thailand, Hawaii, Indonesia and the Philippines.

“I want my students to critically think about these projects and design their own hypotheses and develop their own questions about the system,” Nishiguchi said. “I love introducing my students to new and exciting things. Taking them out to the field, they become so much more involved, focused and learn so much more.”

The projects and research being carried out in Nishiguchi’s lab are funded by the National Science Foundation, the National Institutes of Health, the Howard Hughes Medical Institute and NMSU’s Minority Access to Research Careers Program and MBR-RISE to Excellence Program.

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