Looking for clues from frogs, fish, and snails to fight off disease

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In their effort to fight cancer and other threats to human health, researchers look to the birds, the bees – and to frogs, fish, and any number of species, studying how their natural defenses help protect them and what we might learn from them.

Such researchers from around North America will gather in Rochester next week for the 3rd North American Comparative Immunology Workshop at the University of Rochester Medical Center. They'll trade notes about the disease-fighting capabilities of catfish, frogs, snails, sea squirts and other species, in an effort to learn more about stopping diseases that affect not only those animals but people as well.

The three-day workshop is being organized by Jacques Robert, Ph.D., associate professor of Microbiology and Immunology and the creator of the Jumping Frog Laboratory, an international resource that puts frogs in the forefront in the fight against diseases that threaten both humans and amphibians.

Robert himself is an expert on the immune system of the frog, which develops much like a person's but much faster – in just a couple of weeks, compared to many months for people.

In one line of research, scientists are trying to discover how the body can fight off cancerous tumors more effectively. Through work in frogs, they've learned that the body relies heavily on a specialized type of T cell to counter the tumor's growth or even oust the tumor altogether.

"Learning more about how an organism like the frog identifies and fights tumors provides a good lead to see if there is a resource within the body that can be tapped to fight tumors in people more effectively," said Robert.

At next week's workshop, scientists will discuss how studies in catfish have uncovered previously unknown links between very different parts of the immune system – important clues for understanding how the body fights off cancer and other diseases.

Such work also offers clues to how organisms respond to emerging pathogens. In people, for instance, a small change to a long-known threat, flu, caused a worldwide pandemic just three years ago. Currently, amphibians are experiencing a vast die-off around the globe partly due to infections from a fungus (chytridiomycosis) and a virus (ranavirus), which had been present for decades but only recently threatened frog populations worldwide.

“How are these pathogens able to escape the frog’s immune system? Understanding the challenge that amphibians are facing will help us understand how a human pathogen might attack us, and to be better prepared to respond,” said Robert.

Two years ago, Robert was part of an international team that sequenced the more than 20,000 genes of an African clawed frog, Xenopus tropicalis. The accomplishment gave scientists a new tool to understand how our genes work at the most basic level. The team found that that frog has more than 1,700 genes very similar to genes in people that are related to conditions like cancer, asthma, and heart disease.

At Rochester, Robert heads a unique international resource, the Xenopus laevis Research Resource for Immunobiology. The laboratory, funded by the National Institute of Allergy and Infectious Diseases, is the world’s most comprehensive resource specializing in the use of Xenopus for immunological research. The laboratory makes available to scientists around the globe tools such as reagents, antibodies, and other equipment and expertise. His lab has aided the research efforts of more than 100 other laboratories since it was created eight years ago.

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