

## Complex bacterial challenge in fight against deadly amphibian disease

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A young wood frog. Credit: Michael Zahniser, via Wikimedia Commons.

New research from The University of Manchester and the Institute of Zoology has shed light on the complex challenge facing scientists battling one of the world's most devastating animal diseases.

Chytrid fungus (*Batrachochytrium dendrobatidis*) is thought to be behind the decline or <u>extinction</u> of at least 200 species of <u>frogs</u>. It is also one of the reasons why 31% of <u>amphibian</u> species are currently listed as threatened by the International Union for the Conservation of Nature.

This latest study used <u>bacteria</u> from frogs in Belize to test the limitations of probiotic treatments. This form of treatment aims to introduce bacteria cultivated from amphibians that aren't affected by the disease to



those at risk of infection to boost their immunity.

Dr Rachael Antwis who carried out the study whilst completing her PhD at Manchester's Faculty of Life Sciences explains: "Using <u>beneficial</u> <u>bacteria</u> to act as 'probiotics' for disease mitigation is already common in agriculture and human health. In fact, many bacteria that reside on amphibian skin have been shown to inhibit the growth and survival of B. dendrobatidis. However, the reliability of the potential probiotics hasn't been tested against the shifting targets the disease presents."

To assess the effectiveness of probiotic treatments, the team used bacteria taken from frogs in Belize, where the species has shown resilience despite the long term presence of the disease in the area. 56 strains of bacteria were isolated and stored for use in the laboratory.

The team challenged the bacteria against different genetic strains of the disease, and then looked at whether the bacteria had inhibited the growth of the disease in its various forms. They found the bacteria performed in a variety of ways with only a small number inhibiting all forms of the disease. The bacteria that had an impact on one strain of the disease didn't have the same impact on the other genetic variations.

Dr Trenton Garner from The Zoological Society of London's Institute of Zoology explains the results: "Because only a small proportion of the bacteria that could be used as candidate probiotics showed broadspectrum inhibition against the global pandemic B. dendrobatidis lineage, we believe probiotic treatments are unlikely to be consistently successful when confronting a variety of fungal genotypes. Because of the enormous genetic variability of the disease and its ability to rapidly evolve, it's vital that any treatment takes this into account."

He continues: "We suggest that a variety of bacteria be used when creating probiotic treatments as this is likely to offer more



comprehensive protection of hosts from B. dendrobatidis and other threatening amphibian pathogens."

The results of the study have been published in the journal *Applied and Environmental Microbiology*.

Moving forwards the scientists say that further research is needed to fully understand how bacteria inhibit B. dendrobatidis growth and the ability to infect hosts. Looking at the B. dendrobatidis genome for virulence factors will be fraught with difficulty but this study demonstrates some hope for finding effective probiotic treatments from within the amphibian community.

Dr Antwis concludes: "A lot more work is definitely needed before we can identify an effective cure for this devastating disease. But as a scientist I believe we not only have a moral obligation to keep searching, but an ecological one too. Amphibians inhabit the middle of food chain, making up a vital part of our ecosystem. If they go then that could spell disaster for many more species."

**More information:** "Amphibian symbiotic bacteria do not show universal ability to inhibit growth of the global pandemic lineage of Batrachochytrium dendrobatidis" *Appl. Environ. Microbiol.* AEM.00010-15; Accepted manuscript posted online 27 March 2015, DOI: 10.1128/AEM.00010-15

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