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## Catching a Killer One Spore at a Time

A workshop at the Smithsonian Tropical Research Institute in Panama has dramatically improved the ability of conservationists and regulatory agencies to monitor the spread of chytridiomycosis—one of the deadliest frog diseases on Earth.

Caused by the chytrid fungus, *Batrachochytrium dendrobatidis*, this disease is probably responsible for the extinction of nearly 100 frog species since the 1970s. During the past decade, the epidemic swept from the highlands of Costa Rica through western Panama. It is now moving toward eastern Panama from Colombia.

“The fungus spreads so rapidly because humans ship nearly 100 million amphibians around the world each year, mainly for food and pets, with virtually no disease testing,” said Kerry Kriger, executive director of the U.S. non-profit, Save The Frogs! and course instructor with Sandra Victoria Flechas from Universidad de los Andes in Colombia.

This hands-on course trained 22 scientists on the frontlines to use a genetic technique called quantitative polymerase chain reaction, PCR, which detects even single fungal spores.

“We’ve probably just doubled the number of people in the world who know how to use this method to detect the pathogen,” said Kriger. “The beauty of PCR is that you don’t have to kill the frog or take a skin sample to test for the disease.”

Researchers run a cotton swab over a frog to pick up any fungal DNA, and use quantitative PCR to evaluate the sample. The technique was developed by Donna Boyle and colleagues in Australia in 2004 and modified by Kriger who made it more rapid, cost-effective and wrote a simplified protocol for scientists with no specialized training.

Workshop participants included personnel from the three institutions in Panama that have laboratory facilities for PCR: STRI, Panama’s Ministry of Agriculture and another government research center. Students from the University of Panama and Florida State University, staff from the El Valle Amphibian Rescue Center and a local conservation organization, as well as scientists from Panama, Costa Rica and Colombia, now form a regional disease-testing team.

Darien Province in eastern Panama is one of the most high-diversity amphibian habitats on the planet. Researchers have counted more than 60 amphibian species at a single site. It seems that eastern Panama has not yet been affected by the disease, but scientists are worried. “We have a lot of swab samples from expeditions to Darien, but we haven’t had enough people who know how to analyze them,” said Andrew Crawford, former post-doctoral fellow at STRI, now professor of biology at Universidad de los Andes.

In Panama research efforts to stop chytridiomycosis are underway. STRI has hosted many of the scientists who have documented the decline. The Houston Zoo set up the El Valle Amphibian Rescue Center to try to save Panama’s emblematic golden frog. “Quantitative PCR is extremely useful to us because it can pinpoint the beginning of a die-off,” said Edgardo Griffith, director of the center and course participant.

The Panama Amphibian Rescue and Conservation Project, supported by a consortium of zoos and research institutes and coordinated by the Smithsonian’s National Zoo, is building a new Amphibian Rescue Center at Summit Nature Park near Panama City.

“During the next several months we will collect frog species on the brink of extinction. We’ll use quantitative PCR to make sure that the center’s rescue pods—frog habitats made from retrofitted shipping containers—stay fungus free,” said Roberto Ibáñez, Smithsonian staff scientist and local director of the project. “This workshop is a vital part of controlling amphibian die-offs in Panama and ensuring that our amphibian rescue efforts pay off.”

The workshop was organized by the Círculo Herpetológico de Panamá, financed by Panama’s National Office of Science and Technology, and received support from the Smithsonian and the Houston Zoo.

STRI, headquartered in Panama City, Panama, is a unit of the Smithsonian Institution. The institute furthers the understanding of tropical nature and its importance to human welfare, trains students to conduct research in the tropics and promotes conservation by increasing public awareness of the beauty and importance of tropical ecosystems. Web site: [www.stri.org](http://www.stri.org).

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Learning to detect chytridiomycosis

Edgardo Griffith, El Valle Amphibian Conservation Center, Panama, learns to use quantitative PCR techniques to track chytridiomycosis, a disease that has driven more than 100 animal species to extinction over the last several decades.

Credit: Marcos Guerra, STRI

Swabbing Litoria wilcoxii

Swabbing Litoria wilcoxii

Very few countries have testing programs in place to prevent the spread of chytridiomycosis, which infects the skin of amphibians. Samples for quantitative PCR disease testing are obtained from frog skin using a cotton swab.

Credit: Save The Frogs!