



Richard Merritt and colleagues from the Noguchi Memorial Institute in Ghana collect macroinvertebrates from local water bodies as part of their research on the transmission of Buruli ulcer disease.

MSU Entomologist Collaborating with Ghanaian Institutions on Tropical Disease Research

A tropical skin disease nicknamed “the sore that heals in vain” wreaks both physical and social mayhem – mostly on children – yet its transmission is a mystery, one that an MSU researcher and his research associate hope to solve.

Richard Merritt, chairperson of the MSU Department of Entomology, and Eric Benbow, soon to return to MSU from DePauw University in Indiana, are using a \$2 million grant from the National Institutes of Health (NIH) and National Science Foundation (NSF) to investigate possible links between biting aquatic insects, water quality, and Buruli ulcer transmission. The joint NIH-NSF program supports efforts to create a predictive understanding of the ecological and biological mechanisms that govern relationships among human-induced environmental changes and the emergence and transmission of infectious diseases.

Scientists know that Buruli ulcer disease is caused by a bacterium, *Mycobacterium ulcerans*, found in tropical regions such as western Africa. They also know that 70 percent of Buruli ulcer patients are children under 15 and that for the last decade the number of infections has been on the rise. “It’s called the ‘mysterious disease’ because nobody knows how it’s transmitted,” Merritt said. “So that’s the real dilemma, and we’re just getting started trying to figure this disease out.”

A Buruli ulcer infection begins with a painless raised nodule followed by a sore. Left untreated, the mycobacterium produces a toxin that destroys

surrounding tissue, muscle, and in some cases bone, leaving open wounds, or ulcers, and disfigured limbs, Merritt said. In many cases, amputation is the only option. Antibiotics have shown some success in treating Buruli ulcer if caught in its early stages, but by the time patients normally seek medical attention it is too late.

“I was in an orphanage in Ghana where 60 percent to 70 percent of the kids had Buruli ulcer disease,” Merritt said. “Some of these little kids’ arms or legs are covered with ulcers and doctors can’t do a skin graft because there isn’t enough skin there to take. I was really touched by these kids.”

Merritt, who is a specialist in aquatic and medical entomology, will investigate any possible role that biting water insects, like the creeping and giant water bugs, may have in the transmission of the disease. If insects are transmitters of *M. ulcerans*, determining the way they transfer the disease agent is key. Merritt speculates the pathogen may be transmitted to humans from a direct insect bite. It’s also possible biting water insects might be a reservoir for the bacterium to grow. The bacterium also may live in the water or attached to the surface of plants and infect humans by entering the body through scratches and cuts, Merritt said. “Buruli ulcer has always been associated with water. That’s the critical thing. No matter where the disease is, there’s always water around. Insects are thought to be involved. That’s how I got into this.”

Merritt and Benbow also will explore possible connections between land use, water quality and

pollution, and the increasing rates of Buruli ulcer infections. It’s possible *M. ulcerans* is a normal inhabitant of some tropical water bodies, Merritt said. He suggests human changes in water quality may be giving the bacterium a competitive advantage resulting in an increased presence.

Buruli ulcer also has economic impacts. Families must absorb the costs of medical treatment and may miss days of work to care for their sick children, Merritt said. For those whose bodies have been ravaged by the infection, the disease’s effects are life long. “Many people don’t report their illness to their own village because they may be considered social outcasts.”

Unraveling Buruli ulcer disease is a collaborative effort. Merritt hopes to establish a scientific partnership between MSU and Ghana. He and his research team are working closely with local Ghanaian Ministry of Health officials, the University of Ghana, and the Noguchi Memorial Institute for Medical Research.

In summer 2005, Merritt identified a student at the Noguchi Institute in Ghana interested in beginning his Ph.D. work at MSU next fall under Merritt’s direction. Merritt is currently searching for funding for this student from different sour-

es. One of Merritt’s goals is to equip people with the scientific expertise necessary to return to their country of origin and help battle the disease. He points out that there are already many international students at MSU from countries with reported cases of Buruli ulcer, including Ghana, Benin, and Togo. “MSU has the opportunity to help mankind and in terms of the land-grant mission, we can help increase health and economic stability. We want to give them something back. Training is one of the ways we can do that.”

Merritt and Benbow are accumulating data as to which of the villages are endemic for the disease and investigating the incidence of disease in these villages. Merritt plans to return to Ghana in spring 2006 to continue his research and build strong relationships with villagers whose lives are affected by this disease. “When villagers find out what we’re doing and that we are trying to help them, they are very glad to see us,” Merritt said.

This is a slightly modified and updated version of an article by Alicia Clarke, a student writer in University Relations. It appeared in the *MSUToday* online edition in October 2005.



Richard Merritt, Pam Small (a microbiologist from the University of Tennessee), and colleagues from the Noguchi Memorial Institute in Ghana sort macroinvertebrates collected from local water bodies.

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