

Leprosy maintains stubborn hold through infectious buddy system

February 6 2015, by Jeff Dodge



Physical therapy. Credit: American Leprosy Missions

Leprosy is an ancient and debilitating infectious disease largely quelled with medicine in the past several decades. Yet its persistence in some developing countries has mystified scientists, who long have thought the bacteria that cause the disease cannot survive in the environment.

Now a team led by Colorado State University researchers has discovered that the pathogen, *Mycobacterium leprae*, can live for months inside protective host amoebae that are common in water, soil and plants – then

can be easily transferred to trigger infection.

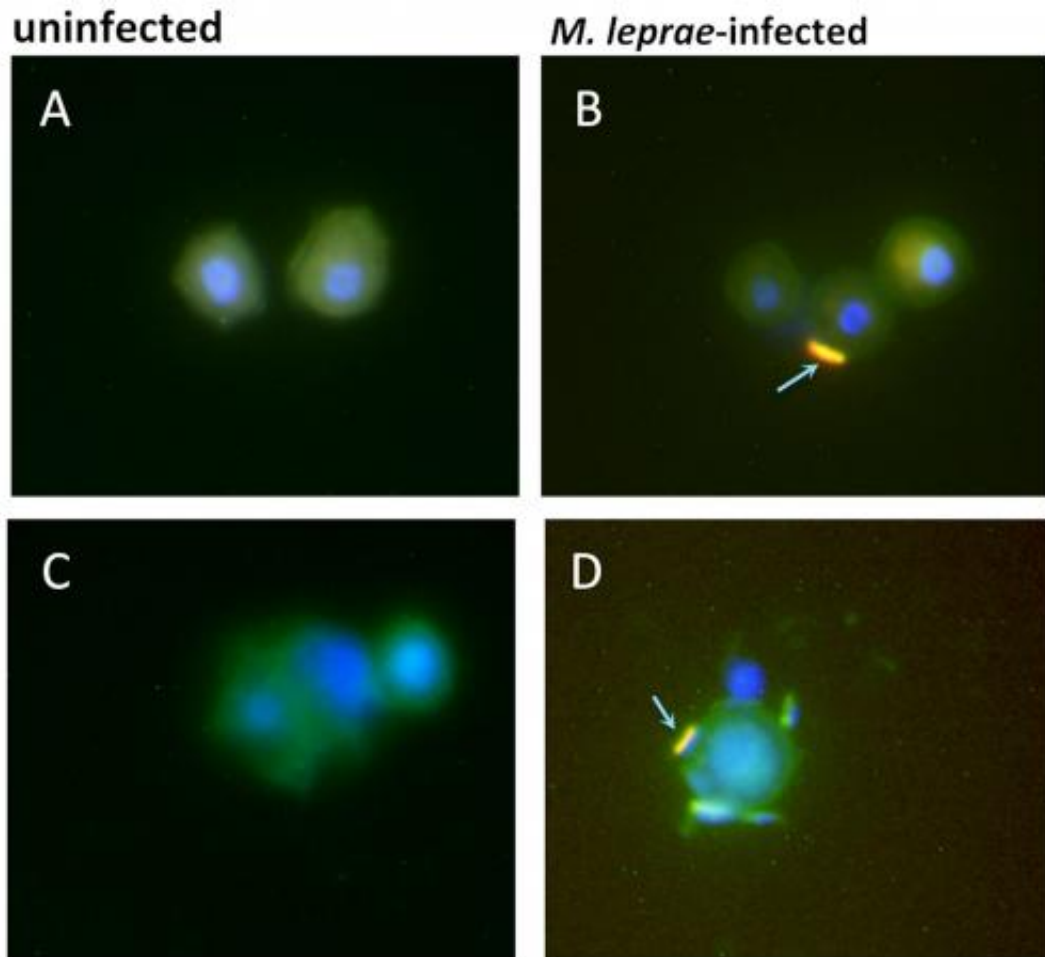
"It can persist in these amoebae for months, and is still capable of transmitting the disease," said Mary Jackson, a member of the research team and director of CSU's Mycobacteria Research Laboratories. The labs are renowned for research to discover new diagnostics, therapies and preventions for tuberculosis and [leprosy](#), diseases caused by mycobacterial pathogens that infect people and animals.

The team's discovery could help explain why the number of global leprosy cases hovers around 200,000 per year, with endemic pockets of disease in about 15 developing countries, according to the World Health Organization. Despite a global campaign to eradicate leprosy – and marked cures resulting from multidrug therapy – the organism that causes the disease has hung on for thousands of years, said William Wheat, a researcher in the CSU Department of Microbiology, Immunology, and Pathology.

"While we have eliminated more than 90 percent of leprosy since the 1980s, we still have these emerging cases in remote areas," Wheat said. "And it's a disease of poverty, so people can't always seek medical care."

Wheat was lead author of a paper reporting the findings, recently published in the journal *PLoS Neglected Tropical Diseases*. The study was supported by funding from the National Institutes of Health, the New York Community Trust's Heiser Program for Research in Leprosy, the Order of Malta and the American Leprosy Missions.

Leprosy – a source of fear and social stigma for millennia – damages skin and attacks nerves, causing loss of sensation, paralysis and muscle degeneration. If it is not treated, leprosy can result in blindness and disfigurement, such as loss of fingers and toes.



Amoebae can harbor leprosy bacteria for months in protective cysts. Credit: PLoS Neglected Tropical Diseases

Drug therapy has greatly reduced infection rates, but hot spots remain in parts of Brazil, India, Africa, Myanmar, Indonesia and the Philippines.

Jackson and Wheat led the effort to identify a possible environmental culprit in continued spread of *Mycobacterium leprae*.

Their laboratory investigation revealed that the [bacteria](#) can reside inside common environmental amoebae. These amoebae form protective cysts

around the bacteria, shielding the pathogens and allowing them to persevere.

Another research group found in 2008 that leprosy bacteria could survive in amoebae for 72 hours.

The CSU investigators and their collaborators demonstrated an infectious buddy system that lasts much longer: They showed that *M. leprae* can live in amoebic cysts for at least eight months, and that this "bacterial cargo" is capable of causing leprosy infection long after being engulfed by amoebae.

The researchers hope amoebae in the natural world could become targets for preventing the spread of stubbornly persistent *M. leprae*.

"If we can understand how it survives and spreads, that would be huge," Jackson said. "If we know what to sample and look for in the environment, we could identify the red flags."

The next step is to test for amoebae in parts of the world where leprosy remains a problem.

"What we would like to do is prevent transmission from happening in the first place," Wheat noted.

John Spencer, an assistant professor in the Department of Microbiology, Immunology, and Pathology and co-author on the paper, is part of the quest. He recently received a Fulbright Scholar award to survey communities in Brazil in an effort to more accurately report leprosy case numbers. Spencer and collaborators have uncovered higher-than-expected rates of infection in the Brazilian state of Pará; they know that accurate reporting is a critical first step to eradicating illness.

"If you could eliminate root causes of disease, you could probably eliminate leprosy in less than 100 years," Spencer said.

More information: Wheat WH, Casali AL, Thomas V, Spencer JS, Lahiri R, et al. (2014) "Long-term Survival and Virulence of *Mycobacterium leprae* in Amoebal Cysts." *PLoS Negl Trop Dis* 8(12): e3405. DOI: [10.1371/journal.pntd.0003405](https://doi.org/10.1371/journal.pntd.0003405)

Provided by Colorado State University

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