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Researchers devise vaccine that provides long-term protection against Chagas disease

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Researchers from The University of Texas Medical Branch at Galveston have successfully tested a vaccine for Chagas disease, which is widespread in Latin America but is beginning to show up in the U.S. - including the Houston area.

The UTMB researchers have published the first report demonstrating that a prospective vaccine against *T. cruzi*, the parasite responsible for Chagas disease, can provide long-lasting immunity in an animal model. These findings are published in the May 7 edition of *PLOS Pathogens*.

Chagas disease, caused by *T. cruzi* parasite infection, represents the third greatest tropical disease burden in the world. This disease is widespread in most Latin American countries, including Mexico and Central America, and is recognized as an emerging disease in the U.S.

Currently, about 11 to 18 million people are infected worldwide and about 50,000 people die each year from cardiac and intestinal complications of the disease.

Nineteen cases of Chagas were reported to the Texas Health and Human Services Commission in 2013, seventeen of which were from the Houston area. No vaccine or suitable treatment is currently available for control of this infection.

The *T. cruzi* parasite is spread by triatomine "kissing bugs." The bugs become infected after biting a person or animal infected with the

parasite. Infection is spread when an infected insect deposits feces on the victim's skin and then they accidently rub it into the bite wound or mucus membranes like the eyes or mouth.

"Prior to this study, we systematically screened the *T. cruzi* genome database and identified three proteins with strong potential for vaccine development. The proteins become antigens once the body mounts an immune response that creates antibodies," said UTMB's Shivali Gupta, postdoctoral fellow in the department of microbiology and immunology. "We found that vaccinating mice with these antigens just prior to infecting them with *T. cruzi* kept the parasite levels down and staved off the signs of Chagas disease seen in the unvaccinated mice."

In this study, the researchers examined the ability of the two strongest *T. cruzi* antigens to provide long-term protection against Chagas disease. The mice first received an injection that contained DNA coding for the two selected proteins. After three weeks, a second injection containing the actual proteins was given. Some of the mice received a booster immunization containing the proteins after an additional three months. All mice were exposed to *T. cruzi* either four or six months after completion of the immunization series.

Even without the booster, the level of parasites was 2 to 3 times lower in the immunized mice compared with the unvaccinated mice. Mice that had received the three-month booster had parasite levels five times lower than their unimmunized counterparts when infected four months later.

"The vaccine-induced immunity waned slightly six months after the booster immunization, but still provided 2-fold control over the parasites," said Nisha Garg, professor in the departments of microbiology and immunology as well as pathology. "This should be sufficient to prevent spread of the infection and prevent chronic Chagas disease symptoms in the vaccinated host."

The researchers concluded that the vaccine provided long-term immunity against *T. cruzi* and that booster immunization would be an effective strategy to maintain or enhance the protective immunity against *T. cruzi* infection and Chagas disease.

More information: Gupta S, Garg NJ (2015) A Two-Component DNA-Prime/Protein-Boost Vaccination Strategy for Eliciting Long-Term, Protective T Cell Immunity against Trypanosoma cruzi. PLoS Pathog 11(5): e1004828. doi:10.1371/journal.ppat.1004828 . dx.plos.org/10.1371/journal.ppat.1004828

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