

# New discovery could lead to vaccines for plague and bacterial pneumonias

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There is an ongoing battle in the "war on terror" that remains mostly unseen to the public -- a race between scientists working to develop a vaccine to protect against plague and the terrorists who seek to use plague as a weapon.

"Governments remain concerned that bioweapons of aerosolized *Yersinia pestis*, the bacteria that causes plague, could kill thousands," said Stephen Smiley, a leading plague researcher and Trudeau Institute faculty member.

The anthrax scare that followed the terror attacks of September 11, 2001, made the threat of [bioterrorism](#) real and led to a surge in federal funding into research aimed at heading off such threats.

According to Dr. Smiley, there is no licensed plague vaccine in the United States. Together with postdoctoral associate Jr-Shiuan Lin, he is working to develop a vaccine that will protect members of the armed services and public from a "plague bomb."

*Yersinia pestis* is arguably the most deadly bacteria known to man. Plague infections of the lung, known as pneumonic plague, are extremely lethal. The bacteria, which grow both inside and outside the cells of the lung, usually lead to death within a week of infection.

Most of the plague vaccine candidates that have been studied aim to stimulate [B cells](#) to produce plague-fighting [antibodies](#). However, animal

studies suggest that antibodies may not be enough to protect humans from pneumonic plague. The Smiley laboratory has shown that [T cells](#) can also fight plague. The lab previously demonstrated that a single immunization with an [experimental vaccine](#) stimulates the production of T cells that provide partial protection against pneumonic plague.

New data, reported in the current issue of *The Journal of Immunology*, show that a second immunization, or booster, improves the protection provided by T cells. "It is particularly exciting that the boost seems to improve protection by increasing a newly described type of T cell, which we call a Th1-17 cell," said Dr. Smiley. These cells have characteristics of both Th1 cells, which defend against intracellular bacteria, and Th17 cells, which specialize at killing extracellular threats.

This research is focused primarily on thwarting the use of plague as a bioweapon. However, small, natural outbreaks of plague continue to this day. A plague vaccine will protect against both naturally occurring outbreaks and those that have been manufactured.

Additionally, Dr. Smiley believes these Th1-17 cells may be important in fighting other kinds of pneumonia: "Bacterial pneumonia is one of the most common causes of death in hospitals and, like plague, many of these pneumonias are caused by bacteria that grow both inside and outside the cells of our bodies."

Provided by Trudeau Institute

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