

# Team finds molecule that polices TB lung infection, could lead to vaccine

January 2 2013

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The presence of a certain molecule allows the immune system to effectively police tuberculosis (TB) of the lungs and prevent it from turning into an active and deadly infection, according to a new study led by researchers at Children's Hospital of Pittsburgh of UPMC and the University of Pittsburgh School of Medicine. Their findings appear today in the online version of the *Journal of Clinical Investigation*.

More than 2 billion people or one-third of the world's population are infected with mycobacterium tuberculosis, the bacterium that causes TB, said senior author Shabaana A. Khader, Ph.D., assistant professor of pediatrics, Pitt School of Medicine. The infection is challenging to treat partly because the bacillus is able to enter cells and linger for years without causing symptoms, known as latent TB. Then, typically when the immune system becomes impaired due to other reasons such as age or HIV, the infection becomes active and causes the cough, night sweats, fever and weight loss that characterize the disease.

"A hallmark of TB that we see on chest X-rays is the granuloma, a collection of [immune cells](#) that surround the infected [lung cells](#)," Dr. Khader said. "But what we didn't know was the difference between a functioning protective granulomae, as in [latent TB](#), and a non-protective granuloma seen in active [TB patients](#). We aimed to find immunologic markers that could show us the status of the infection."

For the study, which was funded by the National Institutes of Health, the researchers studied human TB-infected cells as well animal models of

the disease. They found that [granulomas](#) that contain ectopic lymphoid structures, which resemble lymph nodes, are associated with effective suppression of TB, and that granulomas that don't contain them are associated with active TB. They also learned that immune cells called [T cells](#) that had a surface marker molecule called CXCR5 were associated with the presence of ectopic lymphoid structures.

It's akin to reporting a break-in, Dr. Khader said. If a person calls 911 because of a robbery, but doesn't give a specific address, the immune system police could come to the neighborhood but don't know for certain which home was invaded.

"The presence of CXCR5 provides a specific address for the infected cells that tells the immune cells where to focus their attention to contain the problem," she explained. "That results in the formation of ectopic lymphoid structures and the protective granuloma that keeps TB infection under control, unlike in active disease. Without CXCR5, those structures did not form and active TB was more likely."

When the researchers delivered CXCR5 T cells from donor animals to TB-infected mice that lacked CXCR5, T cell localization and ectopic lymphoid structure formation was restored, leading to decreased susceptibility to TB.

"The protective power of CXCR5 points us in a novel direction for future management of TB," Dr. Khader said. "These findings have powerful implications for the development of vaccines to prevent infection."

Provided by University of Pittsburgh Schools of the Health Sciences

Citation: Team finds molecule that polices TB lung infection, could lead to vaccine (2013,

January 2) retrieved 2 May 2024 from <https://medicalxpress.com/news/2013-01-team-molecule-polices-tb-lung.html>

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