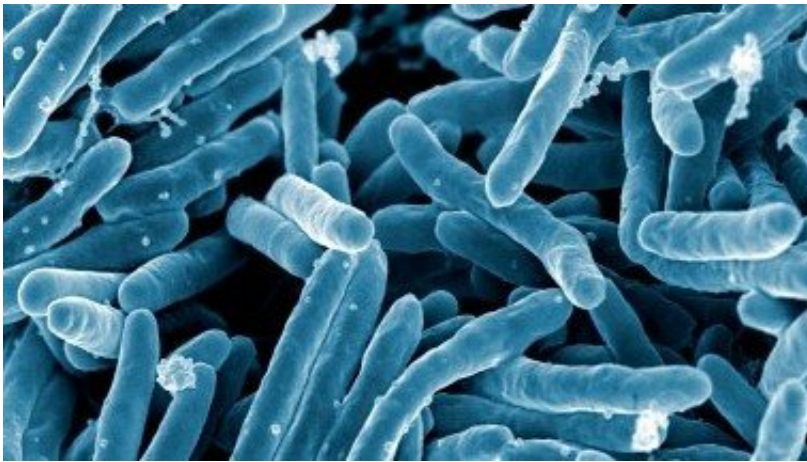


New vaccine targets killer disease tuberculosis

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Tuberculosis bacteria. CC0 Public Domain.

There is only one existing vaccine for TB and it is not effective in adults. Researchers at the Centenary Institute and University of Sydney will next test their new vaccine in clinical trials with humans.

Australian medical researchers from the Centenary Institute and the University of Sydney have successfully developed and tested on mice a new type of vaccine targeting tuberculosis (TB), the world's top infectious disease killer in humans.

Reported in the *Journal of Medicinal Chemistry*, the early-stage vaccine was shown to provide substantial protection against TB in a pre-clinical

laboratory setting when tested on the rodents.

"Tuberculosis is a huge world-wide health problem. It's caused by a bacteria that infects the lungs after it's inhaled, is contagious and results in approximately 1.6 million deaths per year globally," said Dr. Anneliese Ashhurst, co-lead author of the reported study and affiliated with both the Centenary Institute and the University of Sydney.

The research program targeting the deadly disease has currently taken over five years of effort to implement. During that time Dr. Ashhurst and a team of scientists have created the advanced synthetic TB vaccine and have now demonstrated its effectiveness using mouse models.

"Two peptides [small proteins] which are normally found in tuberculosis bacteria were synthesized and then bound extremely tightly to an adjuvant [a stimulant] that was able to kick-start the [immune response](#) in the lungs," said Dr. Ashhurst.

"We were then able to show that when this vaccine was inhaled into the lungs, it stimulated the type of T cells known to protect against TB. Importantly, we then demonstrated that this type of vaccine could successfully protect against experimental airborne TB infection," she said.

Professor Warwick Britton, Head of the Centenary Institute Tuberculosis Research Program and co-senior researcher on the project with Professor Richard Payne, School of Chemistry, University of Sydney, emphasized the importance of the work being done.

"There currently exists only one vaccine for TB (known as BCG) and this is only effective in reducing the risk of disease for infants," Professor Britton said.

"It fails to prevent infection or provide long-term protection in older individuals and it isn't considered suitable for use in individuals with an impaired immune system. More effective vaccines are urgently required to save lives," he said.

Professor Britton is excited that the team's vaccine strategy—directly generating immunity in the lungs—has proven to be the right research approach to take.

"The important thing is that the vaccine actually gets to the lungs because that's where you first see TB. Ultimately, we would love to see a form of this vaccine available for use in an easily inhaled nasal spray which would provide life-long TB protection. Although this outcome is still many years away, we are certainly heading in the right direction.

"Our next steps will be to determine if our synthetic [vaccine](#) can be developed into a form suitable for use in humans," said Professor Britton.

There are an estimated two billion individuals carrying TB globally and up to 10% of these individuals develop the disease in their lifetime. More than 50 percent of TB cases occur in the Asia Pacific region.

More information: Anneliese S. Ashhurst et al. Mucosal Vaccination with a Self-Adjuvanted Lipopeptide Is Immunogenic and Protective against *Mycobacterium tuberculosis*, *Journal of Medicinal Chemistry* (2019). [DOI: 10.1021/acs.jmedchem.9b00832](https://doi.org/10.1021/acs.jmedchem.9b00832)

Provided by University of Sydney

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