mRNA vaccine against tuberculosis shows efficacy in mice, results pave way for larger trials

Tuberculosis (TB) is caused by the bacteria Mycobacterium tuberculosis and spreads through the air when an infected person coughs or sneezes. Symptoms include a persistent cough, chest pain, fever, and fatigue.

New Delhi: A new mRNA vaccine against tuberculosis has been shown to effectively boost immunity in pre-clinical trials conducted in mice, the results of which pave the way for clinical trials of the vaccine. Developed by researchers from Australia, the vaccine uses messenger RNA (mRNA) technology, in which instructions to create parts of the disease-causing bacteria are transferred to the host. The host's body then produces an immune response, thereby "learning" how to respond to the bacteria. mRNA vaccines were first developed for COVID-19.

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Currently, the most widely used vaccine against TB is the Bacillus Calmette-Guerin (BCG). Developed in 1921, the vaccine works by introducing a weakened version of the TB-causing bacteria into the body. The body then develops immunity against TB. However, the effectiveness of BCG in adults is inconsistent, the team noted.

The study, published in the journal eBioMedicine, found that the mRNA vaccine successfully triggered an immune response that helped reduce TB numbers in infected mice. Furthermore, in mice vaccinated with BCG, a booster dose of the mRNA vaccine significantly improved long-term protection, the researchers observed.

Senior author Jamie Triccas, deputy director of the Sydney Infectious Diseases Institute, said the results represent a major advance in TB vaccine research, providing a strong rationale for further clinical development.

"Our findings demonstrate that an mRNA vaccine can induce potent, pathogen-specific immune responses that target TB, a disease that has long evaded effective vaccine development," Triccas added.

The team expects the mRNA vaccine to be more effective and consistent compared to BCG when used in humans, as mRNA vaccines allow for rapid adaptation, making them an attractive choice for global efforts in controlling TB.

Although mRNA was discovered in the early 1960s, the success of mRNA vaccines in producing strong immune responses against COVID-19 infection has prompted scientists globally to use the technology against other infectious diseases.

"mRNA vaccines offer a scalable, cost-effective, and adaptable platform that can be rapidly deployed against infectious diseases," said co-lead author Dr. Claudio Counoupas from the Centenary Institute, Sydney.

"Our study provides evidence that this (mRNA) platform can be harnessed for TB, potentially improving protection and durability of immunity in a way that traditional vaccines cannot," said author Colin Pouton from Monash University.

The team is looking to assess the vaccine's efficacy in larger models before moving to human studies.

"These findings of a protective lipid nanoparticle (LNP)-mRNA vaccine for TB highlight the potential of the LNP-mRNA platform for TB control and support further research to facilitate translation to humans," the authors wrote.

According to the World Health Organization, about half of the world's TB cases can be found in eight countries, including India, Bangladesh, China, and Pakistan.

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