

Tuberculosis drugs under development expected to have major impact on the disease

August 3 2009

The latest drug regimens, vaccines and diagnostic tools under development to combat tuberculosis could have a potentially large impact on the disease once they become available, according to research findings published in the Aug. 3 early edition online of the *Proceedings of the National Academy of Sciences*.

Using a mathematical model that examined TB in Southeast Asia, a region with a large proportion of TB cases worldwide, researchers in the Vaccine and Infectious Disease Institute at Fred Hutchinson Cancer Research Center found that the incidence of the disease could be reduced between 13 percent and 71 percent by 2050, depending upon the type of interventions used and whether they are implemented singly or in combination.

The study was led by M. Elizabeth "Betz" Halloran, M.D., D.Sc., a member of the Hutchinson Center's Public Health Sciences Division and professor of biostatistics at the University of Washington, and directed by Laith Abu-Raddad, Ph.D., an assistant member of the Hutchinson Center's Public Health Sciences Division and a visiting assistant professor of public health at Weill Cornell Medical College in Qatar.

Halloran and colleagues examined the expected benefits of implementing the new TB tools developed with support from the Bill & Melinda Gates Foundation. They chose to apply their modeling to the 11-country Southeast Asia region as defined by the World Health Organization (Bangladesh, Bhutan, Democratic People's Republic of

Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste) because it already has successful TB-intervention programs.

"Our results demonstrate that each of the novel vaccines, drug regimens and diagnostics currently under development offers substantial reductions in TB incidence and TB-related mortality compared with current approaches," said Abu-Raddad, the study's first author. "Were these technologies used in combination, there would be an additional powerful synergistic effect," he said.

Some of the study's key findings:

- Vaccination of newborns with the vaccine under development by the Aeras Global TB Vaccine Foundation could decrease TB incidence by 39 percent to 52 percent by 2050.
- The Global Alliance for TB Drug Development is working on new drug regimens that shorten treatment duration and are effective against drug-resistant TB strains which could reduce TB incidence 10 percent to 27 percent.
- The Foundation for Innovative New Diagnostics New leads the effort on new diagnostic tools that could reduce TB incidence by 13 percent to 42 percent. Diagnostics and treatment go hand-in-hand because new diagnostic tests have an epidemiological effect by moving people to treatment more rapidly. The three diagnostic methods examined in the study achieve their improvements in TB incidence and mortality fairly rapidly. The four-month, two-month, and 10-day novel active disease treatment regimens produce 10 percent, 23 percent, and 27 percent reductions in TB incidence by 2050 compared to 2015.

- In combination, the triple application of vaccination, new drugs and diagnostics the products could prevent 55.3 million cases and lower TB incidence by 71 percent (to 509.2 cases per million) by 2050, far more than any of the individual approaches.

"Combinations of the new technologies currently under development could have an enormous benefit," said Halloran. "However, there is a big difference between what is in the current portfolio and what could be achieved by going beyond it. To achieve further improvements, technologies and delivery strategies not currently under development should be considered."

The findings could alter the practice of tuberculosis control, particularly if mass vaccination catch-up campaigns were added to the current practice of vaccinating newborns, Halloran noted. The study results have already changed the way that Aeras is considering its vaccination strategies and goals to include mass vaccination options.

Halloran and colleagues are world renowned for creating disease models. For this study, they created a model of [tuberculosis](#) within a population, similar to previous TB models. Individuals have a defined disease state at all times, such as susceptible, latently infected, or recovered. The rates at which individuals transition from one state to another, and the factors that affect these transitions were determined from an extensive search of the existing TB literature. The team discussed the novel portfolio interventions with FIND, Aeras and TB Alliance to understand the expected efficacies and improvements over current approaches to TB intervention. The ways in which the new technologies are expected to work, and on whom, were plugged into the model. The group took the expected effects of the novel technologies and applied them to the large TB model to understand the results of these technologies on a population scale.

In 2006, Southeast Asia accounted for 35 percent of all new TB cases in the world and 32 percent of the world's TB-related deaths. With no novel interventions, 101.7 million new TB cases and 17.9 million TB-related deaths are expected in the region between 2015 and 2050, according to researchers. Despite these grim numbers, the Southeast Asia region was chosen for the study because it already has generally successful TB intervention programs.

TB is considered to be the leading cause of death worldwide from a curable infection, and it is estimated that one-third of the world's population is latently infected with the disease.

Source: Fred Hutchinson Cancer Research Center ([news](#) : [web](#))

Citation: Tuberculosis drugs under development expected to have major impact on the disease (2009, August 3) retrieved 6 May 2024 from <https://medicalxpress.com/news/2009-08-tuberculosis-drugs-major-impact-disease.html>

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