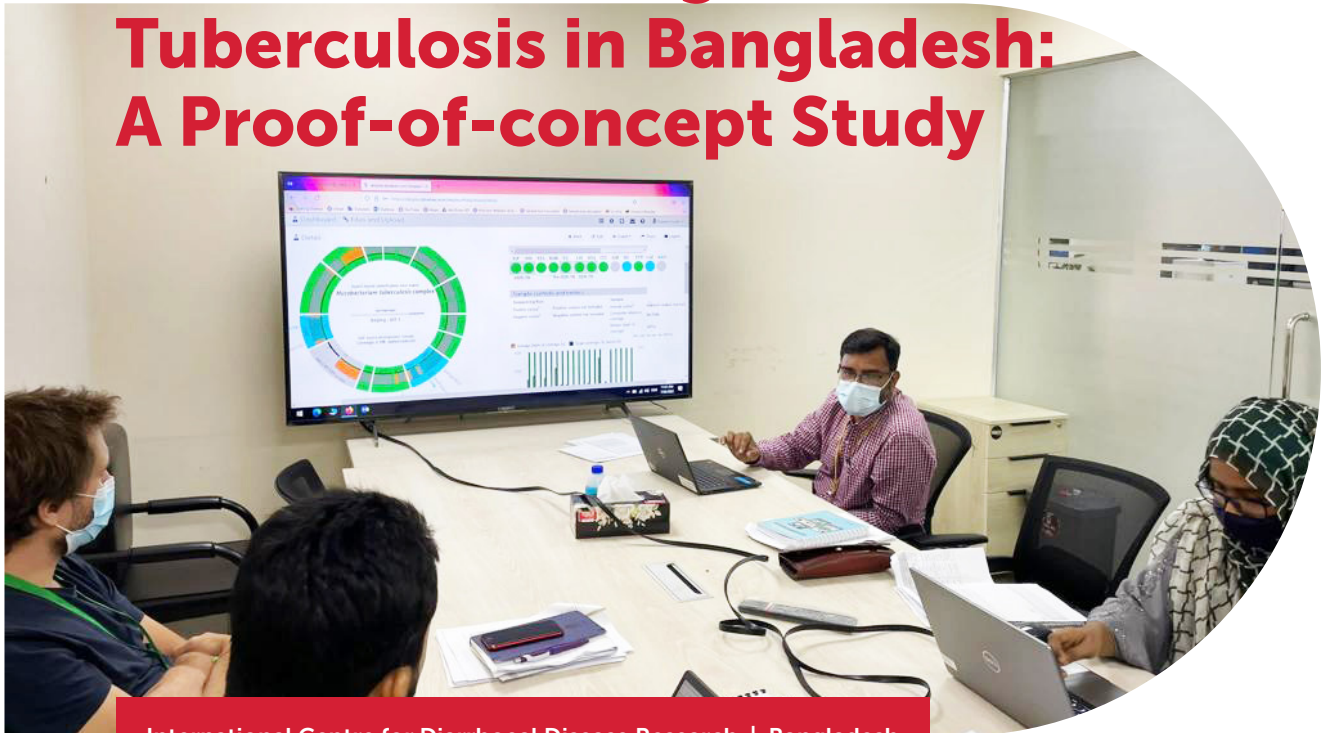**Country in Focus: Bangladesh**

THE INTRODUCING NEW TOOLS PROJECT (iNTP)

Application of Targeted Next-Generation Sequencing for Detection of Drug-Resistant Tuberculosis in Bangladesh: A Proof-of-concept Study

International Centre for Diarrhoeal Disease Research | Bangladesh

Targeted next-generation sequencing (tNGS) has emerged as a comprehensive alternative to existing methods for drug susceptibility testing of *Mycobacterium tuberculosis* strains from sputum samples.

The tNGS approach overcomes many of the significant challenges associated with conventional phenotypic testing as well as the limitations of other less comprehensive molecular tests by providing rapid, detailed sequence information for multiple gene regions. Although the tNGS technology is established in medical diagnostics of many diseases, its use in TB diagnostic algorithms for clinical decisions in high incidence, high resistance settings has not yet been recommended by WHO as additional evidence has been needed.
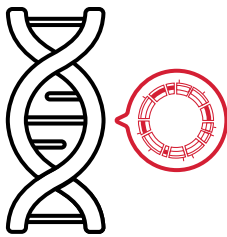
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15 anti-tuberculosis drugs can be detected using a MiniSeq sequencing system with Deeplex Myc-TB

Sputum samples collected and tested from **310 patients by December 2022**

Implementation of tNGS under the project

With funding from the United States Agency for International Development (USAID) under the *introducing New Tools Project* (iNTP), the Stop TB Partnership has supported a tNGS study at the **International Centre for Diarrhoeal Disease Research, Bangladesh** (icddr,b) with the primary objectives of demonstrating the feasibility of the use of tNGS with direct testing of sputum samples and contributing to the global evidence base on the use and feasibility of tNGS for TB drug resistance detection. The San Raffaele Scientific Institute (WHO Supranational Reference Laboratory, Milan) has provided technical assistance to the icddr,b team.

In 2022, icddr,b initiated use of a MiniSeq sequencing system (Illumina, San Diego, USA) with the Deeplex® Myc-TB assay (GenoScreen, Lille, France), which detects mutations responsible for resistance to 15 anti-tuberculosis drugs. By December 2022, tNGS had been performed on sputum samples collected from 310 patients enrolled at TB Screening and Treatment Centers (TBSTCs) of icddr,b, the National Institute of Diseases of the Chest and Hospital (NIDCH), and the Shaymoli 250-bedded TB hospital. In parallel, samples were also tested using phenotypic drug susceptibility testing (pDST) by solid (Löwenstein-Jensen) and liquid culture (Bactec™ MGIT™) as well as tested by line probe assay (GenoType MTBDRplus and MTBDRsl).

The final analysis comparing the results of tNGS with phenotypic and genotypic drug susceptibility testing methods will be published in 2023.

Going Forward

Icddr,b has shared its interim findings with WHO to contribute to the evidence base that will be considered by a WHO Guideline Development Group in May 2023 that will be making recommendations on the use of sequencing methods for guiding clinical management of people with TB.

The use of sequencing methods for TB have been incorporated into the National Strategic Plan 2024-2030 of the Bangladesh National TB Control Programme (NTP).

Under the USAID-funded Alliance for Combating TB (ACTB) project, icddr,b will continue using tNGS in 2023 as part of a study on transmission dynamics of multidrug-resistant TB across 10 NTP-affiliated sites treating multidrug-resistant TB.

Disclaimer: The findings in this document are those of the authors and do not necessarily represent the views of the U.S. Agency for International Development or the U.S. Government

For more information on icddr,b, visit:

🔎 https://www.icddrb.org/

For more information on the introducing New Tools Project, visit:

🔎 https://www.stoptb.org/accelerate-tb-innovations/introducing-new-tools-project

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