

Summer Student Research Program Project Description

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PROJECT TITLE (200 Characters max):

Transmission links and clinical spectrum of exhaled Mycobacterium tuberculosis

HYPOTHESIS:

Tuberculosis (TB) remains a leading infectious cause of death worldwide, with approximately 10 million new cases annually and limited decline in incidence, in part due to ongoing transmission from individuals with undiagnosed disease. Recent studies from South Africa have shown that *Mycobacterium tuberculosis* (Mtb) can be detected in the exhaled breath and aerosols of 80–90% of individuals who are not diagnosed with TB, including those without symptoms and those with negative sputum tests. We hypothesize that sputum-negative but breath Mtb-positive individuals have TB disease pathology and contribute to undiagnosed transmission. This study will identify breath Mtb-positive individuals in New Jersey and test this hypothesis by evaluating for latent TB infection among their close contacts and assessing inflammatory and lung imaging features characteristic of TB.

PROJECT DESCRIPTION (Include design, methodology, data collection, techniques, data analysis to be employed and evaluation and interpretation methodology)

Enrollment of participants at University Hospital and surrounding New Jersey Clinics is projected to begin in May-June 2025. The SSRP scholar will support the enrollment start, including (a) facilitating high-quality data completion and exchange between clinical and lab teams and (b) screening UH census for potentially eligible participants and alerting the study team. Data collection methods will include Epic and RedCap, alongside study reports/spreadsheets. Data analysis will consist of rate of testing positive for *Mycobacterium tuberculosis* in breath among initial enrollees.

SPONSOR'S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:

1. Patterson B, Dinkele R et al. Aerosolization of viable *Mycobacterium tuberculosis* bacilli by tuberculosis clinic attendees independent of sputum-Xpert Ultra status. Proc Natl Acad Sci U S A. 2024 Mar 19;121(12):e2314813121. doi: 10.1073/pnas.2314813121. Epub 2024 Mar 12. PMID: 38470917
2. Dinkele R, et al. Persistent *Mycobacterium tuberculosis* bioaerosol release in a tuberculosis-endemic setting. iScience. 2024 Aug 20;27(9):110731. doi: 10.1016/j.isci.2024.110731. PMID: 39310776
3. Xie YL, et al. Prominence of *Mycobacterium tuberculosis* biomarkers among sputum culture-negative clinic attendees, independent of Ultra status. J Infect Public Health. 2025 Jul;18(7):102791. doi: 10.1016/j.jiph.2025.102791. Epub 2025 Apr 24. PMID: 40315556.
4. Xie YL, et al. Transmission of *Mycobacterium tuberculosis* From Patients Who Are Nucleic Acid Amplification Test Negative. Clin Infect Dis. 2018 Nov 13;67(11):1653-1659. doi: 10.1093/cid/ciy365. PMID: 29697779

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THIS PROJECT IS: **Clinical** **Laboratory** **Behavioral** **Other**

THIS PROJECT IS CANCER-RELATED

Please explain Cancer relevance

THIS PROJECT IS HEART, LUNG & BLOOD- RELATED **Yes**

Please explain Heart, Lung, Blood relevance

Evaluates breath shedding of pulmonary TB against lung pathology

THIS PROJECT INVOLVE RADIOISOTOPES? **No**

THIS PROJECT INVOLVES THE USE OF ANIMALS

PENDING

APPROVED

IACUC PROTOCOL #

THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS? YES

PENDING

APPROVED

IRB PROTOCOL # M

THIS PROJECT IS SUITABLE FOR:

UNDERGRADUATE STUDENTS

ENTERING FRESHMAN

SOPHMORES

ALL STUDENTS

- For identifying eligible participants, best suited for medical students who will be able to obtain Epic (EMR) access.
- For data supporting role – open to all students who are motivated and organized – preferably with some database and/or coordination experience.

THIS PROJECT IS WORK-STUDY: **Yes** **or** **No**

THIS PROJECT WILL BE POSTED DURING ACADEMIC YEAR

FOR INTERESTED VOLUNTEERS: **Yes** **or** **No**

To commence summer 2026, with potential option to continue analyses through academic year.

WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?

The SSRP scholar will gain experience navigating electronic medical records; diagnosing tuberculosis and identifying clinical and epidemiologic risk factors; managing and analyzing study data; and developing leadership skills. They will also be exposed to core public health tools, including contact investigations, and to translational research integrating laboratory-based breath testing for viable *M. tuberculosis* (DMN-trehalose staining) with clinical data.