Washington University in St. Louis
Office of Technology Management

METABOLIC BIOMARKERS FOR ACCURATE, REAL-TIME DIAGNOSTICS AND MONITORING OF C. DIFFICILE INFECTION

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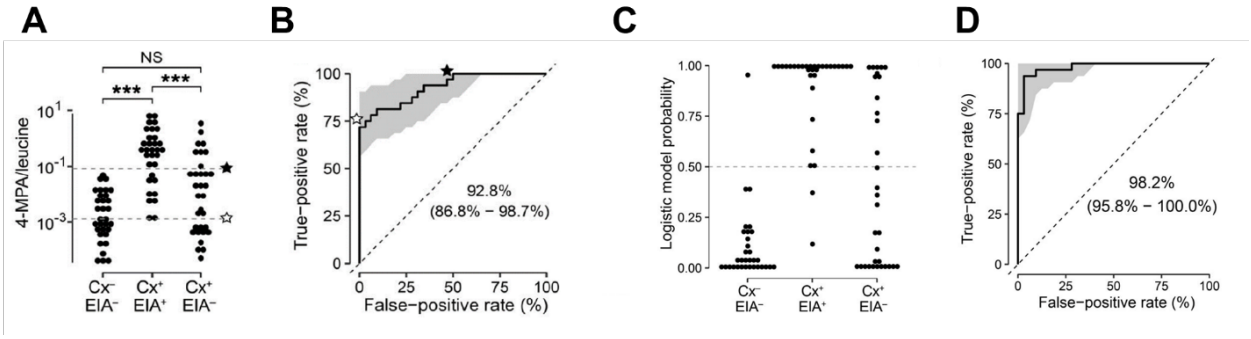
Technology Description

Researchers in Prof. Jeffrey Henderson's laboratory have developed a method of analyzing metabolic biomarkers from fecal samples to more accurately identify *C. difficile* infection (CDI) and distinguish between symptomatic and asymptomatic colonization. CDI is currently both overtreated and undertreated due to high false positive (culture and NAAT) and false negative (toxin detection) rates. This new method can achieve >75% true-positive rate and <10% false-positive rate, indicating a well-differentiated, highly sensitive and specific CDI detection platform.

Accurate diagnosis of CDI is critical to identify patients who require treatment; to avoid treating patients without an active infection; and to monitor treatment success. The biomarker-based method can synergize with NAAT analysis to avoid false positive results from inactive *C. difficile* spores (asymptomatic colonization). Furthermore, this method circumvents variation caused by sample dilution because the results are computed as a ratio of two metabolites (4-methylpentanoic acid and leucine). Ultimately, this method enables physicians to segment patients who would benefit from antibiotic treatment or personalized microbiome therapy and becomes a "test-of-cure" to confirm when treatment is effective.



(A & B) A biomarker-based method that analyzes the ratio of 4-MPA/leucine, which can reliably distinguish between bona fide CDI (CX+/EIA+) and negative control (Cx-/EIA-) or asymptomatic colonization (Cx+/EIA-) cases. (**C&D)** Addition of bile acid scoring to the 4-MPA/leucine ratio further improves diagnostic power.

Stage of Research

Using mass spectrometry, the inventors performed metabolomics profiling of stool samples from a cohort of 186 hospitalized patients and discovered a number of chemical signatures that can distinguish patients with CDI from those with non-*C. difficile* diarrhea and from those with *C. difficile* colonization.

Publications

- Robinson, J. I., Weir, W. H., Crowley, J. R., Hink, T., Reske, K. A., Kwon, J. H., ... & Henderson, J. P. (2019). Metabolomic networks connect host-microbiome processes to human Clostridioides difficile infections. *The Journal of Clinical Investigation*, 129(9).

Applications

- **Enteric diagnostics and treatment monitoring** – detect CDI and use as "test of cure" to determine whether active *C. difficile* has been cleared, even when *C. difficile* DNA or toxin lingers

Key Advantages

- Rapid, accurate, real-time diagnostic
- Multiplexes with other analytical methods (such as NAAT)
- Early detection and test of cure

Patents: Pending

Related Web Links: Henderson Profile& Lab