

Beth Israel Deaconess

A Description of the Proposed In Vitro Diagnostic, and the Development Approach, Challenges, and Risks

Emerging antimicrobial resistance is compromising our ability to treat bacterial infections. Current FDA-cleared antimicrobial susceptibility testing diagnostics are inadequate to address current and future needs. Specifically, available commercial methods are inflexible, have a limited antimicrobial menu, practically require one day before results are available, and often fail to properly define susceptibility in drug resistant pathogens. In consequence, multidrug-resistant pathogen isolates often need to be sent to reference laboratories in order to test agents of last resort or new antimicrobials by gold standard dilution methodology, leading to up to a week delay before actionable results are available to help clinicians navigate the few remaining therapeutic options. The delay between start of empiric therapy, the best guess as to what therapy may be effective, an increasingly uncertain prediction for drug-resistant pathogens, and institution of effective directed therapy, is what we call the "antimicrobial testing gap". The length of this gap is directly related to increased patient morbidity and mortality. To shorten this gap, we propose development of a platform that uses inkjet printer technology combined with novel microscopic assays to perform reference standard antimicrobial susceptibility testing for any antimicrobial at any desired concentrations at will for any of the 18 drug-resistant bacterial pathogens of highest concern in under four hours. The technology will be developed for testing isolated bacterial pathogens, and for direct testing of positive blood culture broth and patient urine specimens. Taken together, we predict that the envisioned platform will significantly reduce the antimicrobial testing gap, direct available therapeutic choices where they will be most effective, and save lives.