

Point-of-Care Diagnostics for Infectious Diseases: DxBox

Health need

While fever is a common symptom of illness, clinicians often cannot distinguish between bacterial, parasitic, viral, fungal, or noninfectious causes. In the absence of an accurate diagnostic that identifies the causative agent of a fever, treatment is based on regional prevalence of infections. In sub-Saharan Africa, fever is often treated with antimalarial drugs, which leads to over-prescription and mismanagement of the patient's care regimen. The emergence of antimalarial and antibiotic drug resistance results in an urgent need for accurate diagnosis of fever-causing agents at the point of care in resource-limited settings.

Technology solution

Health care facilities in low-resource settings often have unreliable cold chains, limited laboratory facilities, and technical staff with limited training. Diagnostic tools developed for these settings must meet challenging specifications for stability of reagents, robustness of instruments, ease of use, and cost. Diagnostic platforms that detect multiple potential causes for disease in parallel at the point of care will assist health care providers in administering the correct treatment in a timely manner. Led by the University of Washington (UW), a consortium of PATH, the UW, and private companies (Micronics and Epoch Biosciences/EliTech Group) has been tasked under a Grand Challenge project to develop a lab-on-card platform (DxBox). This platform will accurately and inexpensively diagnose febrile illness at the point of care. The DxBox will perform both immunoassays to detect pathogen antigen or host antibodies to pathogen antigens and PCR to detect pathogen nucleic acids. The platform consists of two components: a disposable device housing the reagents and reaction chambers for sample processing and test development and a portable instrument to drive the diagnostic tests on the disposable device and read the test results from a sample of whole blood. The initial diseases of interest in this "fever panel" include malaria, influenza, typhoid, rickettsial infections, measles, and dengue.

Current status and results

Started in mid 2005, the technical work on developing the reagents, probes, and microfluidic immunoassays is progressing. The commercial partners are developing the integrated microfluidic device on which the sample processing and all the diagnostic tests will be performed. PATH is playing a role in immunoassay development and is evaluating different diagnostic tests on this platform with clinical samples. Additionally, PATH has performed user needs assessments in Brazil, India, and Kenya, as well as conducted a global stakeholders web based survey. These studies investigate the needs of various stakeholders in resource-limited settings for the introduction of the multivalent diagnostic platforms. A functional instrument and disposable card is expected to be done by the third quarter of 2010.



Prototype of the DxBox instrument with a disposable device.

A simple diagnostic tool that can accurately identify why a person is sick can be used in a primary health care center and ensure correct treatment; this will help reduce the enormous burden of infectious disease in low-resource settings.

Availability

For more information regarding this project, contact Gonzalo Domingo at gdomingo@path.org.

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