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Detecting Infectious Pathogens:
Low Resource Environments

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Diagnostic Requirements: Infectious Diseases

- Diagnostic medicine is sophisticated in the developed world
  - Large biosciences industries create modern sensitive machinery
  - Implying that diagnostic medicine is simple

- Diagnostic medicine is not only a function of the most sophisticated machinery but rather a system of inputs that enables the end user to confirm a diagnosis
  - Astute clinicians to identify clinical manifestations of disease
  - Astute laboratory diagnosticians to carry out tests
  - Standardized tools and reliable infrastructure

Evolution of Diagnostic Medicine: Low Resource Environments

- Diagnostic medicine advanced considerably in light of recent outbreaks of emerging infectious diseases
- Enabling early detection in low-resource environments included the deployment of sophisticated diagnostic tools to regions with limited capacity
- Methods had limited sustainability and highlighted the challenge of deploying sophisticated technologies to low-resource environments
  - Limited human capacity
  - Lack of infrastructure
  - Limited access to reagents
  - Limited funding
  - Inability to maintain equipment

Determinants of Diagnostic Tests: Low Resource Environments

Clinical Knowledge

Infectious Diseases

Technical Specifications

Infrastructure

Safety and Security

Funding/Sustainability

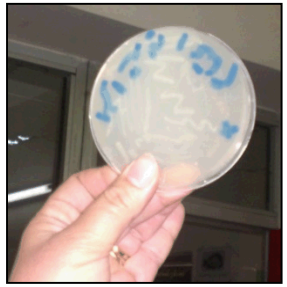
Requirements for Diagnostics: Low Resource Environments

- Minimal infrastructure requirements
  - No reliance on grid
  - No reliance on clean water
- No cold chain requirements
- Stable
  - 40-45°C and >70% humidity
- Easy to use
- Minimal sample preparation
- Reduce reliance on astute clinicians
- Supports safety and security
  - Reduces proliferation risk
  - Minimize hazardous waste
- Portable or field deployable

Parallels in Diagnostic Requirements

Detecting infectious diseases in low-resource environments shares many parallels with provision of detection capabilities to troops deployed to low-resource environments

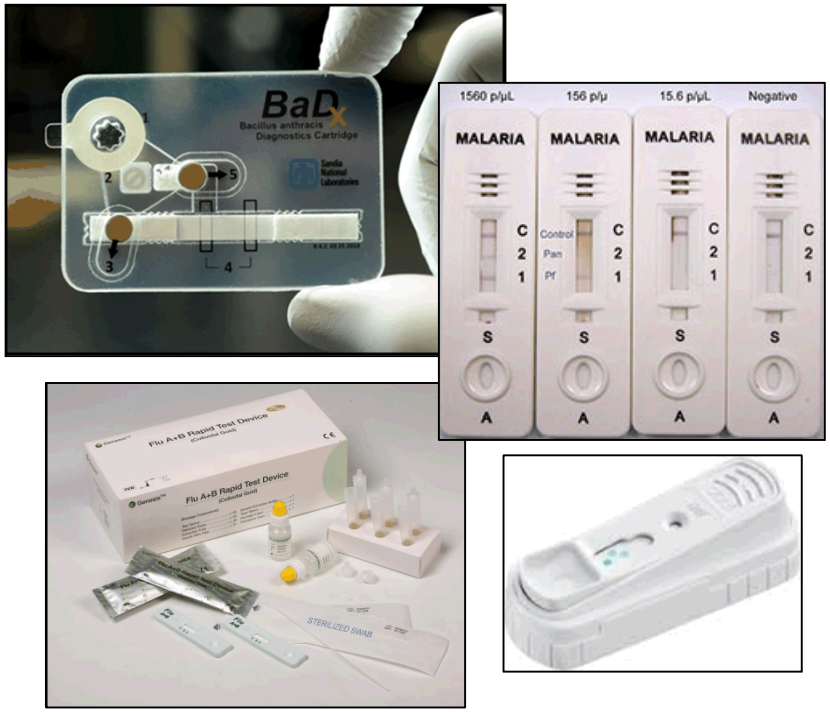
- Targeted
- Circumvent clinician requirements
  - Multiplex
- Easy to use
- Sensitivity and specificity
- Resilient to various environmental factors
- Portable
- Little to no sample preparation
- Safe, secure, reduced hazardous waste



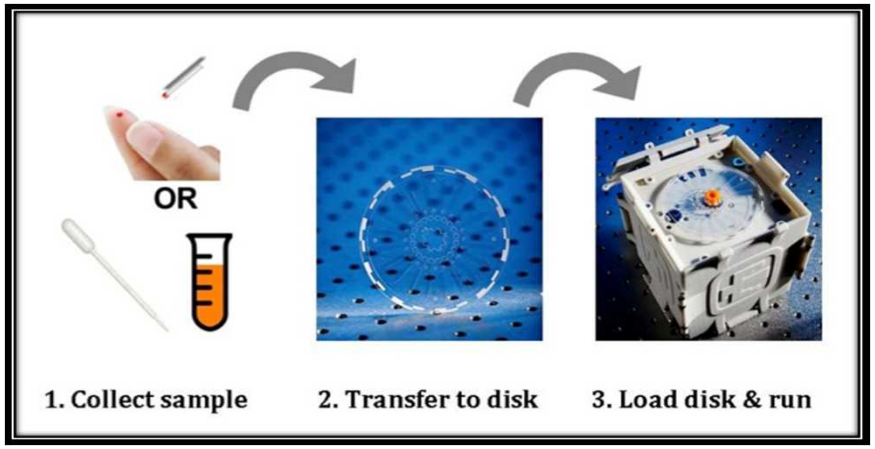
Example Technologies

- Rapid tests and easy to use technologies exist
- Integrated into a system can create a comprehensive tool to diagnose and detect infectious diseases

Lateral Flow Assays



Multiplex and minimal sample prep



Summary

- Can use principles of laboratory capacity building in the developing world to help build diagnostic capabilities for troops deployed to low resource environments
- Challenges are not always apparent
  - Limited clinical capabilities
  - Infrastructure limitations
  - Storage requirements
  - Reagent stability
  - Field deployable
- Safety and security are essential
  - Must always consider the biological threat