

**Re-imagining the Future of Diagnostics for NTD Control and Elimination**

**Session Date:** Saturday, November 4

**Session Time:** 9:00am – 12:00pm

**Session Location:** Camden

**Session Description:** The World Health Organization (WHO) has identified 20 NTDs for control and elimination by 2030. With the exception of guinea worm disease, diagnostics play a critical part in surveillance, monitoring progress towards elimination and for research to determine the impact of interventions. In recent years, tremendous advances have been made in point-of-care diagnostic technologies driven by the need for equitable access to diagnostics for control and prevention of well resourced, high burden diseases such as HIV and tuberculosis, and by the need for open platform rapid detection technologies for response to global infectious disease epidemics. These innovations can be leveraged to improve diagnostic tools for NTDs. The overall aim of this session is to present ideas for an integrated innovative diagnostic system to improve the accuracy and efficiency of NTD surveillance, monitoring progress towards elimination and assessing the impact of interventions. We will also propose the partnerships and investments required to make this system a reality.

**Session Chairs:** Rosanna Peeling, London School of Hygiene and Tropical Medicine  
Dirk Engels, The World Health Organization (ret.)

**Session Rapporteur:** Gretchen Cooley

**KEY DISCUSSION POINTS****Introduction, Session Chairs Rosanna Peeling and Dirk Engels**

- Challenge for 2020 and beyond is to identify the correct tools for each situation and to be able to integrate those tools despite different control strategies.
- Point-of-care tests will be needed to improve access to treatment at the most peripheral level of health care systems and to close in on last remaining cases as prevalence falls.
- Need more sensitive diagnostics for mid- and late-term program assessments.
- Need cost-effective tools and strategies to make long-term surveillance attractive to donors.
- Sensitive modular diagnostics are desirable because they will be adaptable to different program needs in different countries and at different stages of control and elimination.
- Leverage technologies and methods developed by other disease elimination initiatives for cost-effective ways to develop new diagnostic systems for NTD control and elimination.

**Rosanna Peeling, on behalf of Noah Fongwen: An integrated Diagnostic System for NTDs and What is needed to achieve it**

- Diagnostic tools with increasing sensitivity and specificity are needed for NTD surveillance as disease prevalence decreases

- We need to identify and exploit commonalities of geographic overlap, control strategy, and target populations to maximize use of resources.
- Open-source diagnostic platforms are useful to create modular diagnostics that are adaptable to different needs and situations.
  - Can combine NTDs biomarkers with biomarkers for other diseases.
  - Luminex xMAP based assays are customizable for multiplex detection of up to 500 different antibodies from serum or whole blood.
  - Multiplex nucleic acid tests platforms are customizable by designing primers of interest.
    - Alere I, BioFire, Cepheid provide systems which are becoming more cost effective, field adaptable, and faster as technology progresses
    - Potential for point-of-care management of viral outbreaks and monitoring antibiotic resistance.
- Data connectivity between field and lab is a key to successful control and elimination programs.
  - Connectivity is beneficial for managing interconnected survey sites, ensuring both timely ability to use results for policy decisions and manage stock.
- Minimize financial risk for private partners by organizing evaluation and implementation research studies for novel diagnostics and work with control programs to work out demand forecasts or offer advanced purchase commitments for diagnostic tests under development.
- For some NTDs there is a need to exploit state of the art technology to rapidly identify new biomarkers
  - Explore GAVI and “omics” studies for promising diagnostic targets.

**Ana Lucianez, on behalf of Bernadette Abela-Ridder: Diagnostics for the NTD Left Behind**

- There are very specific diagnostic needs for taeniasis, cysticercosis, echinococcosis, and food-borne trematodes
- *Taenia solium*
  - Target product profile for taeniasis, neurocysticercosis and porcine cysticercosis in September 2017 issue of PLoS NTD.
  - In humans, a specific point-of-care test is needed that can differentiate people with viable versus non-viable cysts; a challenge is the high number of people transiently antibody or antigen positive in absence of clinically relevant cysticercosis.
  - Porcine diagnostics need to be more sensitive.
- Echinococcosis
  - Need serological diagnostics to support imaging and provide information about whether drug treatment is successful.
  - Challenge is high rate of discordant serology that leads to needing multiple tests for diagnosis.
  - Challenges in livestock and dogs are weak and discordant serological responses, and the risk of cross-reaction from taeniid co-infections.
- Food-borne trematodes
  - Diagnosis by egg detection is variable in sensitivity and only possible in chronic infections
  - Need a sensitive serological test that can distinguish between past and current infections.

**Anthony Solomon: An integrated diagnostics system for post elimination surveillance anchored on trachoma elimination**

- Trachoma elimination programs routinely carry out epidemiologically robust surveys involving children and adults that can be exploited by other disease control programs.
  - Data collected electronically with information about household water access and sanitation
- Integration of surveillance for other diseases is possible by adding collection of other sample types (e.g. stool, saliva, urine).
- Blood from finger prick dried onto filter paper is an extremely cheap and beneficial sample type to collect
  - Can be used in multiplex serological assays to collect data on multiple diseases
  - Can collect blood spots and store them for monitoring trends over time or to validate new biomarkers or diagnostics

**CHALLENGES/KNOWLEDGE GAPS IDENTIFIED**

- Characterization of antibody responses in urine would be beneficial as it is easy and non-invasive to collect and has already shown utility detecting some NTDs like schistosomiasis and strongyloidiasis.
- Identify organization to drive agenda and push for integrated surveillance using currently available methods. It is likely that agendas will have to be customized to specific regions due to complexity of multiple elimination programs.
- Identify how the tools available now can be used to advance elimination goals and what needs exist that newer technology will need to address.

**RECOMMENDED NEXT STEPS**

There is a need for

- Leadership and commitment of countries to drive agenda to set recommendations and guidelines for integrated diagnostic platforms.
- Coordination of sample collection in study platforms currently being utilized to maximize use of resources.
- Active identification of existing data, public and private partners and technology that can be exploited for cost-effective diagnostic development since market is not financially incentivized to do this on its own.