S172

2-hour Symposium

Towards malaria elimination

Malaria diagnostics

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Malaria is a preventable and treatable parasitic disease. However, many symptoms like fever, headache or fatigue mimic other common diseases and thus effective diagnostic tests are desirable/needed to guide treatment. Diagnostic testing is essentially used to confirm the clinical suspicion of malaria in sick individuals who present with compatible symptoms. Since the advent of artemisinin-combination-therapy (ACT), diagnostic testing has also been increasingly adopted in resource poor settings, where diagnostic tests are often lacking and treatment was/is presumptive, based on clinical diagnosis.

For decades light microscopy of Giemsa stained samples has been the diagnostic standard. Antigen detection (RDTs), almost a paradigm of a point-of-care (POC) test, is being increasingly used for diagnosis. Molecular methods show excellent sensitivity and species identification but are rather back-up test in clinical settings and more used in epidemiology and research settings.

The most important aspects/characteristics of malaria diagnostic tests are: (i) the limit of detection of parasites (LOD), (ii) species identification, (iii) determination of parasitaemia (parasite load), (iv) simplicity of use, turnaround time and interpretation, (v) need for reagents (costs, quality, storage), (vi) need for equipment (initial cost, maintenance, repair, electricity, need for laboratory infrastructure), (vi) quality control of testing, (vii) non-invasive testing (urine, saliva, “through skin”) and (viii), the question if it is truly a POC test.

Although malaria diagnostics serve to distinguish infected from uninfected individuals in a clinical setting, diagnostic tests are also important in malaria surveillance activities, especially in the light of elimination strategies. This includes studies on malaria prevalence and as elimination efforts proceed, tests are necessary which detect low-level transmission and thus also detect asymptomatic infections.

Other areas for diagnostic tests include the detection of malaria in pregnancy, tests that assist with the differential diagnosis of fever (non-malarial causes of fever); tests for the liver stage of P. vivax, and tests in the field of blood transfusions. One might want to add sensitivity testing to this list, especially facing the possible threat of resistance to ACT.

Several new approaches have been developed or are under development to address these issues. High-volume-PCR may decrease the LOD significantly while LAMP certainly simplifies molecular methods. Other approaches use microfluidics, often combined with some type of molecular detection, adaptable to small portable POC style instruments. Malaria pigment (hemozoin) is the target of methods because it can be detected without the need for reagents, which might allow to reduce costs per test significantly.

Finally, test results have to translate into clinical decision making, especially in cases of non-malaria causes for disease. Negative malaria results may be ignored and the patient treated regardless, because no further tests are available for sick individuals. As malaria cases decrease this aspect may become an important part of any elimination strategy.