Rapid test for glucose-6 phosphate dehydrogenase enzyme deficiency

**Needs**

There are 2.5 billion people at risk of infection with *Plasmodium vivax* and an estimated 80 to 300 million clinical cases every year. Primaquine and tafenoquine, both part of the 8-aminoquinoline drug family, represent current and emerging radical cure treatment options for *P. vivax*. This class of drugs targets the liver stage (hypnozoite) of the parasite and as such reduces the risk of relapse.

However, 8-aminoquinolines exert oxidative stress on red blood cells. Red blood cells from patients with compromised levels of the enzyme glucose-6-phosphate dehydrogenase (G6PD) cannot tolerate this oxidative pressure, which causes intracellular damage and may result in acute hemolysis. Symptoms of this drug-induced hemolytic syndrome range from nausea, vomiting, and headache to renal failure and death, depending on the degree of G6PD enzyme deficiency and concomitant phenotypic variables. Deficiency in the G6PD enzyme affects over 400 million people worldwide, and more than 140 mutations in the X-linked G6PD gene have been described to date. The prevalence of G6PD mutations is highest in populations residing in regions that are historically malaria endemic.

Safe and wide-scale adoption of 8-aminoquinoline-based antimalarials relies on the availability of low-cost, point-of-care diagnostic tests for G6PD deficiency. While several tests are commercially available, very few have been rigorously evaluated, and most are not practical for use at the point of care for malaria case management.

**Goals**

The goal of this project is to assess the performance and operational characteristics of rapid diagnostic tests for point-of-care screening of G6PD deficiency and to make recommendations on these technologies to guide the donor, private-sector, and user community.

**Approach**

To do this, PATH is working with key stakeholders to identify the priority use case scenarios for G6PD testing in support of malaria case management. From this PATH is developing minimally acceptable product specifications and requirements G6PD deficiency tests along with guidelines for evaluation of new tests in the field. PATH is using this information to search the commercial and academic landscape for promising candidate tests and to partner with National Malaria Control Programs to carry out evaluation of performances, user interface, modes of failure, and fully burdened cost of these tests.

Data from this evaluation will be used to create a set of recommendations that may include support of use of an existing test(s), further adaptation/modification of existing test(s), combinations of rapid and laboratory test(s) for confirmation, or development of a new test(s) to better meet the needs of health workers involved in malaria case management in the developing world.

**Status & Next Steps**

PATH is currently performing laboratory evaluations of over ten commercial G6PD tests. The results of these evaluations will be used to develop standards by which the scientific community can evaluate G6PD tests.

Standards by which the suitability of adoption of current tests to support malaria treatment use case scenarios will be established. These standards will be validated in field evaluations. Diagnostic test developers will be engaged in efforts to develop point-of-care G6PD tests that more closely fit the needs of the malaria community.

**Acknowledgements & Contacts**

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