How to use a
G6PD Rapid Diagnostic Test

(for detecting glucose-6-phosphate dehydrogenase deficiency)

A guide for training at health facility level

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NOTE ON MODIFYING THIS MANUAL TO SUIT YOUR COUNTRY'S MALARIA CONTROL POLICIES

This manual and the accompanying material are designed to train health workers in the safe and accurate use of the glucose-6-phosphate dehydrogenase (G6PD) rapid diagnostic tests (RDT) following a diagnosis of *Plasmodium vivax* infection. The manual is targeted for a health facility level that has the capacity to safely administer and monitor a 2 week primaquine treatment regimen for radical cure of *P. vivax*. National guidelines for treatment of vivax malaria differ between countries and therefore will not be covered in this manual. Workers will also need separate training in case management for radical cure of *P. vivax* in G6PD normal and G6PD deficient individuals.

RDT formats and protocols can vary. These instructions and the accompanying job aid presented in this manual were designed based on examples of commercially available G6PD RDT products. Therefore, it may be necessary to modify the training and job aid to fit the brand and type of RDT you are using. Particular sections of the training that might need modification include:

- Sections 2.6.3, 2.10, 2.11, and 2.13 on where to add blood and buffer;
- Section 2.16 and Section 5 on interpreting test results.

WHO can assist with these modifications. (Contact Malaria_rdt@who.int)

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Glossary of acronyms

AFRO.....WHO – Regional Office for Africa

ALRI.....Acute lower respiratory infection

AQ ..... Amodiaquine

CHW .....Community health worker

DHMT ..... District health management teams

FIND……Foundation for Innovative New Diagnostics

FST…… ..... Fluorescent spot test

G6PD……..…… Glucose-6-phosphate dehydrogenase

GMP……World Health Organization, Global Malaria Programme

NADPH…… Nicotinamide adenine dinucleotide phosphate

RDT..... Rapid diagnostic test

Introduction to trainers on the use of this manual

Purpose

The purpose of this manual is to train health workers to use G6PD rapid diagnostic tests (RDTs) safely and effectively, so as to inform appropriate decision making for *P. vivax* radical cure. The original malaria RDT manual from which this specific manual was adapted, was tested in Zambia with the Zambian National Malaria Control Centre and Zambian community health workers (CHWs).

This manual should be used with the accompanying job aid. The job aid is a set of step-by-step instructions about how to use a G6PD RDT. It contains both words and pictures. You will find a small version of the job aid at the end of this manual. At the end of the training, you should give each participant one or more copies of the job aid to take with them. Participants should use the job aid whenever they perform a G6PD RDT. Without the job aid, the material in this manual will not provide sufficient training. ***You should not conduct the training without the job aid.***

The training takes approximately 3 hours. Based on malaria RDT field testing, this training, ***if used with the accompanying job aid***, should be sufficient to enable most health workers to use G6PD RDTs correctly and safely. However, RDT use should be monitored in the field to ensure good diagnostic practice and blood safety. Further revision of the material may occur following field experience and feedback. We welcome your comments and suggestions. Please send them as an email to: *Malaria_rdt@who.int*. The ideal group size for the training is 10–15 health workers. Conducting the training with more than 15 participants makes it difficult for a single trainer to provide sufficient attention to each participant, particularly during sections 4 and 5. If you plan to use this material with a group larger than 15, it is strongly recommended that you work with one or more assistants who have experience using RDTs and can help you provide one-on-one attention to participants. Even with smaller groups, it would be helpful to have one or more assistants available.

What this manual contains

This manual provides step-by-step instructions for carrying out the training. The table of contents lists each section. The manual also contains a small version of the job aid, a list of frequently asked questions, sample RDTs and answer keys for those samples.

The different styles of type in this manual indicate different things:

Normal type like this is used to explain parts of the training to you, the trainer, and to describe learning objectives, activities, and sometimes specific things you should say to training participants. In some cases, this will include sentences you can read directly to participants.

Blue italic type in a box like this is used to indicate instructions to you, the trainer, about how to manage the training or what to do in a particular situation. These instructions are NOT meant to be read to participants. For example, an instruction of this type might say 'Remind participants to consult national guidelines on use of primaquine for radical cure of P. vivax infection in G6PD deficient individuals.'

Green italic type with a red arrow pointing to it like this highlights areas that may cause difficulty or require special attention. The arrow followed by light italic type may also contain tips about how to resolve or avoid particular problems or overcome barriers.

Purple text like this refers to questions that the trainer can ask the trainees to test their knowledge in important areas.

Text in coloured frames like this relates to topics or activities a trainer needs to cover during each section of the training.

How to use the manual

Before conducting this training, you should have enough experience using the RDT and job aid to feel comfortable carrying out each step of the test safely and correctly. You should also have a good knowledge of national policy on safe radical cure of *P. vivax* in G6PD deficient and G6PD normal individuals. If you have not used the RDT or job aid, you should seek training from someone with experience.

Once you have become comfortable and familiar with the RDT and job aid and understand national policy on radical cure of *P. vivax* infection, read through the entire manual one or more times before conducting the training. Review the learning objectives and presentation material in each section. Notes on common errors and difficulties observed during development of this material are included. You may find these notes useful during your preparation and presentation. In several sections, model answers are given to frequently asked questions from trainees. These model answers are set off from the rest of the text in boxes. You may use them directly as written to work through these important issues with trainees or as a guide to ensure all these important issues are addressed in each section of the training programme. In some cases, it may be appropriate for you to adapt the model answers to reflect national management policy and the specific RDT product in use.

break, resulting in haemolysis. G6PD deficiency is a metabolic disorder arising from genetic defects in the G6PD gene. The deficiency results in a breakdown of red blood cells (haemolysis) when the individual is exposed to particular medications eg. primaquine, pathogens or foods.

Upon exposure to an oxidative substance, symptoms may vary in severity and range from asymptomatic to, fatigue, rapid heartbeat, blood in urine, shock, heart failure, jaundice, and acute haemolytic anaemia (AHA) caused by premature destruction of red blood cells, which can result in death.

G6PD deficiency is the most common inherited sex linked enzyme deficiency, that affects more than 400 million people worldwide, and mostly populations throughout Africa, Asia, The Mediterranean and the Middle East *(4,6)*. Deficiency is inherited on the X chromosome and since males have just one X chromosome, they can be hemizygous G6PD normal or hemizygous G6PD deficient. Full manifestation of the deficiency (<10% of normal G6PD activity) will be seen in male hemizygotes (see Figure 1). *(1)*

Since females have two X chromosomes, they may be homozygous normal, homozygous deficient or heterozygous (see Figure 1). Full manifestation of the deficiency (<10% of normal G6PD activity) will be seen in female homozygous deficient individuals *(1)*. Those who are heterozygous carry deficiency on one gene, but not the other. During lyonization in early development, one X chromosome is switched off in each cell. Which X chromosome is deactivated is random and varies, therefore, heterozygous females can show an intermediate range of deficiency which