Malaria Rapid Diagnostic Test Performance

Results of WHO product testing of malaria RDTs: Round 2 (2009)

 \diamond









For research on diseases of poverty UNICEF · UNDP · World Bank · WHO

Malaria Rapid Diagnostic Test Performance

Results of WHO product testing of malaria RDTs: Round 2 (2009)









For research on diseases of poverty UNICEF · UNDP · World Bank · WHO

WHO Library Cataloguing-in-Publication Data :

Malaria rapid diagnostic test performance: results of WHO product testing malaria RDTs: round 2 (2009).

1.Malaria - diagnosis. 2.Antimalarials - therapeutic use. 3.Malaria - drug therapy. 4.Diagnostic tests, Routine. 5.Reagent kits, Diagnostic - utilization.. 6.Sensitivity and specificity. I.UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. II.Centers for Disease Control (U.S.). III.Foundation for Innovative New Diagnostics.

ISBN 978 92 4 159946 7

(NLM classification: WC 750)

Copyright © World Health Organization on behalf of the Special Programme for Research and Training in Tropical Diseases 2010

All rights reserved.

The use of content from this health information product for all non-commercial education, training and information purposes is encouraged, including translation, quotation and reproduction, in any medium, but the content must not be changed and full acknowledgement of the source must be clearly stated. A copy of any resulting product with such content should be sent to TDR, World Health Organization, Avenue Appia, 1211 Geneva 27, Switzerland. TDR is a World Health Organization (WHO) executed UNICEF/UNDP/World Bank/World Health Organization Special Programme for Research and Training in Tropical Diseases.

This information product is not for sale. The use of any information or content whatsoever from it for publicity or advertising, or for any commercial or income-generating purpose, is strictly prohibited. No elements of this information product, in part or in whole, may be used to promote any specific individual, entity or product, in any manner whatsoever.

The designations employed and the presentation of material in this health information product, including maps and other illustrative materials, do not imply the expression of any opinion whatsoever on the part of WHO, including TDR, the authors or any parties cooperating in the production, concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delineation of frontiers and borders. Mention or depiction of any specific product or commercial enterprise does not imply endorsement or recommendation by WHO, including TDR, the authors or any parties cooperating in the production, in preference to others of a similar nature not mentioned or depicted.

The views expressed in this health information product are those of the authors and do not necessarily reflect those of WHO, including TDR. WHO, including TDR, and the authors of this health information product make no warranties or representations regarding the content, presentation, appearance, completeness or accuracy in any medium and shall not be held liable for any damages whatsoever as a result of its use or application. WHO, including TDR, reserves the right to make updates and changes without notice and accepts no liability for any errors or omissions in this regard. Any alteration to the original content brought about by display or access through different

media is not the responsibility of WHO, including TDR, or the authors. WHO, including TDR, and the authors accept no responsibility whatsoever for any inaccurate advice or information that is provided by sources reached via linkages or references to this health information product.

Layout: Bruno Duret

Printed in Philippines

ഗ	ACKNOWLEDGEMENTS	VIII
Jt	ABBREVIATIONS	Х
Contents	 SUMMARY PEFORMANCE OF MALARIA RDTS WHO PRODUCT TESTING: ROUNDS 1 AND 2 I.1. Introduction The WHO Product Testing Programme Results of the Evaluation Summary of outcomes Use of these Results 	5: 1 1 2 3 3
	 2. WHO MALARIA RDT PRODUCT TESTING: ROUND 2 EXECUTIVE SUMMARY 2.1. Introduction 2.2. The WHO Product Testing Programme 2.3. Results of the Evaluation 2.4. Use of these Results 	11 11 11 11 12
	3. BACKGROUND	13
	4. OBJECTIVE	14
	 5. MATERIALS AND METHODS 5.1. Test selection 5.2. Outline of the Product Testing Protocol 5.3. Evaluation panels 5.4. RDT registration 5.5. Specimen panel registration 5.6. Test phases 5.7. Performing rapid tests 5.8. Interpretation of results 	15 16 16 17 17 18 18 18
	6. DATA MANAGEMENT	19
	7. QUALITY ASSURANCE	20
	8. ETHICAL CONSIDERATIONS	20
	 9. DATA ANALYSIS 9.1. Measures of parasite detection: parasite detection score and positivity rates 9.2. False-positive results 9.2.1. Incorrect species identification 9.2.2. False-positives from <i>Plasmodium</i>-negative samples 9.3. Band intensity 9.4. Lot agreement 9.5. Invalid tests 	21 21 21 21 21 21 21 21 21 22
	9.6. Heat (thermal) stability	22

10. LABORATORY VERSUS FIELD-BASED	
MALARIA RDT EVALUATIONS	

MALARIA RDT EVALUATIONS	22
 11. RESULTS 11.1. Summary 11.2. Phase 1 - P. falciparum culture panel 11.3. Phase 2 - Wild-type P. falciparum and P. vivax and Plasmodium spp. negative samples 11.3.1. P. falciparum detection 11.3.2. P. vivax detection 11.3.3. Combined detection of P. falciparum and P. vivax 11.3.4. P. falciparum and P. vivax positivity rate 11.3.5. Band intensity 11.3.6. False-positive rates 	 23 23 26 27 27 28 29 29 30 31
12. HEAT STABILITY 12.1. <i>P. falciparum</i> test lines 12.2. Pan-specific test lines	33 35 37
13. EASE OF USE DESCRIPTION	38
 14. DISCUSSION OF KEY FINDINGS 14.1. Panel Detection Score (PDS) and its relationship to sensitivity 14.2. False-positive rate and specificity 14.3. Heat (thermal) stability 14.4. Ease of use description 14.5. Inter-lot variability 14.6. Target antigens and species 	41 42 42 43 43 43
 15. USING THESE RESULTS TO ENSURE QUALITY OF DIAGNOSIS IN THE FIELD 15.1. Beyond procurement 15.2. Lot testing 16. CONCLUSIONS 	44 44 45 45
17. REFERENCES	46
ANNEXES Annex 1: Characteristics of malaria rapid diagnostic tests in the evaluation	47 48
Annex 2: malaria RDT guide to results interpretation Annex 3: Phase 1 results Annex 4: Phase 2 results Annex 5: Example algorithm for selecting a malaria RDT Annex 6: Introducing RDT-based malaria diagnosis into national programmes	50 60 62 78 80

FIGURES

- **Figure S1:** Malaria RDT performance in Phase 2 of Rounds 1 and 2 against wild-type (clinical) samples containing *P. falciparum* at low (200) and high (2000 or 5000) parasite densities (parasites/µl) and clean-negative samples
- **Figure S2:** Malaria RDT performance in Phase 2 of Rounds 1 and 2 against wild-type (clinical) samples containing *P. vivax* at low (200) and high (2000 or 5000) parasite densities (parasites/µl) and clean-negative samples
- Figure 1: Mode of action of antigen-detecting malaria RDTs
- Figure 2: Network of specimen collection, characterization and testing sites
- Figure 3: Malaria RDT Product Testing Overview
- Figure 4a: Origin of Phase 2 *P. falciparum* wild-type (clinical) samples
- Figure 4b: Origin of Phase 2 *P. vivax* wild-type (clinical) samples
- Figure 5: Testing procedure and calculation of 'panel detection score' and band intensity for Product A against a sample density of 200 parasites/µl
- Figure 6: Testing procedure and calculation of 'panel detection score' and band intensity for Product A against a sample density of 2000 parasites/µl
- **Figure 7:** Phase 1 *P. falciparum* panel detection score of malaria RDTs at low (200) and high (2000) parasite densities (parasites/µl) according to target antigen type (HRP2 or pLDH)
- **Figure 8:** Phase 2 *P. falciparum* panel detection score of malaria RDTs at low (200) and high (2000) parasite density (parasites/µl) according to target antigen type (HRP2 or pLDH)
- **Figure 9:** Phase 2 *P. vivax* panel detection score of malaria RDTs at low (200) and high (2000) parasite densities (parasites/µl) according to target antigen type (aldolase, pLDH, aldolase + pLDH)
- Figure 10: Phase 2 P. falciparum panel detection score and positivity rate at 200 parasites/µl
- Figure 11: Phase 2 *P. vivax* panel detection score and positivity rate at 200 parasites/µl
- Figure 12: Phase 2 P. falciparum (P. falciparum test line) false-positive rate against clean-negative samples
- Figure 13: Phase 2 Plasmodium spp. (pan or P. vivax test line) false-positive rate against clean-negatives
- Figure 14: Phase 2 *P. falciparum* false-positive rate versus *P. falciparum* panel detection score at low (200) parasite density (parasites/µl)
- Figure 15: Phase 2 P. vivax false-positive rate versus P. vivax panel detection score at low (200) parasite density (parasites/µl)
- **Figure 16:** Heat stability of *P. falciparum* specific test line of *P. falciparum* only tests against a low density *P. falciparum* sample (200 parasites/µl). Positivity rate at baseline, and after 60 days incubation
- Figure 17: Heat stability of *P. falciparum* specific test line of *P. falciparum* tests against a high density *P. falciparum* sample (2000 parasites/µl). Positivity rate at baseline, and after 60 days incubation
- **Figure 18:** Heat stability of *P. falciparum* specific test line in combination tests against a low density *P. falciparum* sample (200 parasites/µl). Positivity rate at baseline, and after 60 days incubation
- **Figure 19:** Heat stability of *P. falciparum* specific test line in combination tests against a high density *P. falciparum* sample (2000 parasites/µl). Positivity rate at baseline, and after 60 days incubation
- **Figure 20:** Heat stability of pan-line of pan-specific tests against a low density *P. falciparum* sample (200 parasites/µl). Positivity rate at baseline, and after 60 days incubation
- **Figure 21:** Heat stability of pan-line of pan-specific tests against a high density *P. falciparum* sample (2000 parasites/µl). Positivity rate at baseline, and after 60 days incubation
- Figure 22: Heat stability of pan-line of combination tests against a low density *P. falciparum* sample (200 parasites/µl). Positivity rate at baseline, and after 60 days incubation
- **Figure 23:** Heat stability of pan-line of combination tests against a high density *P. falciparum* sample (2000 parasites/µl). Positivity rate at baseline, and after 60 days incubation.
- Figure A6.1: Example malaria RDT implementation budget

TABLES

Table S1: Malaria RDT Phase 2 performance in Rounds 1 and 2 against wild-type (clinical) samples containing P. falciparum and P. vivax at low (200) and high (2000 or 5000) parasite densities (parasites/µl) and cleannegative samples Table S2: Malaria RDT Rounds 1 and 2 heat stability results on a cultured P. falciparum sample at low (200) and high (2000) parasite density (parasites/ml). Positivity rate at baseline, and after 60 days incubation at 35°C and 45°C Table 1: Manufacturers and products accepted into Round 2 of WHO Malaria RDT Product Testing Programme Table 2: Characteristics of *Plasmodium* spp. negative specimens Table 3: Summary Phase 1 performance of malaria RDTs against 20 cultured P. falciparum lines at low (200) and high (2000) parasite densities (parasites/ μ l) Table 4: Summary Phase 2 performance of malaria RDTs against wild-type (clinical) P. falciparum and P. vivax samples at low (200) and high (2000) parasite densities (parasites/µl) and Plasmodium spp. negative samples Table 5: Heat stability testing results for 27 malaria RDTs on a cultured P. falciparum sample at low (200) and high (2000) parasite densities (parasites/ μ I). Positivity rate at baseline, and after 60 days incubation at 35°C and 45°C Table 6: Ease of use description of 29 malaria RDTs Table A3.1: Lot variability in positive results against P. falciparum culture samples at low (200) and high (2000 or 5000) parasite densities (parasites/µl) Distribution of test band intensity scores (0-4) against Phase 1 P. falciparum cultured parasites at low (200) Table A3.2: and high (2000) parasite densities (parasites/ μ l) Lot variability in positive results against Phase 2 wild-type P. falciparum and P. vivax samples at low (200) Table A4.1: and high (2000) parasite densities (parasites/ μ l) Distribution of test band intensity (0-4) scores against Phase 2 wild-type P. falciparum samples at low (200) Table A4.2: and high (2000) parasite densities (parasites/ μ l) Table A4.3: Distribution of Pan/Pv test band intensity (0-4) scores for Phase 2 wild-type P. vivax samples at low (200) and high (2000) parasite densities (parasites/µl) Table A4.4: Panel detection score of Phase 2 wild-type P. falciparum in low (200) and high (2000) parasite densities $(parasites/\mu I)$ by continent Phase 2 P. falciparum test line false-positive rates for wild-type P. vivax samples at low (200) and high (2000) Table A4.5: parasite densities (parasites/µl) Phase 2 Pan (or P. vivax) test line false-positive rate for non Pf infection on wild-type P. falciparum samples Table A4.6: at low (200) and high (2000) parasite densities (parasites/µl)

预览已结束,完整报告链接和二维码如下:



https://www.yunbaogao.cn/report/index/report?reportId=5 29132