

MALARIA TESTING 2022

INTRODUCTION

Malaria can be acquired during travel to an area where malaria is endemic. These areas may expand or change with seasonal rains. The malaria risk areas in South Africa have experienced good rainfall during the pre-malaria season, and rains are expected to last throughout the summer. On rare occasions, malaria may be transported from a risk area, so called 'taxi malaria'. Therefore, any patient with unexplained fever must be tested for malaria, even in the absence of a recent travel history. Malaria infection rates are already on the increase and are anticipated to rise as the season progresses.

LABORATORY TESTING FOR SUSPECTED MALARIA

The test or test panels that are chosen usually depend on the clinical findings, travel history, other laboratory findings, as well as possible financial constraints (Table 1).

TABLE 1: AVAILABLE MALARIA TESTS

Mnemonic	Test	Perform site
Standalone tests		
MALA	Rapid antigen detection test (RDT)	All
MA	Peripheral blood smears (PBS)	All
QBCN	Automated flow cytometry (XN31)	Centurion and high-risk areas
MALPCR	Malaria PCR	Centurion and high-risk areas
MALIDPCR	Malaria identification PCR	Centurion only
Combination tests		
MAL	RDT+PBS	All
MALQ	RDT+PBS+automated flow cytometry	See above

Even though standalone tests may be used to confirm the diagnosis of malaria, they have limitations (Table 2). Good diagnostic practice favours the use of malaria test combinations to enhance prompt and correct diagnosis.

The gold standard of malaria diagnosis, according to the World Health Organization (WHO), remains peripheral blood smears (PBS). The accuracy of a reported PBS is linked to the experience of the technician in the laboratory.

If the PBS is negative, the diagnosis of malaria is unlikely. However, the PBS should be repeated every six to 12 hours for 48 hours if malaria is still clinically suspected, especially if antimalarials, or antibiotics that have anti-malaria activity such as fluoroquinolones, tetracyclines or cotrimoxazole, have been taken recently. It is recommended that the PBS is interpreted with RDT tests and vice versa, where possible. All Ampath sites offer both PBS and RDT testing.

Specific indications to add automated flow cytometry, malaria PCR and malaria ID PCR tests are listed in Table 2. These tests are more costly and may have longer turnaround times, depending on where they are offered (Table 1). For a quick reference guide, refer to Table 3.

TABLE 2: ADVANTAGES AND LIMITATIONS OF AVAILABLE MALARIA TESTS

Tests	Advantages	Limitations
Rapid antigen detection (RDT)	<ul style="list-style-type: none"> • Suitable for diagnosis and confirmation of infection • Quick turnaround time • Low cost • LOD: 100 parasites/µl 	<ul style="list-style-type: none"> • False positives may occur, recommend to use with PBS • Test may remain positive for two weeks after treatment • False negatives can occur with low parasitemia and certain non-Pf species • Limited speciation, not always possible • Cannot distinguish between non-Pf species • Not suitable for treatment follow up
Thick smear	<ul style="list-style-type: none"> • Suitable for diagnosis and confirmation of infection • More sensitive compared to thin smears • Different stages may be detected • Low cost 	<ul style="list-style-type: none"> • False negatives: Detection depends on technologist expertise • Slower turnaround time: 100–400 fields are examined before a negative result is reported
Thin smear	<ul style="list-style-type: none"> • Suitable for diagnosis and confirmation of infection • Facilitates speciation and quantification of infected RBCs (treatment follow up) • Ring forms and other life stages can be detected • Low cost 	<ul style="list-style-type: none"> • Detection and interpretation depends on the technologist's expertise • Less sensitive compared to thick smears
Automated flow cytometry based (XN31) Indication to add this test: 1. Discrepant results (Ag/smears) 2. Unclear speciation 3. Confirmation of percentage malaria infection	<ul style="list-style-type: none"> • Suitable for diagnosis and quantification of infected RBCs (treatment follow up) • High sensitivity and specificity (LOD: 20 parasites/µl) • Includes blood smear • Can report FBC (without WBC differentiation) • Low false positive rate • Speciation 	<ul style="list-style-type: none"> • Sample only stable for 48 hours at 2–8°C • Can only distinguish between Pf and non Pf species and NOT between non-Pf species • Turnaround time depends on when it reaches the testing laboratory • More expensive compared to PBS and RDT
Malaria PCR Indication to add this test: 1. To exclude false positives 2. To exclude false negatives where there is high clinical suspicion, but negative antigen and/or smears	<ul style="list-style-type: none"> • Suitable for diagnosis • High sensitivity (similar to flow cytometry) 	<ul style="list-style-type: none"> • Test can remain positive for weeks after successful treatment • Turnaround time depends on when it reaches the testing laboratory • More expensive compared to PBS and RDT
Malaria ID PCR Indication to add this test: 1. For speciation where there is a low parasitaemia or suspected mixed infection	<ul style="list-style-type: none"> • Suitable for accurate speciation of <i>P. falciparum</i>, <i>P. malariae</i>, <i>P. ovale</i> and <i>P. vivax</i> • High sensitivity (similar to flow cytometry) 	<ul style="list-style-type: none"> • Does not detect <i>P. knowlesi</i> • Turnaround time depends on when it reaches the testing laboratory • More expensive compared to PBS and RDT

RBC = Red blood cells; LOD = Limit of detection; WBC = White blood cells

Please note QBC (buffy coat fluorescence) is no longer available.

TABLE 3: QUICK REFERENCE GUIDE

Tests	LOD	Diagnosis	Speciation	Follow up
RDT	100 parasite/µl	Yes	Yes (limited)	No
Thick smear	Approximately 50–500 parasites/µl (dependent on technologist's expertise)	Yes	No	No
Thin smear	Depends on technologist's expertise	Yes	Yes	Yes
Malaria PCR	Similar to flow cytometry	Yes	No	No
Malaria ID PCR	Similar to flow cytometry	Yes	Yes (accurate)	No

For more information, contact your local Ampath representative.