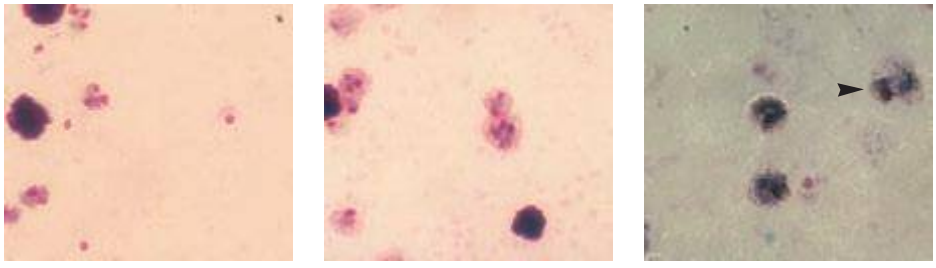
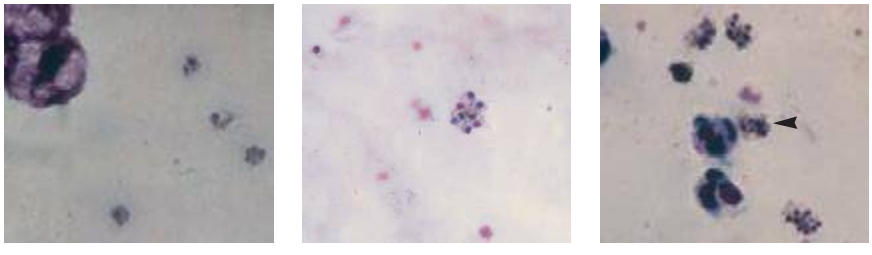


A B C

FIGURE 248-8 **Thick blood films of *Plasmodium ovale*. *A.*** Trophozoites. ***B.*** Schizonts. ***C.*** Gametocytes. *(Reproduced from Bench Aids for the Diagnosis of Malaria Infections, 2nd ed, with the permission of the World Health Organization.)*



A B C

FIGURE 248-9 **Thick blood films of *Plasmodium malariae*. *A.*** Trophozoites. ***B.*** Schizonts. ***C.*** Gametocytes. *(Reproduced from Bench Aids for the Diagnosis of Malaria Infections, 2nd ed, with the permission of the World Health Organization.)*

TABLE 248-5 STANDARD METHODS FOR THE DIAGNOSIS OF MALARIA[a]

Method	Procedure	Advantages	Disadvantages
Thick blood film[b]	Blood should be uneven in thickness but thin enough that the hands of a watch can be read through part of the spot. Stain dried, unfixed blood spot with Giemsa, Field's, or another Romanowsky stain. Count number of asexual parasites per 200 WBCs (or per 500 at low densities). Count gametocytes separately.[c]	Sensitive (0.001% parasitemia); species specific; inexpensive	Requires experience (artifacts may be misinterpreted as low-level parasitemia); underestimates true count
Thin blood film[d]	Stain fixed smear with Giemsa, Field's, or another Romanowsky stain. Count number of RBCs containing asexual parasites per 1000 RBCs. In severe malaria, assess stage of parasite development and count neutrophils containing malaria pigment.[e] Count gametocytes separately.[c]	Rapid; species specific; inexpensive; in severe malaria, provides prognostic information[e]	Insensitive (<0.05% parasitemia); uneven distribution of *P. vivax*, as enlarged infected red cells concentrate at leading edge
PfHRP2 dipstick or card test	A drop of blood is placed on the stick or card, which is then immersed in washing solutions. Monoclonal antibody capture of parasitic antigens reads out as a colored band.	Robust and relatively inexpensive; rapid; sensitivity similar to or slightly lower than that of thick films (~0.001% parasitemia)	Detects only *Plasmodium falciparum*; remains positive for weeks after infection[f]; does not quantitate *P. falciparum* parasitemia
Plasmodium LDH dipstick or card test	A drop of blood is placed on the stick or card, which is then immersed in washing solutions. Monoclonal antibody capture of parasitic antigens reads out as two colored bands. One band is genus specific (all malarias), and the other is specific for *P. falciparum*.	Rapid; sensitivity similar to or slightly lower than that of thick films for *P. falciparum* (~0.001% parasitemia)	Slightly more difficult preparation than PfHRP2 tests; may miss low-level parasitemia with *P. vivax*, *P. ovale*, and *P. malariae* and may not speciate these organisms; does not quantitate *P. falciparum* parasitemia
Microtube concentration methods with acridine orange staining	Blood is collected in a specialized tube containing acridine orange, anticoagulant, and a float. After centrifugation, which concentrates the parasitized cells around the float, fluorescence microscopy is performed.	Sensitivity similar or superior to that of thick films (~0.001% parasitemia); ideal for processing large numbers of samples rapidly	Does not speciate or quantitate; requires fluorescence microscopy

[a]Malaria cannot be diagnosed clinically with accuracy, but treatment should be started on clinical grounds if laboratory confirmation is likely to be delayed. In areas of the world where malaria is endemic and transmission is high, low-level asymptomatic parasitemia is common in otherwise healthy people. Thus malaria may not be the cause of a fever, although in this context the presence of >10,000 parasites/μL (~0.2% parasitemia) does indicate that malaria is the cause. Antibody and polymerase chain reaction tests have no role in the diagnosis of malaria except that PCR is increasingly used for genotyping and speciation in mixed infections and for detection of low-level parasitemias in asymptomatic residents of endemic areas. [b]Asexual parasites/200 WBCs × 40 = parasite count/μL (assumes a WBC count of 8000/μL). See Figs. 248-6 through 248-9. [c]*P. falciparum* gametocytemia may persist for days or weeks after clearance of asexual parasites. Gametocytemia without asexual parasitemia does not indicate active infection. [d]Parasitized RBCs (%) × hematocrit × 1256 = parasite count/μL. See Figs. 248-4 and 248-5. [e]The presence of >100,000 parasites/μL (~2% parasitemia) is associated with an increased risk of severe malaria, but some patients have severe malaria with lower counts. At any level of parasitemia, the finding that >50% of parasites are tiny rings (cytoplasm thickness less than half of nucleus width) carries a relatively good prognosis. The presence of visible pigment in >20% of parasites or of phagocytosed pigment in >5% of polymorphonuclear leukocytes (indicating massive recent schizogony) carries a worse prognosis. [f]Persistence of PfHRP2 is a disadvantage in high-transmission settings, where many asymptomatic people have positive tests, but can be used to diagnostic advantage in low-transmission settings when a sick patient has previously received unknown treatment (which, in endemic areas, often consists of antimalarial drugs). A positive PfHRP2 test indicates that the illness is falciparum malaria, even if the blood smear is negative.

Abbreviations: LDH, lactate dehydrogenase; PfHRP2, *P. falciparum* histidine-rich protein 2; RBCs, red blood cells; WBCs, white blood cells.