

Plasmodium spp.

Determination of Parasitemia

Determination of parasitemia can be done using both thick and thin smears.

Thick smears:

The number of parasites/ μ L of blood is determined by enumerating the number of parasites in relation to the standard number of WBCs/ μ L (8000).

$$\begin{aligned} &\text{No. Parasites} \times (8000 \div \text{No. WBCs counted}) \\ &= \text{No. parasites per } \mu\text{L of blood} \end{aligned}$$

Thin smears:

The percent of infected RBCs is determined by enumerating the number of infected RBCs in relation to the number of uninfected RBCs. A minimum of 500 RBCs total should be counted.

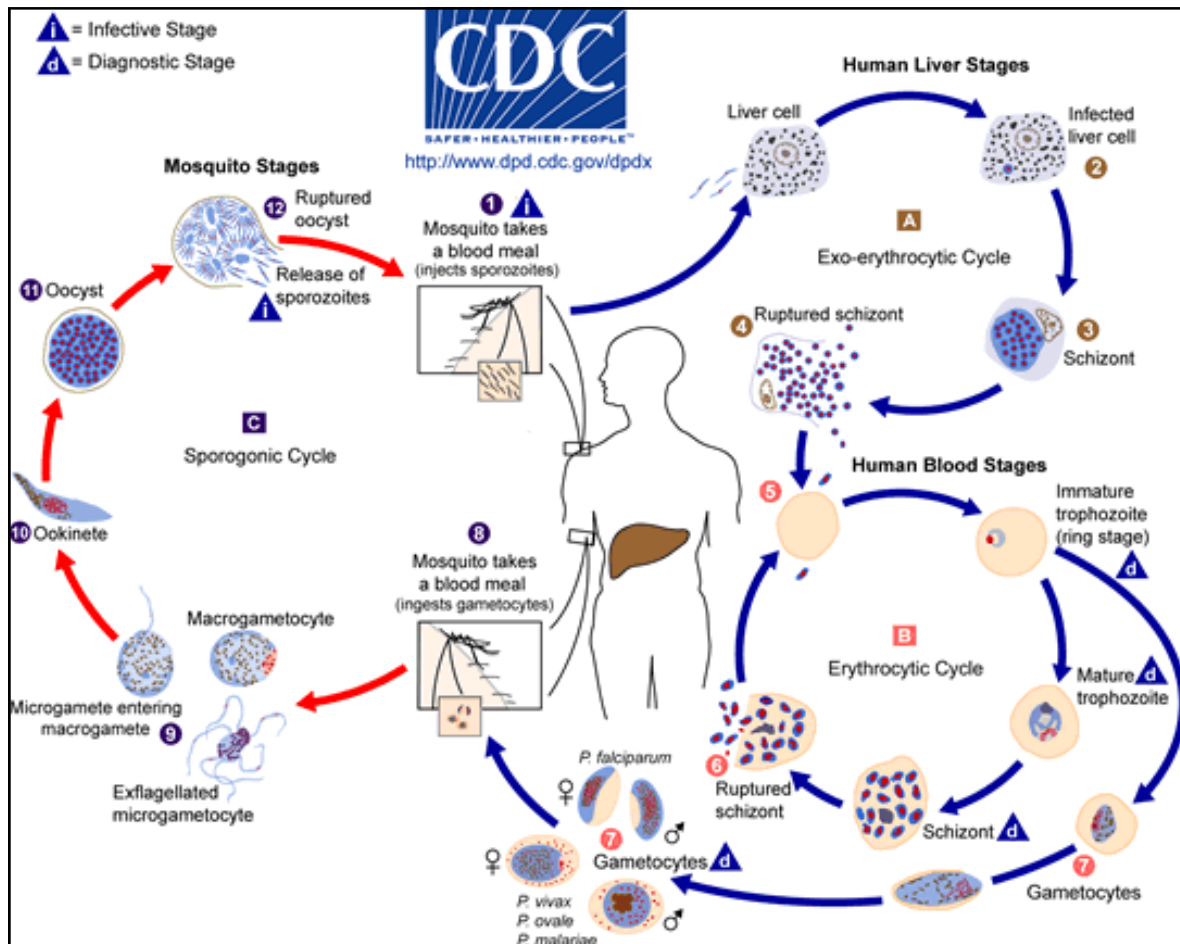
$$\begin{aligned} &(\text{No. infected RBCs} \div \text{Total No. RBCs counted}) \times 100 \\ &= \text{Percent Infected RBCs} \end{aligned}$$

Notes:

- Multiply-infected RBCs are counted as one.
- Gametocytes are not figured in calculations.

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Life Cycle of *Plasmodium* spp.



The malaria parasite life cycle involves two hosts. During a blood meal, a malaria-infected female *Anopheles* mosquito inoculates sporozoites into the human host **1**. Sporozoites infect liver cells **2** and mature into schizonts **3**, which rupture and release merozoites **4**. (Of note, in *P. vivax* and *P. ovale* a dormant stage [hypnozoites] can persist in the liver and cause relapses by invading the bloodstream weeks, or even years later.) After this initial replication in the liver (exo-erythrocytic schizogony **A**), the parasites undergo asexual multiplication in the erythrocytes (erythrocytic schizogony **B**). Merozoites infect red blood cells **5**. The ring stage trophozoites mature into schizonts, which rupture releasing merozoites **6**. Some parasites differentiate into sexual erythrocytic stages (gametocytes) **7**. Blood stage parasites are responsible for the clinical manifestations of the disease.

The gametocytes, male (microgametocytes) and female (macrogametocytes), are ingested by an *Anopheles* mosquito during a blood meal **8**. The parasites' multiplication in the mosquito is known as the sporogonic cycle **C**. While in the mosquito's stomach, the microgametes penetrate the macrogametes generating zygotes **9**. The zygotes in turn become motile and elongated (ookinetes) **10** which invade the midgut wall of the mosquito where they develop into oocysts **11**. The oocysts grow, rupture, and release sporozoites **12**, which make their way to the mosquito's salivary glands. Inoculation of the sporozoites into a new human host perpetuates the malaria life cycle **1**.