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Unveiling the Enigmatic *Plasmodium knowlesi*: Insights, Challenges, and Promises in Malaria Research

Moumaris M*

Institute of Medical Sciences, Research and Development Company, France

***Corresponding author:** Mohamed Moumaris, Research and Development Company, 14 avenue René Boylesve 75016 Paris, France, Tel: +33762122825; Email: mohamed.moumaris@sciencesettechnologies.com

Editorial

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Abbreviation: PCR: Polymerase Chain Reaction.

Editorial

Plasmodium knowlesi, a malaria parasite found in southeast Asia, can infect both primates and humans, potentially causing severe malaria. It is closely related to *Plasmodium vivax*, and its treatment utilizes chloroquine or artemisinin combination therapy. *Plasmodium knowlesi* presents significant health and economic challenges due to its zoonotic nature. However, it also serves as a valuable model for scientific research, aiding in vaccine development and understanding malaria invasion mechanisms. Its use facilitates progress in pharmaceutical investigations and the establishment of in vitro culture methods with both primate and human cells.

Plasmodium knowlesi is a malaria parasite that cycles between mosquitoes and primates. Its life cycle involves various stages, such as sporozoites, merozoites, and gametocytes. Asexual reproduction occurs in vertebrates, while sexual reproduction occurs in mosquitoes. Gametocytes transform into gametes, which combine to form an ookinete, penetrating the mosquito's stomach lining [1,2]. The ookinete matures into an oocyst, producing sporozoites via meiosis and mitotic divisions. These sporozoites migrate to the mosquito's salivary glands for transmission. When a mosquito bites a primate, it injects sporozoites into the bloodstream, initiating the hepatic stage. After further development and schizogony, releasing merozoites invade erythrocytes, beginning the erythrocytic phase [3-5].

After invading primate erythrocytes successfully, merozoites undergo morphological changes, including ring stage, trophozoite, and schizonte phases (Figure 1). Schizont-containing red blood cells rupture, releasing up to 16 merozoites into the bloodstream to infect new red blood cells, perpetuating the parasitic life cycle [6-8]. *Plasmodium knowlesi* completes its life cycle within 24 hours but sometimes enters a sexual phase lasting about 48 hours, forming microgametocytes or macrogametocytes (Figure 2). These sexual forms wait in the bloodstream to be ingested by mosquitoes [9,10].

Knowlesi malaria is a zoonotic disease affected by human activities and the adaptability of parasites and vectors. It is imperative to devise effective strategies for preventing, diagnosing, and treating zoonotic malaria. Rapid diagnostic tests are crucial for effectively handling *Plasmodium knowlesi* infections, allowing quick treatment for complications, mortality, and drug resistance. PCR is highly accurate in detecting *Plasmodium knowlesi* compared to conventional blood examination microscopy, which can lead to incorrect diagnoses [11-31].

The intricate dance between *Plasmodium knowlesi*, primates, and mosquitoes unveils challenges and opportunities in the fight against malaria. While this zoonotic parasite poses significant health and economic burdens, its unique biology also provides a window into understanding malaria's complexities. Through innovative research and strategic interventions, we can harness the power of knowledge to develop effective prevention and treatment strategies, ultimately paving the way toward a malaria-free future.

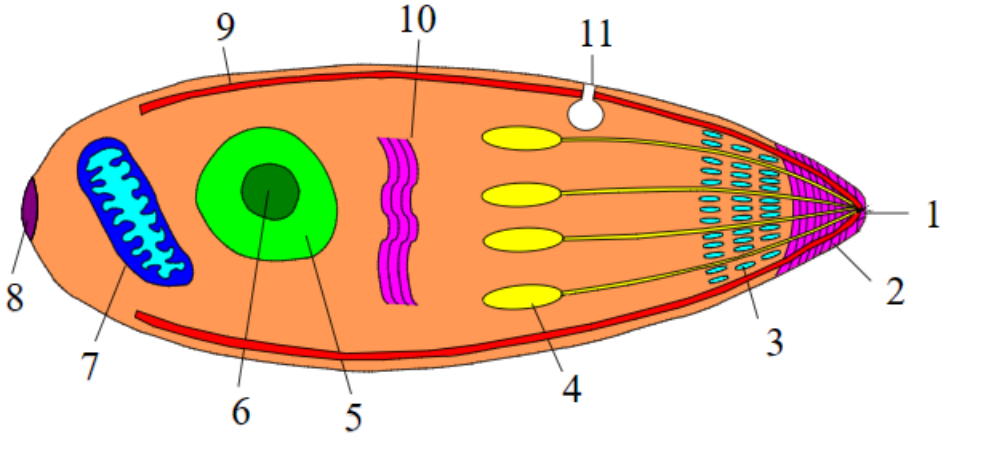

Figure 1: The cell structure of Plasmodium parasite. 1: polar ring, 2: conoid, 3: micronemes, 4: rhoptries, 5: nucleus, 6: nucleolus, 7: mitochondria, 8: posterior ring, 9: alveoli, 10: golgi apparatus, 11: micropore. This image is licensed under creative commons attribution.

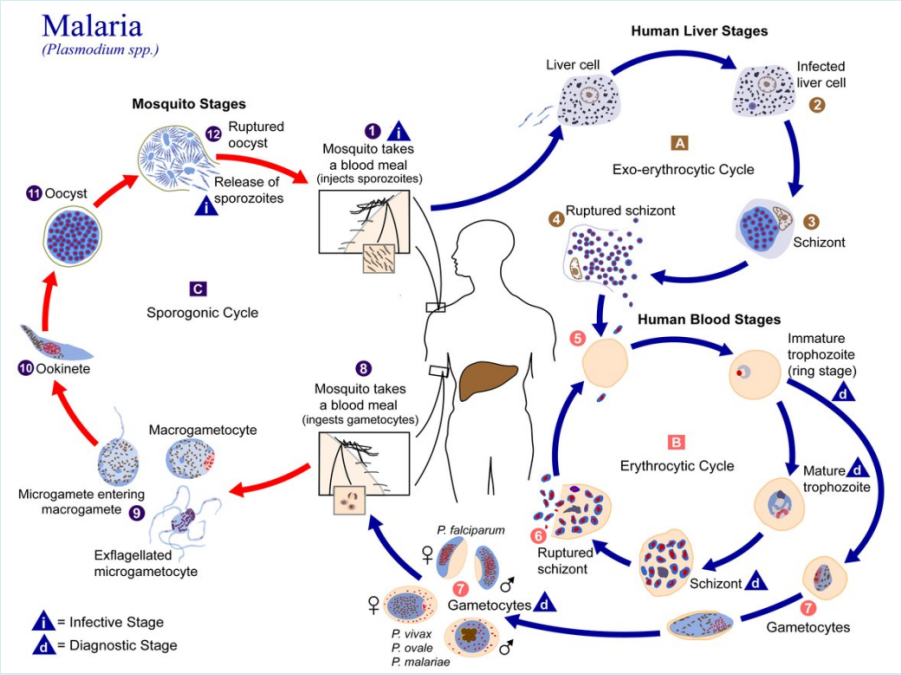

Figure 2: The life-cycle of Plasmodium parasite (the description is in the text). This image is licensed under creative commons attribution.

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