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Potential Role of 8-Aminoquinolines in Preventing Malaria Recrudescence

Nigua Liaan*

Department of Public Health, University of Montreal School of Public Health, Quebec, Montreal, QC H2L 1M3, Canada

Introduction

Malaria remains a major global health concern, with millions of cases reported each year, particularly in regions with limited access to healthcare resources. One of the challenges in malaria treatment is the risk of recrudescence, where the parasite reappears after initial clearance, leading to continued illness and transmission. In recent years, 8-aminoquinolines have garnered attention for their potential role in preventing malaria recrudescence. This article explores the mechanisms, challenges, and prospects of 8-aminoquinolines in combating this persistent threat.

Description

Recrudescence occurs when the malaria parasite, typically Plasmodium falciparum or Plasmodium vivax, reactivates and proliferates in the bloodstream after initial treatment with antimalarial drugs. This phenomenon is often attributed to the presence of dormant liver-stage parasites (hypnozoites) in the case of P vivax and P ovale infections, or the development of drug-resistant parasites in P falciparum infections. Recrudescence not only prolongs the duration of illness but also contributes to the spread of drug-resistant strains, posing challenges to malaria control and elimination efforts. 8-Aminoquinolines, such as primaquine and tafenoquine, are a class of drugs with known activity against hypnozoites, making them essential for preventing relapse in P vivax and P ovale infections. These drugs target the dormant liver-stage parasites, preventing their reactivation and subsequent recurrence of malaria symptoms. Additionally, 8-aminoquinolines exhibit gametocytocidal activity, reducing the infectiousness of treated individuals and interrupting the transmission cycle of malaria [1].

their potential benefits, the use of 8-aminoquinolines faces several challenges. Primaquine, the most widely used drug in this class, is associated with significant side effects, particularly hemolysis in individuals with glucose-6-phosphate dehydrogenase deficiency. This genetic condition affects the red blood cells' ability to withstand oxidative stress, leading to hemolytic reactions upon primaquine administration. Additionally, concerns about adherence to treatment regimens and the risk of poor compliance further complicate the effective use of 8-aminoquinolines in malaria control programs. Efforts to overcome the challenges associated with 8-aminoquinolines focus on several fronts. Research into alternative dosing regimens, including shorter courses of treatment or intermittent therapy, aims to minimize the risk of side effects while maintaining efficacy. Furthermore, advancements in point-of-care diagnostics for G6PD deficiency enable targeted screening and personalized treatment approaches, ensuring the safe administration of primaquine and tafenoquine to individuals at risk [2].

***Address for Correspondence:** Nigua Liaan, Department of Public Health, University of Montreal School of Public Health, Quebec, Montreal, QC H2L 1M3, Canada; E-mail: nigual8@gmail.com*

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Additionally, the development of novel formulations and combination therapies may enhance the tolerability and effectiveness of 8-aminoquinolines, further expanding their utility in malaria control and elimination programs. One of the primary roles of 8-aminoquinolines is in preventing relapse in malaria caused by Plasmodium vivax and Plasmodium ovale. These parasites form dormant liver-stage forms called hypnozoites, which can reactivate weeks to months after the initial infection, leading to relapse.Primaquine and tafenoquine target these hypnozoites, effectively preventing relapse and providing a complete cure for the infection. In addition to preventing relapse, 8-aminoquinolines play a crucial role in interrupting the transmission cycle of malaria. By killing the sexual-stage parasites (gametocytes) of Plasmodium species circulating in the bloodstream, these drugs reduce the infectiousness of infected individuals to mosquito vectors. This interruption of transmission is essential for reducing the spread of malaria within communities and ultimately achieving malaria elimination [3].

Beyond their activity against hypnozoites and gametocytes, 8-aminoquinolines also target other stages of the malaria parasite life cycle. Primaquine, for example, has been shown to inhibit the early liver-stage development of Plasmodium parasites, further reducing the parasite burden and preventing the progression of infection. 8-aminoquinolines are often used in combination with other antimalarial drugs as part of artemisinin-based combination therapies or other treatment regimens. These combination therapies provide synergistic effects, enhancing treatment efficacy and reducing the risk of drug resistance. Additionally, the inclusion of 8-aminoquinolines in combination therapies may shorten the duration of treatment and improve patient adherence. Radical cure refers to the complete elimination of both the acute infection and any dormant forms of the parasite that may cause relapse. 8-aminoquinolines are essential components of radical cure regimens, ensuring that all stages of the malaria parasite are targeted and cleared from the body. This comprehensive approach to treatment helps prevent recurrent infections and reduces the overall burden of malaria in endemic regions [4,5].

Conclusion

The potential role of 8-aminoquinolines in preventing malaria recrudescence represents a promising avenue for improving the effectiveness of antimalarial treatment and reducing the burden of this devastating disease. Despite challenges related to safety, adherence, and drug resistance, ongoing research and innovation offer opportunities to harness the full therapeutic potential of primaquine and tafenoquine in malaria control and elimination efforts. By addressing these challenges and capitalizing on emerging opportunities, 8-aminoquinolines may play a pivotal role in achieving the ambitious goal of a malaria-free world.

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Conflict of Interest

There are no conflicts of interest by author.

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