

Antimalarial Drug Discovery: *Andrographis paniculata* Leaf Extract

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Editorial

Malaria is a serious hazard to humanity and the major cause of mortality and morbidity in the endemic countries. Although the distribution of the malaria is substantially varied, sub-Saharan Africa, Asia, and Central and Latin America are the most affected regions [1]. The present global situation indicates a recent resurgence in the severity of this disease and that malaria could still be described as one of the major communicable diseases, with an annual incidence of 300-500 million clinically manifested cases and a death of 1-2 million peoples [2].

Even though an effective malarial vaccine is the best long-term control for this disease, current research on vaccine development is still at the pre-clinical stage, and it is predicted that a reliable malarial vaccine is several years away [3]. Therefore, the strategy for malaria mainly focuses on antimalarial drugs capable of reducing or eliminating malaria parasites. Unfortunately, there is a rapid emergence of antimalarial drug-resistant Plasmodium strains. For instance, resistance has already been developed against the latest first-line antimalarial drugs, artemisinin, in Asia [4]. Additionally, many antimalarial drugs in use today have high toxicity and low therapeutic margin of indices that exposes patients' additional harm and health expenditure [5]. Hence, there is urgent need to search for easily available, affordable, effective, and safe alternative antimalarial drugs which can be integrated into the existing malaria control interventions to successfully curtail the disease and 1 for its eventual elimination or eradication. In this respect, medicinal plants are a potential source of new antimalarial agents [6]. *Andrographis paniculata*, commonly known as "King of Bitters", belongs to the family. Acanthaceae and grows abundantly in Southeast Asia [7]. Interestingly, *A. paniculata* leaf extract has been described to have antimalarial activity against *in vitro* *P. falciparum* culture and *P. berghei* infected mice as *in vivo* [8,9]. The primary bioactive compound of *A. paniculata* is andrographolide, and responsible for antimalarial activity [10]. The IC₅₀ value was found 7.2 µg/ml for *A. paniculata* extract against chloroquine-sensitive strain of *P. falciparum*. It has also been showed the parasite stage-specificity of this plant extract, especially at ring stage of malaria [8]. Moreover, andrographolide and crude extract of *A. paniculata* were observed to have potent synergistic potency with curcumin and additively interactive with artesunate. In mice infected with *P. berghei*, andrographolide-curcumin exhibited better antimalarial activity, not only be decreasing parasitemia, compared to untreated control, but also by extending the life span by 2-3 folds [10,11]. Additionally, hypoglycemia, renal and liver injuries, hemolysis, and body weight loss are the critical features of malaria infection [12]. It was found that *A. paniculata* leaf extract and andrographolide could protect liver and renal injuries induced by *P. berghei* infection in mice. Blood glucose control during malaria infection has also been observed in infected

mice treated with this extract. Moreover, *A. paniculata* leaf extract markedly prevented body weight loss and hemolysis induced by malaria infection [9,13]. In addition to andrographolide, different secondary metabolites, such as alkaloids, glycosides, polyphenols, flavonoids, terpenoids, saponin, and tannin, have been reported from the leaf extract of *A. paniculata* to have these pharmacological activities including antimalarial, anti-hemolysis, hepatoprotective, nephroprotective, and prevention of body weight loss effects [10].

These finding adds important information to the area 1 of malaria research, which always is in need of alternative antimalarial drugs to combat the malaria, especially drug resistant parasites. Even though it is premature to conclude at this time that *A. paniculata* can be used as effective antimalarial, these finding provides a foundation for further exploration of new effective medicinal extracts for protection and treatment from the development of resistance among malaria parasites.

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