

## Chapter 8

# Anti-Malarial Drug Resistance: Need for Novel Natural Products

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### ABSTRACT

*Malaria is a life-threatening infectious disease caused by a protozoan parasite of the genus Plasmodium. It is transmitted through the bites of infected female Anopheles mosquitoes. The global burden is estimated to be around 219 million cases in 87 countries. Natural compounds have been used primarily in the traditional medicine for thousands of years. For the treatment of malaria, natural products were used until the development of synthetic drugs, and most of the currently available anti-malarial drugs have been derived based on the compounds from these traditional medicinal plants. The current chapter tries to briefly indicate the emerging resistance against anti-malarial drugs and to discuss the recent research on natural products that have been evaluated for anti-malarial activity. Rigorous evaluation of the efficacy and safety of traditional medicines is required along with identification of active constituents in order to develop new drugs with novel mechanisms of action.*

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## **INTRODUCTION**

Traditional medicinal systems include various medicinal approaches and practices found at a particular region of the world and were the only system used for treating different types of diseases. These systems can be classified into various categories like Ayurveda, Siddha, Unani, Korean medicine, African medicine system, Irani system and traditional Chinese medicine (Lemonnier *et al.*, 2017). All these systems widely use medicinal plants in different combinations or formulations. In India, traditional systems are still being followed in many regions for treating different ailments. It is eminent that natural products have remained a high productive source for drug discovery and development process. Due to lack of modern medicines and medical facilities there is strong belief in the use of traditional medicinal system that relies upon the experience gained over thousands of years in diverse regions of the world (Deepak, 2008). Today, researchers have started to bank upon this vast array of knowledge for the development of modern drugs and have isolated various bioactive compounds including alkaloids, flavonoids, tannins, phenolics, amines, terpenoids, proteins, etc. that have been reported and used for curing various diseases.

Tropical and subtropical neglected infectious diseases such as leishmaniasis, dengue, leprosy, trachoma, lymphatic filariasis, malaria and tuberculosis affect almost one-sixth part of the world's population that resides mainly in non-developed countries. Malaria is one of the infectious diseases, prevalent in countries with low income groups leading to millions of deaths annually. The patients affected with malaria and the public health systems cannot afford the financial return required by most pharmaceutical companies. This leads to minimal interest of pharmaceutical companies for investing in research and development for novel drug development against neglected diseases. Currently, most research is being undertaken primarily by government research and academic institutions.

The main objectives of the proposed chapter is to review the current status of the traditional medicinal system, the development of plant-based anti-malarial drugs, the structure and activity relationships of the pure compounds with antimalarial potential, current status of the active molecules and future prospects of the natural products in antimalarial drug discovery programs.

## **HERBAL MEDICINE**

Natural products are a large assemblage of diverse secondary metabolites with widespread biological activities and are usually obtained from plants, marine animals and microorganisms. These compounds are widely used as medicines, flavoring

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