Artemisinin – an innovative cornerstone for anti-malaria therapy

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Abstract

Artemisinin-based Combination Therapies (ACT) are recommended by the World Health Organization (WHO) to treat especially multidrug resistant forms of malaria, as currently used medications have become increasingly ineffective. In this chapter, the discovery of artemisinin from Traditional Chinese Medicine and its further development to ACT are reviewed. It is highlighted how the complex supply chain to the naturally occurring endoperoxide artemisinin, required to produce ACT-based drugs, was established; thus addressing the significant therapeutic needs and high demands for the medication.

1. The infectious disease malaria

Malaria (from the Italian words “mal’aria” meaning “bad air” based on the early belief that the disease is caused by breathing the stale, warm, humid air around swamps) is caused by infections with the blood parasite Plasmodium, transmitted by female mosquitoes. The research on malaria, its complex infection cycle and the related vector control has been awarded four Nobel prizes: Ronald Ross (1902), “for his work on malaria, by which he has shown how it enters the organism and thereby has laid the foundation for successful research on this disease and methods of combating it”; Charles Louis Alphonse Laveran (1907), “in recognition of his work on the role played by protozoa in causing diseases”; Julius Wagner-Jauregg (1927), “for his discovery of the therapeutic value of malaria inoculation in the treatment of dementia paralytica”; and Paul Hermann Müller (1948), “for his discovery of the high efficiency of DDT as a contact poison against several arthropods” [1].

Malaria is associated with flu-like symptoms (high fever) and may result in coma and death. It is estimated that 500 million infections occur yearly in Africa. Since every 30 seconds a person – especially young children – dies, malaria is the most prevalent tropical disease. In addition to the devastating toll malaria takes on human life in terms of morbidity and mortality, the disease has substantial negative impact on the economic development of nations in which the disease is endemic. The drain on African economies alone is estimated to be USD 12 billion each year (WHO, 2000) and the threat of malaria can be a serious deterrent to tourism, further hampering economic development and growth. The subsequent map indicates current distribution of indigenous malaria according to WHO.