



Review

Review on global co-transmission of human *Plasmodium* species and *Wuchereria bancrofti* by *Anopheles* mosquitoesS. Manguin^{a,*}, M.J. Bangs^b, J. Pothikasikorn^c, T. Chareonviriyaphap^d^a Institut de Recherche pour le Développement (IRD), Laboratoire d'Immuno-Physiopathologie Virale et Moléculaire, Faculté de Pharmacie, Université Montpellier 1, Bât D, 15 Ave Charles Flahault, Montpellier 34093, France^b Public Health & Malaria Control Department, Jl. Kertajasa, Kuala Kencana, Papua 99920, Indonesia^c Department of Microbiology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand^d Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok 10900, Thailand

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ABSTRACT

Malaria and lymphatic filariasis are two of the most common mosquito-borne parasitic diseases worldwide which can occur as concomitant human infections while also sharing common mosquito vectors. This review presents the most recent available information on the co-transmission of human *Plasmodium* species and *Wuchereria bancrofti* by *Anopheles* mosquitoes. Important biological and epidemiological aspects are also described including the lifecycle of each parasite species and their specificities, the geographical biodiversity of each pathogen and their vectors where the parasites are co-endemic, and biological, environmental and climatic determinants influencing transmission. The co-transmission of each disease is illustrated from both a global perspective and a country level using Thailand as a study case. Different diagnostic methods are provided for the detection of the parasites in biological samples ranging from traditional to more recent molecular methods, including methodologies employing concomitant detection assays of *W. bancrofti* and *Plasmodium* spp. parasites. The relevant issues of combined malaria and Bancroftian filariasis control strategies are reviewed and discussed.

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Abbreviations: ACT, artemisinin-combination therapies; DEC, diethylcarbamazine; DSP, diurnal subperiodic form; ELISA, enzyme-linked immunosorbent assay; GPELF, global programme to eliminate lymphatic filariasis; ICT, immuno-chromatographic test; IRS, indoor residual spraying; ITN, insecticide-treated net; ITS-1, internal transcribed spacer 1; IVM, integrated vector management; L1, L2, L3, first, second and third instar larva; LF, lymphatic filariasis; LLIN, long-lasting insecticidal net; MDA, mass drug administration; Mf, microfilariae; NP, nocturnal periodic form; NSP, nocturnal subperiodic form; PacELF, Pacific programme for the elimination of lymphatic filariasis; PCR, polymerase chain reaction; PNG, Papua New Guinea; PRG, Southeast Asia programme review group; RBM, Roll Back Malaria; RFLP, restriction fragment length polymorphism; WHO, World Health Organization.

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1. Introduction

Among the approximately 4000 known mosquito species, less than 10% are regarded as efficient vectors of pathogenic agents of infectious diseases having high impact, both direct and indirect, on human welfare and health. Malaria and lymphatic filariasis (LF) are

two of the most common and identifiable mosquito-borne parasitic diseases worldwide (Fig. 1A, B). The overall prevalence and health significance of malaria and LF have made them top priorities for global elimination and control programmes (Kyelem et al., 2008; Molyneux and Zagaria, 2002; WHO-SEARO, 2006; WHO, 2007b, 2008b).

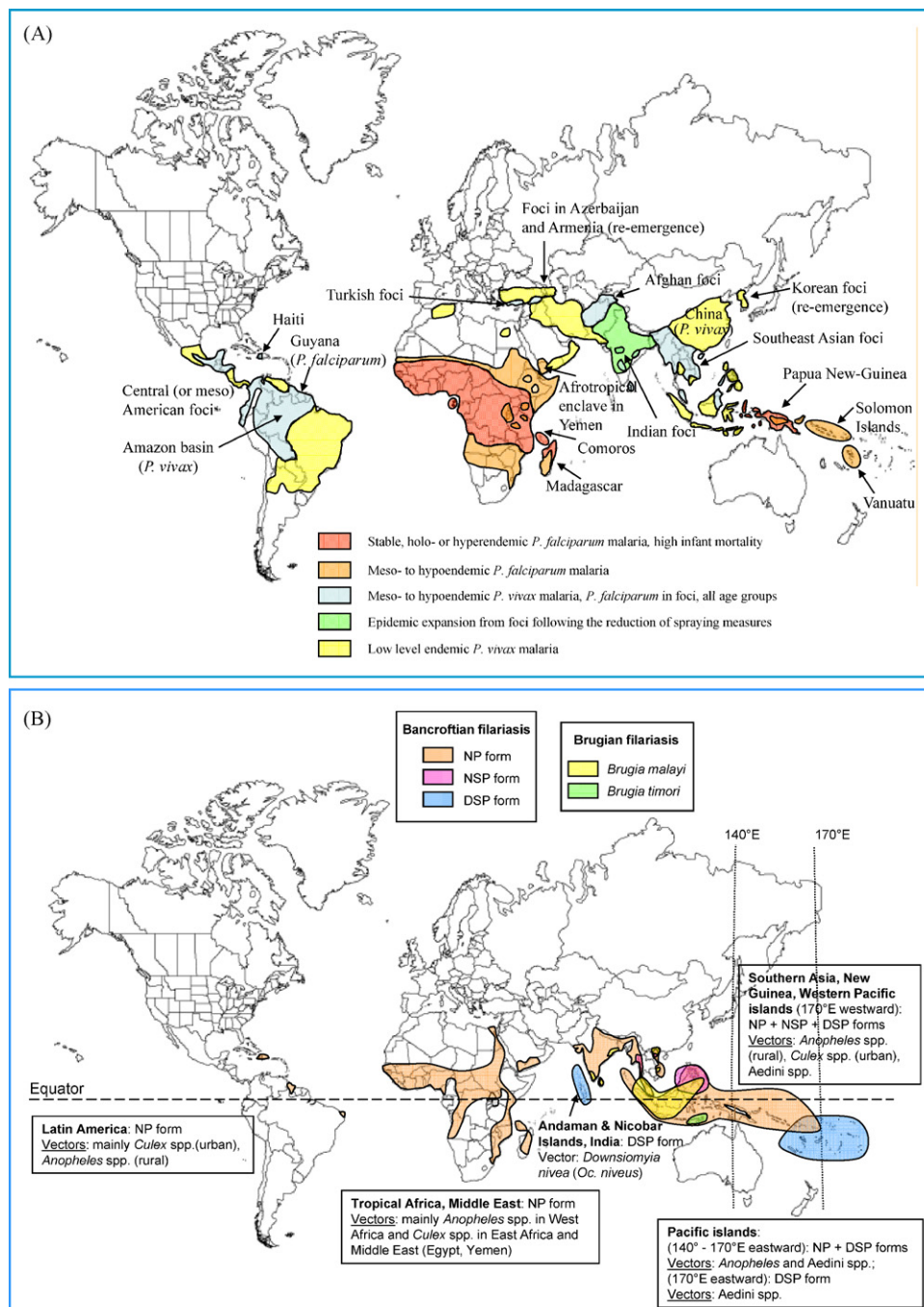


Fig. 1. Global distribution of human *Plasmodium* spp. and lymphatic filarial species; (A) malaria (Manguin et al., 2008a); and (B) lymphatic filariasis based on Mak (1981), Michael and Bundy (1997), Service (1993), and WHO (2008b).

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