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Mathematics of malaria transmission dynamics: the renewed quest for eradication

Abba B. Gumel

Department of Mathematics, University of Maryland,
College Park, MD 20742, USA
agumel@umd.edu

Malaria – a deadly disease caused by protozoan Plasmodium parasites – is spread between humans via the bite of infected adult female Anopheles mosquitoes. Over 2.5 billion people live in geographies whose local epidemiology permits transmission of P. falciparum, responsible for most of the life-threatening forms of malaria. The widescale and heavy use of insecticide-based interventions, notably long-lasting insecticidal nets and indoor residual spraying), during the period 2000–2015, resulted in a dramatic reduction in malaria incidence and burden in endemic areas, prompting a renewed quest for malaria eradication. Numerous factors, such as Anopheles resistance to all currently-available insecticides and anthropogenic climate change, potentially pose important challenges to the eradication efforts. In this talk, I will discuss a genetic-epidemiology framework for assessing the impact of insecticide resistance on malaria. Specifically, questions on whether eradication can be achieved using existing insecticide-based control resources will be addressed. There may be a brief discussion on the utility of some of the gene drive-based biological interventions being proposed as a plausible alternative pathway for achieving the laudable malaria eradication goal.