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Why dengue and yellow fever coexist in some areas of the world and not in others?

Urban yellow fever and dengue coexist in Africa but not in Asia and South America. In this paper we examine four hypotheses (and combination of them) advanced to explain the absence of yellow fever in urban areas of Asia and South America. In addition, we examine one further hypothesis that would explain the coexistence of the infections in Africa and at the same time explaining why they do not coexist in Asia and South America. The hypotheses advanced to explain the nonexistence of yellow fever in Asia and South America are: the risk of importation to Asia of a yellow fever viraemic person is very low; the Asian Aedes aegypti is relatively incompetent to transmit yellow fever; there would exists a competition between dengue and yellow fever viruses within the mosquitoes, as suggested by some in vitru studies, in which the dengue virus always wins; there is an important cross-immunity between yellow fever and other flaviviroses, dengue in particular, such that a person recovered from a bout of dengue would have his/her susceptibility to yellow fever diminished. This latter hypothesis is called hereafter the "Asian hypothesis". Finally, we hypothesize that the coexistence of the infections in Africa is due to the virtual absence of the mosquito Aedes albopicuts, which competes with Aedes aegypti, in Africa. We call this latter hypothesis the "African hypothesis". We construct a model of transmission that allows all the above hypotheses to be tested. We conclude that the Asian and the African hypotheses can explain the observed phenomena. The other hypotheses do not explain the observed phenomena.