Vector control and vaccination in the transmission dynamics of yellow fever

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Urban yellow fever is a sporadic mosquito-borne flavivirus that is endemic in tropical areas of sub-Saharan Africa, Central and Southern America. It is horizontally transmitted by mosquitoes belonging to the Aedes and Haemogogus species [3]. Vertical transmission by mosquitoes have also been reported [2]. The disease symptoms are not specific, but often have clinical manifestations ranging from mild non-specific illness to severe disease including high fever, chills, headache, jaundice, bleeding, organ failure and shock. It has between 20% to 50% lethality [1]. Yellow fever has no specific treatment (anti-viral drug) but it can be prevented by an effective vaccine with life long immunity and 99% efficacy [3]. We construct a compartmental model for the transmission dynamics of yellow fever with vertical and horizontal transmissions. The impact of vaccination and vector control are assessed. The model incorporates both aquatic and non-aquatic stages of mosquito development. Threshold quantities are computed, bifurcation, stability and optimal control analysis are presented.

References

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