
JHOANA P. ROMERO-LEITON, University of Manitoba

Mathematical modelling of the first HIV/ZIKV co-infection cases in Colombia and Brazil

In this work, we present a mathematical model to investigate co-infection with HIV/AIDS and zika virus (ZIKV) in Colombia and Brazil, where the first cases were reported in 2015-2016. The model considers the sexual transmission dynamics of both viruses and vector-host interactions. We begin by exploring the qualitative behaviour of each model separately. Then, we analyze the dynamics of the co-infection model using the thresholds and results defined separately for each model. The model also considers the impact of intervention strategies, such as, personal protection, antiretroviral therapy (ART), and sexual protection. Using available parameter values for Colombia and Brazil, the model is calibrated to predict the potential effect of the intervention strategies on the co-infection spread. According to these findings, transmission through sexual contact is a determining factor in the long-term behaviour of these two diseases. Furthermore, it is noted that co-infection with HIV and ZIKV may result in higher rates of HIV transmission and an increased risk of severe congenital disabilities linked to ZIKV infection. As a result, control measures have been implemented to limit the number of infected individuals and mosquitoes, with the aim of halting disease transmission. This study provides novel insights into the dynamics of HIV/ZIKV co-infection and highlights the importance of integrated intervention strategies in controlling the spread of these viruses, which may impact public health.

Keywords: Stability, Equilibrium points, Optimal control, Personal protection, Sexual protection, Antiretroviral therapy.

Co-authors: Idriss Sekkak (University of Montreal), Julien Arino (University of Manitoba), Bouchra Nasri (University of Montreal).