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Impact of chronic hepatitis C and its treatment on the development of tuberculosis: Stability analysis and optimal control

Communication Info

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Abstract

The study focuses on the spread of TB among individuals infected with HCV, including those undergoing DAA treatment. It contributes by mathematically modeling TB dynamics in this population. The model is analyzed by proving the existence of solutions and demonstrating that all solutions remain positive and bounded. Moreover, the model is extended into an optimal control problem, incorporating three controls: awareness, treatment, and early detection, to reduce TB prevalence among HCV-infected individuals using Pontryagin's maximum principle. Finally, numerical simulations in MATLAB confirm that combining treatment, early detection, and awareness substantially reduces TB transmission among HCV patients compared to uncontrolled scenarios, leading to improved overall health outcomes.

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