Special Session 135: Dynamical Systems in Mathematical Biology: Epidemiology, Population Dynamics, and Reaction Networks

An epidemiological model describing co-infection of HIV/AIDS and COVID-19 considering public awareness and prevention

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Abstract:
This presentation proposes a mathematical model describing the simultaneous transmission of HIV and COVID-19, explicitly incorporating COVID-19 vaccination and public awareness. The model is analytically examined to determine the existence and local stability of equilibria for both single-infection and co-infection scenarios. Results show that each disease persists in isolation when its basic reproduction number exceeds one. For the co-infection framework, the overall reproduction number is governed by the larger of the individual reproduction numbers for HIV and COVID-19. Numerical continuation reveals thresholds that allow both diseases to coexist, while disease-free stability requires both reproduction numbers to be below one. A two-parameter continuation analysis shows that the condition where both reproduction numbers equal one serves as an organizing center for various (co-)infection scenarios.

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