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Modeling HIV Dynamics Under Periodic Combination Drug Therapy

Treatment of HIV infected patients with a combination of antiviral medications is often successful in controlling viral load, but finding optimal dosing regimens remains a challenge for researchers. Mathematical modeling can provide insights into potential treatment strategies. In this talk, I will discuss the dynamical consequences of incorporating combination drug therapy in a classical within-host HIV model. I will consider two types of antiviral drugs, Reverse-Transcriptase Inhibitors and Protease Inhibitors, both of which have time-periodic efficacy functions. Using perturbation techniques and Floquet theory, I argue that the timing between dosages of the two different drugs can critically affect the virus dynamics. I will illustrate the theoretical findings with numerical simulations of the model assuming current estimates of HIV parameters. Understanding optimal timing of drug application may aid in designing treatment strategies, and it also motivates interesting questions for future research.