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HIV coinfection, immunity, and virus evolution in vivo

It is commonly thought that virus evolution in vivo can contribute to or correlate with the progression of HIV infection from the asymptomatic phase towards AIDS. The virus evolves towards immune escape, increased replication kinetics, and a higher degree of cell killing, leading to the depletion of the T helper cell population.

Mathematical models of in vivo HIV evolution have been useful in shaping our understanding of the disease process. However, the models considered so far assume that one cell can only harbor one virus particle. Recent data, however, indicate that one cell can be infected by more than one virus particle, a process called co-infection. I will discuss a mathematical model that studies the effect of co-infection on HIV evolution in vivo and on the process of disease progression. This gives rise to some counter-intuitive insights that find some support in experimental data. It also gives rise to a theory for why natural SIV infection does not progress to AIDS despite the presence of high virus loads and high virus diversity in some cases.