Harnessing Viral Replication for Nanofabrication

Gene transfer holds an enormous potential not only in research but also in diverse applications such as nanofabrication and molecular medicine. Indeed, the spectacular recovery from the recent pandemic thanks to a few billion doses of a small amount of genetic code has awakened industrial interest in recoding cells with even larger genetic payloads, with exciting prospects such as personalized therapies for diseases, cells and organisms with novel functions, or nanofabrication of new materials. In this biotechnological revolution, herpesvirus amplicon vectors are one of the most promising platforms since they can carry up to 10 times larger genomic cargo than other viral vectors. However, their extensive use in the clinic and industry is currently limited by difficulty in harnessing the “von Magnus effect” - herpesvirus replication for largescale production of these bio-nanoparticles without their contamination with viral genes. This project aims to use mathematical modelling and fluorescently labelled mutant viruses to investigate why the von Magnus effect varies among different herpesvirus species. Possible modelling approaches could use partial derivatives (such as in the SIR model) or evolutionary game theory.

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