The conference is supported by the National Laboratory for Health Security project RRF-2.3.1-21-2022-00006

Epidemic patterns of emerging variants with dynamical social distancing

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Motivated by the emergence of new variants during the COVID-19 pandemic, we consider an epidemiological model of disease transmission dynamics, where novel strains appear by mutations of the virus. In the considered scenarios, disease prevalence in the population is modulated by social distancing. We study the various patterns that are generated under different assumptions of cross-immunity. If recovery from a given strain provides immunity against all previous strains, but not against more novel strains, then we observe a very regular sequential pattern of strain replacement where newer strains predominate over older strains. However, if protection upon recovery holds only against that particular strain and none of the others, we find much more complicated dynamics with potential recurrence of earlier strains, and co-circulation of various strains. We compare the observed patterns with genomic analysis we have seen during the COVID-19 pandemic. Joint work with Gergely Röst.