

# Dynamics of viral quasispecies: from experiments to models

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## Resumen

Viruses are suitable model systems to study evolution in short periods of time. Due to their characteristics, viral populations adapt rapidly to changing conditions, thus allowing the quantification of several evolutionary features under controlled laboratory conditions. The interpretation of the experiments, knowledge of the experimental protocols and an understanding of the involved phenomenology are necessary steps prior to the formulation of simple evolutionary models aimed at describing the observed dynamics. RNA viruses are fast mutators and form complex and heterogeneous ensembles known as quasispecies. Within this framework, we will review a number of formal approaches to describe the following experimental situations: (i) The response of a population subjected to repeated bottleneck passages and the effect of Muller's ratchet in its evolution [1, 2]; (ii) The effects of spatial competition on quasispecies diversity [3]; (iii) The kinetics of epidemic spreading of a wild type virus versus its cognate, fragmented form [4]; (iv) The extinction of infectivity in the presence of efficient replication due to increased mutagenesis, which has recently led to the concept of lethal defection [5, 6].

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## Referencias

- [1] E. Lázaro, C. Escarmís, J. Pérez-Mercader, S. C. Manrubia, and E. Domingo, *Resistance of virus to extinction on bottleneck passages: Study of a decaying and fluctuating pattern of fitness loss*, Proc. Nat. Acad. Sci. USA 100, (2005) 10830-35.
- [2] S. C. Manrubia, E. Lázaro, J. Pérez-Mercader, C. Escarmís, and E. Domingo, *Fitness distribution in exponentially growing asexual populations*, Phys. Rev. Lett. 90, (2003) 188102.
- [3] J. Aguirre and S. C. Manrubia, *Effects of spatial competition in the diversity of a quasispecies*, Phys. Rev. Lett. 100, (2008) 038106.
- [4] S. C. Manrubia, J. García-Arriaza, E. Domingo, and C. Escarmís, *Long-range transport and universality classes in in vitro viral infection spread*, Europhys. Lett. 74, (2006) 547-553.
- [5] A. Grande-Pérez, E. Lázaro, P. Lowenstein, E. Domingo, and S. C. Manrubia, *Suppression of viral infectivity through lethal defection*, Proc. Nat. Acad. Sci. USA 102, (2005) 4448-52.
- [6] J. Iranzo and S. C. Manrubia, *Stochastic extinction of viral infectivity through the action of defectors*, Europhys. Lett. 85, (2009) 18001.