Existence and qualitative properties of travelling waves for an epidemiological model with mutations

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I will discuss the existence of travelling waves for a sytem of coupled Fisher-KPP equations, which modelizes the interaction between two competing strains of a pathogen. This system is particularly relevant for fast-mutating pathogens which have to sustain strong evolutionary pressures, like e.g. emerging viruses, for which evolution occurs at the same time scale than propagation. More precisely, we investigated in [1, 2] a situation with two competing strains of a mutating pathogen, that we call wild type and mutant. The wild type has lower basic reproductive ratio but higher carrying capacity than the mutant, which yields a succession in time and space, the (virulent) mutant being at the edge of the invasion front, followed by the wild type. I will establish the existence of such travelling waves using a topological degree method, and show some qualitative properties of the fronts. I will also show the convergence towards the fronts of a single species Fisher-KPP when the carrying capacity of the mutant goes to zero. Finally, I will present an individual-based model that converges formally to the solution of our system and give us insight about the influence of stochasticity and finite-population size on the propagation of such epidemics.

Références

[1] Q. GRIETTE, G. RAOUL, *Existence and qualitative properties of travelling waves for an epidemiological model with mutations*, submitted.

[2] Q. GRIETTE, G. RAOUL AND S. GANDON, *Virulence evolution at the front line of spreading epidemics*, submitted.

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