# Optimizing *Wolbachia*-infected mosquito release

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In this work, we model an optimization problem whose aim is to design a possible strategy of dengue transmission control using *Wolbachia*. Indeed, It has been observed that when some mosquito populations are infected by certain *Wolbachia* bacteria, various reproductive alterations are induced in mosquitos, including cytoplasmic incompatibility. Some of these *Wolbachia* bacteria greatly reduce the ability of insects to become infected with viruses such as the dengue ones, cutting down the insects' vector competence and thus effectively stops local dengue transmission.

We consider an artificial infection of mosquitoes by a cytoplasmic-incompatibility-inducing *Wolbachia* bacteria. The behavior of infected and uninfected mosquitos is assumed to be driven by a reaction-diffusion system of Allen-Cahn type enriched with the presence of an internal control source term standing for releases of infected mosquitos (distributed in time and space). The optimal releasing control strategy is modeled as a least square problem where, in a nutshell, one wants to minimize the number of uninfected mosquitoes at a given time horizon, under some relevant biological constraints.

After investigating existence issues, we provide a minimization algorithm based on the derivation of necessary first order optimality conditions for this problem. As an illustration of this approach, we present some numerical simulations and preliminary conclusions, by considering (in this preliminary work) environments with simple shapes such as rectangles.