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VACCINATION AND STERILIZATION PROGRAMS FOR RABIES CONTROL WITHIN AN INCREASING FOX POPULATION

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On construit un modèle discret monodimensionnel permettant d'étudier la propagation spatiale et temporelle de la rage dans une population de renards. Dans un premier temps, on étudie l'influence de divers paramètres tels que la période d'incubation et la distance de dispersion sur la vitesse de propagation de l'épidémie. Puis on s'intéresse à l'efficacité de deux méthodes de prophylaxie, la vaccination et la stérilisation. Utilisées séparément ces deux méthodes peuvent entraîner des instabilités dans le système. En effet la vaccination utilisée à des taux intermédiaires conduit à une augmentation de la prévalence de l'épidémie. De même que la stérilisation utilisée à un taux trop élevé entraîne une disparition de la population. Un couplage de ces deux méthodes permet d'éradiquer la rage tout en préservant la population.

In a previous work we designed a one-dimensionnal model to simulate the propagation of rabies within increasing population of foxes. With some numerical simulations, we analyse the spatial and temporal propagation of rabies. Using it, we analyzed the influence of some parameters, like the dispersal distance and the mortality induced by rabies, on the propagation of the epidemic. We found a linear dependance between the dispersal distance and the speed of the epidemics. Longer is the dispersal distance, faster is the propagation of rabies.

Then we began testing two methods of prophylaxy : oral vaccination and sterilization. In this work we first compare the efficiency and the inefficiency of these methods when used separately : vaccination requirring high rate for rapidly increasing populations and increasing prevalence at intermediate rates and next sterilization requiring also high rates and yielding low malthusian rate at optimum rate becoming rapidly negative at slightly over-optimum rates. Then we simulate the joint use of vaccination and sterilization programs ; it turns out that far lower rates are necessary to eradicate the epidemics, while undesirable effect of both prophylaxy programs disappear when they are used together. For a given vaccination rate, we can find the sterilization rate we must take to eradicate rabies. The dependance between these rates is linear.

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