BIOLOGICAL VECTOR CONTROL WITH THE STERILE INSECT TECHNIQUE FOR THE CHIKUNGUNYA DISEASE

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Keywords: Vector-control, pulse control, Sterile Insect Technique, Mathematical Epidemiology, Analysis, nonstandard finite difference scheme, numerical simulations.

Chikungunya is a vector-borne Disease, usually localized in Asia and East-Africa, with *Aedes albopictus* mosquito as the principal vector for the Chikungunya virus. In 2005 and 2006, Réunion Island faced two epidemics of Chikungunya: the 2006's epidemic was particularly dramatic. This was the first time that a developed country, like Réunion Island, was affected by this virus. In July 2007, a small outbreak occurred in Italy, indicating that the South of Europe is potentialy threatened.
In recent works [1,2], we proposed and studied a mathematical model to explain the outbreak of 2005 and possible links with the explosive epidemic of 2006. These studies specifically focus on the comparison of different mosquito control tools (adulticide, larvicide, and mechanical control) in order to know if it would have been possible to contain or to completely avert the 2006 epidemic. We showed that the combination of the three control tools (with a suitable period of release and a sufficient duration of the treatment) would have been useful to control the explosive epidemic of 2006 [2].
As far as we know, *Aedes albopictus* in Réunion Island is yet sensitive to Deltamethrin, the only authorized adulticide, but can become resistant, like in Martinique, a West Indies French Island. Moreover, Réunion Island is a hot spot of endemicity and, thus, the use of chemical control tools can be limited. It is also necessary to study and to check the feasibility of other vector control tools such as the Sterile Insect Technique (SIT). To this effect, a project called TIS (Technique d'Insecte Stérile), funded by the French Ministry of Health, the European Union and the Regional Council is ongoing in Réunion Island.

The aim of this talk is to give a short introduction to the TIS project and to present some recent mathematical results related to the SIT-LSIR model considered for the Chikungunya disease. Moreover, because mechanical control (destruction of breeding sites) is a very cheap and sustainable alternative, we combine mechanical control and SIT control. We present several numerical simulations to assess the efficacy of the SIT vector-control in comparison with the Chemical vector control, studied in [2]. We show that SIT (impulse) control could be useful to control the wild mosquito population and thus lower the risk of an epidemic.

References

[1] Y. Dumont, F. Chiroleu and C. Domerg, "On a temporal model for the Chikungunya disease: modelling, theory and numerics", *Math. Biosc.* , v. 213, p. 80-91, 2008.
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