On the Aedes agypti Invasion and Dengue propagation

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Abstract

Dengue is a human disease transmitted by the mosquito *Aedes aegypti*. A dengue epidemics starts when infectious individuals (humans or mosquitoes) appear and propagates in the area previously colonized by the mosquitoes. We study the spatial invasion and the dengue propagation using a system of partial differential reaction-diffusion equations. The human and mosquitoes, and their respective subclasses of subsceptibles and infected are considered. Threshold values are detrmined for the mosquito inavsion and the endemic level of the disease, to asses control strategies.

We study two spatial situations. The first scenario corresponds to the human population free of mosquitoes. Then an invasion of mosquitoes can occur as studied in [2]. The second situation considers that the mosquito population is well established among humans but the dengue disease is absent, and so, the dengue propagation is studied.

The A. aegypti inavison and dengue propagation are studied using the travelling wave solutions [1], [3], to determine the speed wave as function of the essential parameters of the model. Entomological parameters [4] are used to obtain this wave speed as a function of the temperature averange.

References

- [1] Murray, J. D., Mathematical Biology, Springer, Berlin (2002).
- [2] L.T. Takahashi, N.A. Maidana, W.C. Ferreira Jr., P. Pulino and H.M. Yang, Mathematical models for the *Aedes aegypti* disper-

sal dynamics: traveling waves by wing and wind, *Bulletin of Mathematical Biology*, **67** (2005) 509-528.

- [3] Murray, J. D., Stanley, F. R. S., Brown, D.L. On the spatial spread of rabies amog foxes. *Proc. R. Soc. Lond.* B229, pp. 111-150 (1986).
- [4] H. M. Yang, M. L. G. Macoris, K. C. Galvani and M. T. M. Andrighetti, Dinamica de trasnmissao de dengue com dados entomologicos temperatura-dependentes. *Tema* - *Tend. Mat. Apl. Comput.:* in press.