

To whom it may concern,

The group MOSIMBIO (Modelling and SIMulation of BIOlogical systems) works on Individual-based Modelling (IbM) of biological communities. IbM is a bottom-up approach to complex systems well established in theoretical ecology that consists in understanding the collective behaviour of populations starting from simple rules governing the individual behaviour and local interactions.

Specifically, the group studies pathogenic microbial systems using computational models, in collaboration with experimental and theoretical experts in their disciplines. We aim to extract general laws from specific applied problems and we operate as external consultants for various expert groups. We address hot topics in food industry, pharmacology, as well as in biomedical and environmental sciences. Since 2005, the group MOSIMBIO collaborates in several research projects that tackle malaria and latterly tuberculosis. More recently, the group has started applying its methodology to the study of malaria epidemics.

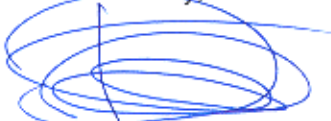
The IbM strategy can complement other kind of approaches, such as top-down Population based Modelling (PbM) and Cellular Automata (CA). When compared to PbM, IbMs and CA are specifically useful for assessing the appearance of emergent collective behaviours, which were not explicitly introduced as modelled laws. But while CA approaches focus on global geometric patterns arising from the local character of interactions, IbMs focus on individual diversity and how this affects collective behaviour.

For these reason, we believe that the collaboration with Dr. Jones Albuquerque can be fruitful for both parts. We propose the following activities to be carried out during his stay in Barcelona:



- Modeling of the epidemiology of malaria in an endemic region and in regions with low endemicity. Comparison between the epidemics caused by *P. falciparum* and *P. vivax*.
- Application of mathematical and computational tools cellular automata model for the epidemic of malaria, and comparison with other approaches;
- Assessment of the applicability of computer models as an effective tool to analyse the expansion process of the disease and to improve its control.

Sincerely,



Daniel López Codina
MOSIMBIO group
<http://mosimbio.upc.edu/>

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