

## ISEE-RESISTANCE: USING IN SILICO EXPERIMENTAL EVOLUTION TO SENSITIZE PROVIDERS ON ANTIBIOTIC RESISTANCE

Guillaume Beslon<sup>\*1,2</sup>, Dominique Schneider<sup>3</sup>

1 Computer Science, INSA-Lyon,

2 Beagle Team, INRIA, Villeurbanne,

3 TIMC-IMAG, Université Grenoble-Alpes, Grenoble, France

\* Speaker and corresponding author.

**Introduction:** To improve awareness and understanding of antimicrobial resistance, direct experiment with serious games offers an interesting complement to communication programs. Games help sensitizing the public by simulating the population dynamics of microbial resistance. However, modeling its evolutionary dynamics is much more difficult as it requires to model the interaction between genomic, phenotypic and population levels. Yet, such multi-scale models are mandatory to efficiently train health professionals.

**Objectives:** We propose a new approach to develop serious games by using In Silico Experimental Evolution (ISEE) as a game engine. ISEE is a recent research field in which simulated bugs evolve in silico through the joint pressure of both a mutation and a selection model. It enables to conduct large-scale simulation experiments to decipher the intertwined pressures that drive evolution.

**Methods:** Aevol (see [www.aevol.fr](http://www.aevol.fr) and references therein) is an ISEE platform that models bacteria at the genomic level and includes an explicit mutational process. In Aevol, the bacterial phenotype is modeled by a mathematical function, thus allowing to simulate efficiently the evolution of large populations over thousands of generations. ISEE-Resistance uses Aevol as the engine of a serious game devoted to teach antibiotic resistance to healthcare providers. We divided the phenotypic function into a set of “core” and “resistance” traits. By submitting bacterial populations to different antibiotic dosages, one can observe the emergence of resistance traits through mutations and their spreading in the population owing to the selection pressure caused by the antibiotic treatment. One can then analyze the causes of resistance fixation and the effect of treatment strategies on the fate of the infection.

**Results:** First experiments have shown the ability of the game engine to finely follow the dynamics of antibiotic resistance emergence and spreading under e.g., inappropriate dosage or discontinued drug usage.

**Conclusion:** Our aim is now to turn the ISEE-Resistance core engine into a full game by developing a user-friendly interface and by offering various scenarii mimicking real situations. We then wish to provide it as an e-learning tool in faculties of medicine and sciences.

Disclosure of Interest: None Declared