

TFM PROJECT PROPOSAL (2023-2024)

TITLE:

Discovery of new sequential antibiotic therapies through high-throughput experiments

TUTORS (1-2):

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PROJECT DESCRIPTION:

Antibiotic resistance has become a serious public health issue, and the rate at which new antibiotics are discovered is insufficient to counteract it. One possible strategy to tackle this problem is to use existing antibiotics in novel ways. Specifically, we will focus on sequential therapies, in which several antibiotics are deployed one after another. Often, when treating bacteria with one antibiotic, they develop sensitivity to another, allowing us to design effective sequential therapies that cycle between the two.

This project aims to study the effectiveness of sequential therapies through high-throughput experiments. We will use the bacterium *Escherichia coli* and four antibiotics used to treat urinary tract infections caused by it as a model. Firstly, we will study how treatment with each of these antibiotics affects the evolution of resistance to the other three (these are the so-called collateral sensitivity networks). Secondly, we will test the 256 sequential 4-day treatments with these four drugs by evolving *E. coli* populations in liquid culture in 96-well plates. The goal is to find effective therapies and decide if we can predict the success of a therapy based on the collateral sensitivity networks.

MORE INFORMATION ABOUT THE GROUP:

Grupo Interdisciplinar de Sistemas Complejos (GISC) webpage:

<https://valbuena.fis.ucm.es/gisc/>

Ares Lab at CNB: <https://www.cnb.csic.es/index.php/es/investigacion/departamentos-de-investigacion/biologia-de-sistemas/clocks-and-rulers-in-life>

Saúl Ares at Google Scholar:

https://scholar.google.com/citations?user=qMPc_JAAAAAJ&hl=en

Pablo Catalán at Google Scholar:

<https://scholar.google.com/citations?user=loafmMMAAAAJ&hl=en&oi=ao>