Bacterial dormancy: how to stay alive without growing

Introduction

A recent finding shows that a clonal Escherichia coli population splits into a growing and a non-growing subpopulation after a switch from glucose to a gluconeogenic carbon source (like fumarate or acetate). The non-growing subpopulation has a very interesting property: besides its tolerance to antibiotics that target growing cells, it is also tolerant to antibiotics that kill non-growing cells. This dormant population can then be the cause for reoccurring infections, as dormant cells can also wake up and grow again.

Despite its importance for public health, we don't know very much about this dormant state. How cells manage to stay alive without growing for long periods is still an unanswered question.

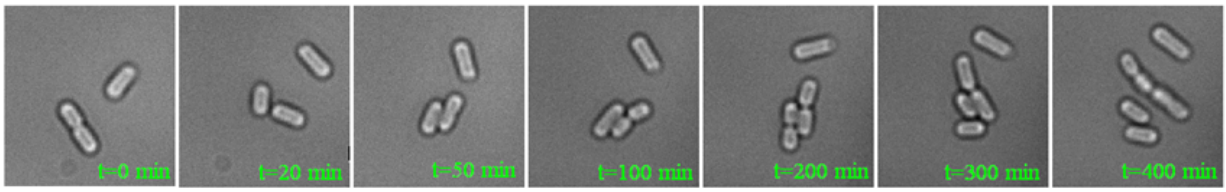

Figure 1: Growing and non-growing cells after a carbon source shift on the microscope

Goal

The goal of this project is to further investigate the properties of the dormant phenotype. Through the use of reporter plasmids, FRET sensors and enzyme tests we will try to get an idea about the metabolic activity of non-growing cells.

Techniques:

cell culturing, spectrophotometry, FRET, time-lapse microscopy

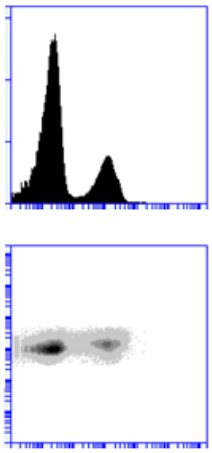

Figure 2: Two populations distinguished by fluorescence in a cytometer

Literature:

- Balaban, Nathalie Q. et al. (2004) Bacterial Persistence as a Phenotypic Switch. *Science.* 305:1622-1625

- Lewis, Kim (2007) Persister cells, dormancy and infectious disease. *Nat Rev Micro.* 5:48-56

- Ewald J. C. et al (2011) Engineering genetically encoded nanosensors for real-time in vivo measurements of citrate concentrations. *PLOS One.* 6:e28245