Scientific Objective:
Investigating the dynamics of the microbial response towards fluctuations of the environment in order to improve bioprocess optimization and scale up

Sub-populations:
- Metabolic states
- Physiological states
- Morphological states
- Genetic diversities

Direct Impact on Process Performances

Highlights: stress response in *E. coli*, *Y. lipolytica* and *C. necator* (9 papers)

Morphology of *Y. lipolytica*  
(Cescut, 2009; Timoumi et al., 2016 & 2017)

Quantitative characterization of transient responses (metabolic and transcriptominc) to environmental perturbations  
(Sunya et al., 2012a,b & 2013; Timoumi et al., 2016 & 2017)

Quantitative characterization and Management of Sub-populations  
(Plasmid+ / Plasmid-/ Viable But Non Cultivable / Viable Cultivable / Physiologic states / Morphology)  
(Montheard et al., 2012; Grousseau et al., 2014; Timoumi et al., 2016 & 2017)