# Team Scientific Questions

## « Process-Environment-Physiology » Interactions that limit Performances ?

## Potentialities of « Microorganism-Bioreactor » System ?

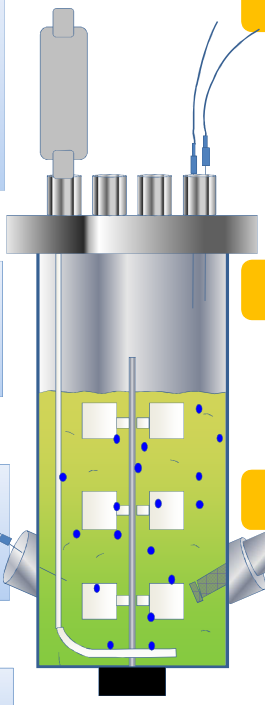
## A Top-Down Systemic Approach …

**Choosing the most:**
-relevant microbial producer
-relevant substrat
-adapted mode of cultivation
*(batch, fed batch, membrane bioreactor)*

**Investigating the microbial dynamics** to highlight the maximal microbial potentialities

**Analysing the dynamic physiological behavior** under intensive culture conditions and/or controlled perturbation

**Integrating the generated knowledge** coupling modeling and experimental data



**MICROBIAL DYNAMICS**

Bio-kinetics
Metabolism → Molecular
Physiology / Cell activity - Morphology
Sub-population Distribution

**PHYSICO-CHEMICAL DYNAMICS**

Physico-Chemical Properties
Rheometry / Granulometry

**MODELING**

Kinetic Phenomenological models
Metabolic models
Hybrid Dynamic Model
Model of Population
Hydrodynamic models (in collaboration)

## … to deduce and design optimized strategies

### *At bioprocess scale*

- ✓ **Cultivation strategies** *(nutritionnal limitations fedbatch or chemostat, A- and D-stats)*
- ✓ **Innovation in bioprocesses** *(membrane reactors, coupled extrusion-fermentation process, milli-reactor, specific gaz reactors, mutagenesis reactor )*
- ✓ **Modeling** *(kinetic, metabolic, control, cybernetic)* **for process simulation**

### *At microbial scale*

- ✓ **Population and sub-population management**
- ✓ **Metabolic engineering** *(rational and inverse)*
- ✓ **Modeling** *(kinetic, metabolic, cybernetic, population)* **for predictive microbial behavior simulation and target identification**