



# TFTAK – BREACHING THE GAP BETWEEN THE ACADEMIA AND INDUSTRY

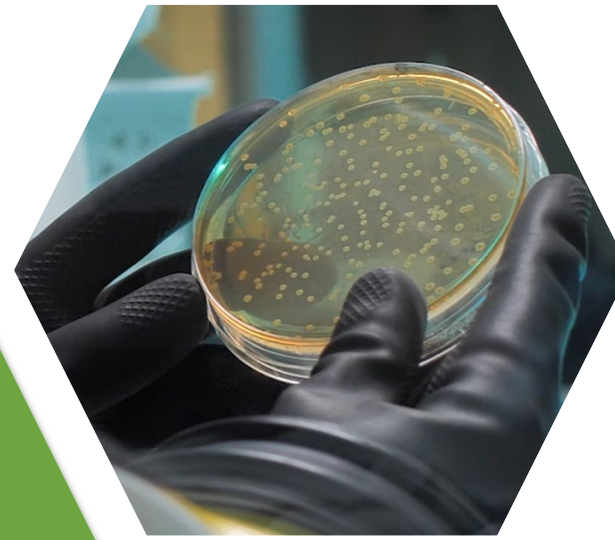
**Ranno Nahku, PhD**

Microbial bioprocess development director

[ranno@tftak.eu](mailto:ranno@tftak.eu), +372 53 436109

[www.tftak.eu](http://www.tftak.eu)

- Client comes with:
  - **a technological issue of microbial production** – product instability, low cell viability, low yield, day-to-day variation etc.
  - **Scale up from product concept** – new food product development, scaling from test tube culture (maximize viable cells, metabolite or protein productivity).
- We are always **considering** all the **limitations of specific partner** – tailor made solution.

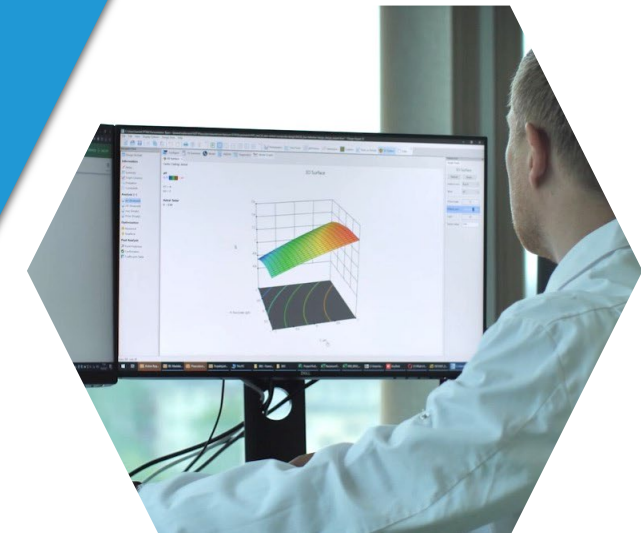


Food  
Research

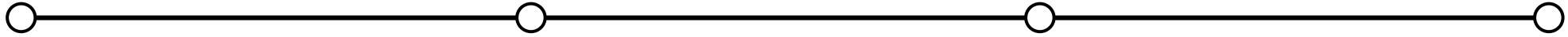
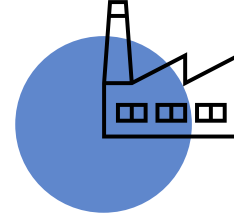
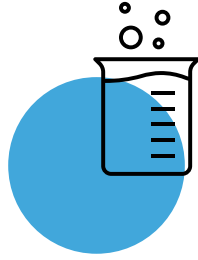


Bioprocess  
Optimization

Analytics



# Food product development pipeline



Selection of ingredients  
and cultures

Development at lab scale

Technology transfer

*In vivo* trial

Proteins  
Fibers  
Vitamins  
Minerals  
Probiotics  
**Side-streams**

Recipe testing  
Production technology  
Pilot testing  
1 mL → 10 L

Transfer of recipes and  
technologies  
10 L → 1000 L

Evaluation of product on  
human health

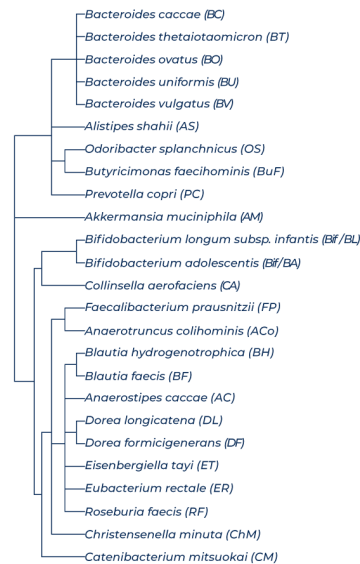
# Example: Apple cider residual valorization

**In vitro** study: human gut model consortium. **Choosing the enzymes** for human nutrition study.

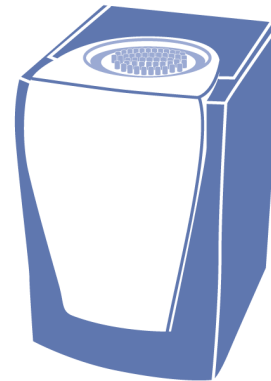
Human nutrition study (in progress)



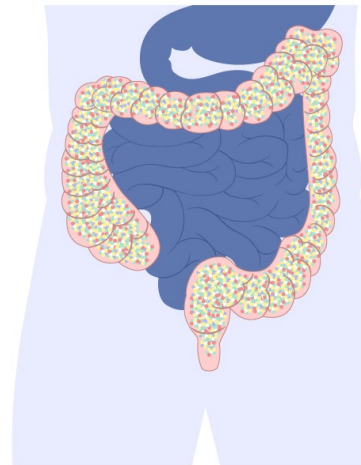
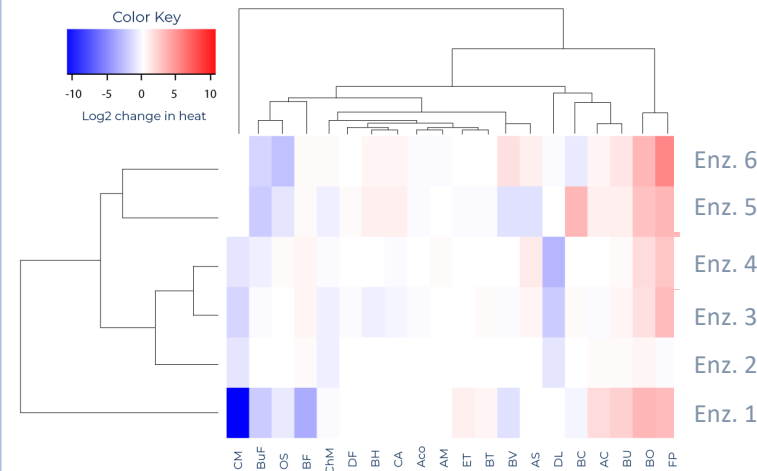
Human gut model consortium



Serial batch in microcalorimeter: base medium vs base + dietary fiber

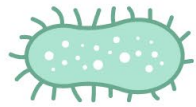


List of changes: consortium composition, metabolome



# TFTAK's microbial cultivation service

## Client

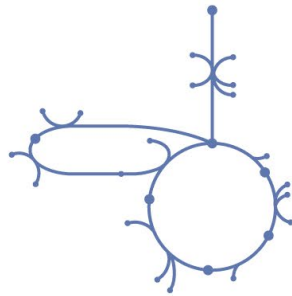


Single species up to BSL 2



Microbial consortia

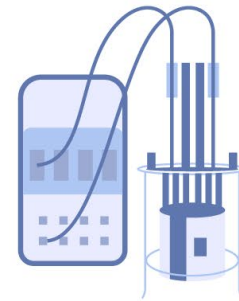
## TFTAK



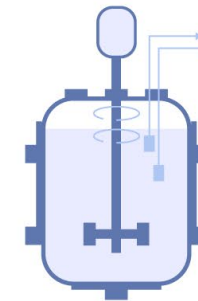
Genome analysis and metabolic modelling



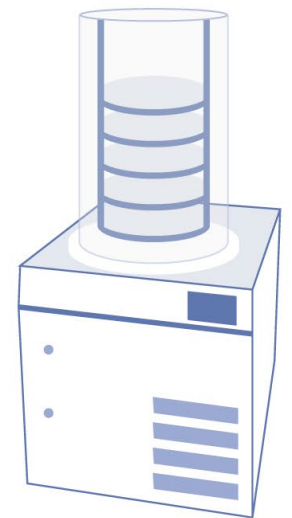
Growth media screening using isothermal microcalorimetry, omics methods and smart experimental design



Development of industrially feasible microbial manufacturing process



Manufacturing of the product (<100 g of freeze-dried cells)

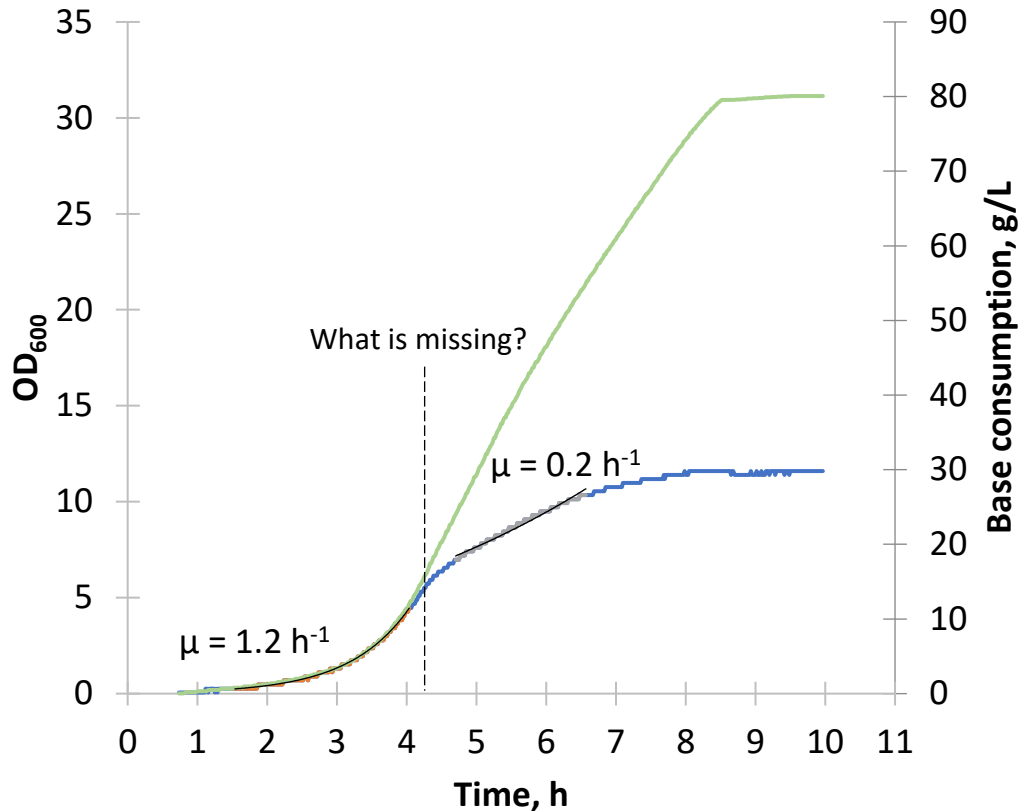


TFTAK's microbial cultivation service

**Key:** Different methods working seamlessly together.

**Challenge:** increasing scale and down-stream processing capabilities.

# Common issue: What is causing the growth phases?



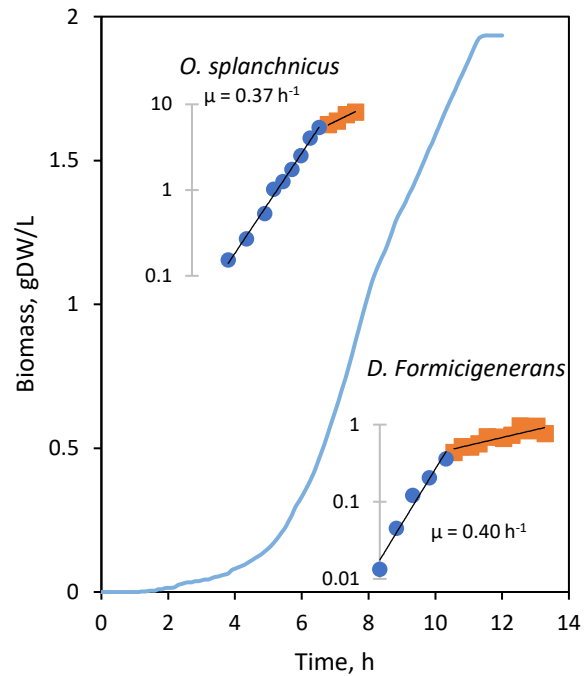
It is **something in the yeast extract!**

Broad range of **quantitative analytical methods:**

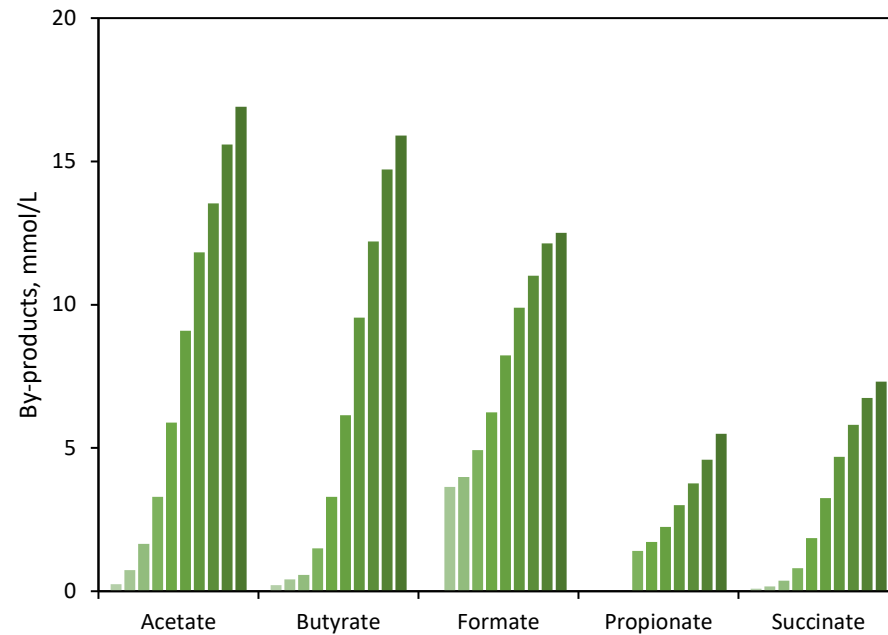
1. Sugars, organic acids.
2. Amino acids.
3. Nucleobases, nucleosides and nucleotides.
4. Custom analytics and semi-quantitative methods

# 25 species consortium manufacturing and viability analysis in TFTAk

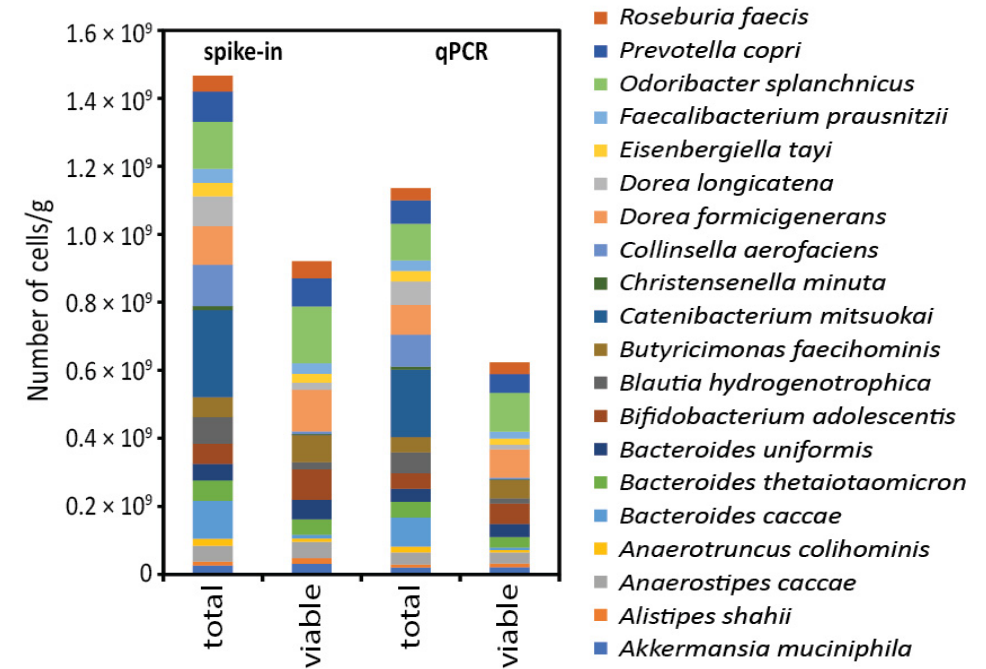
Single species growth curves in consortium growth + 16S data



Quantitative analytics for >30 metabolites

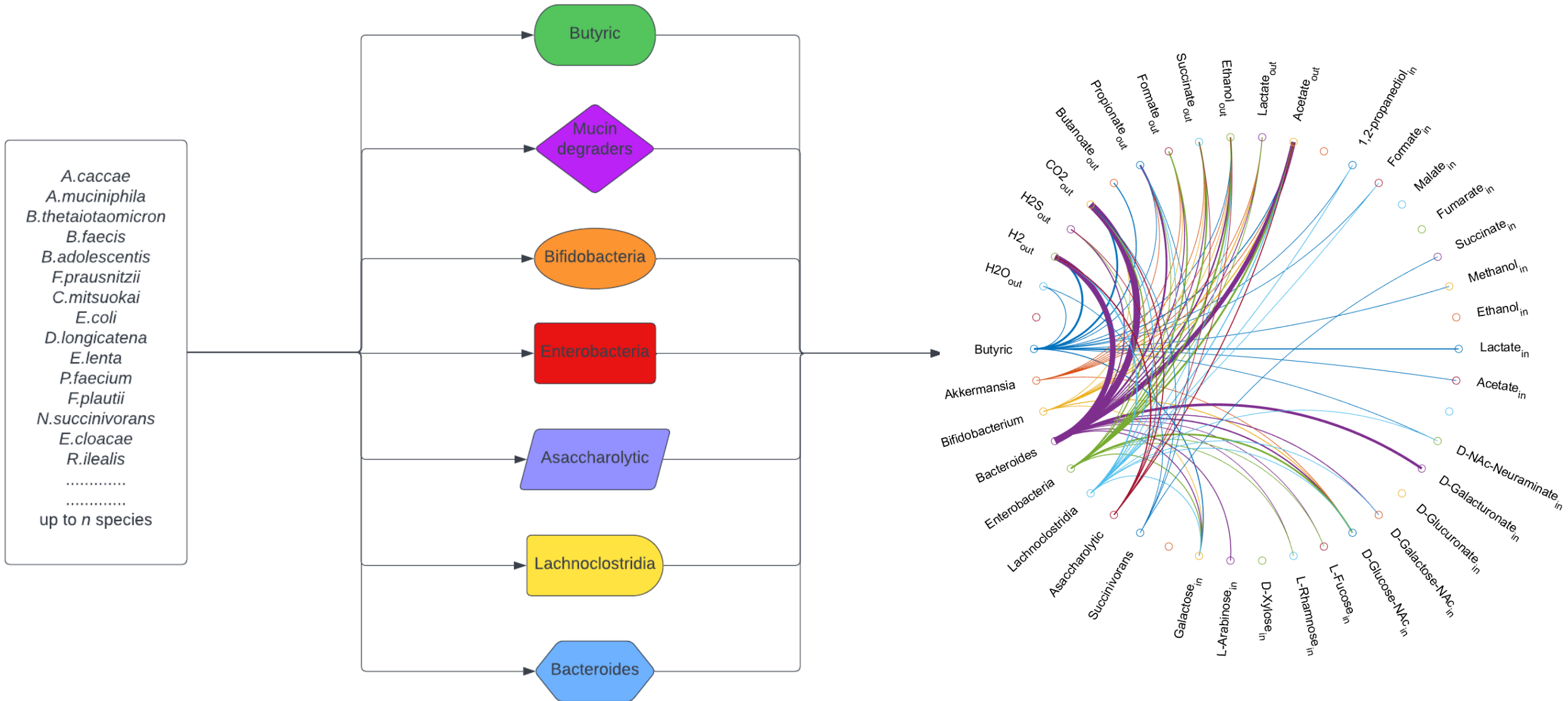


Viable cells in complex consortia: 16S NGS PMAxx staining and viable cells spike in



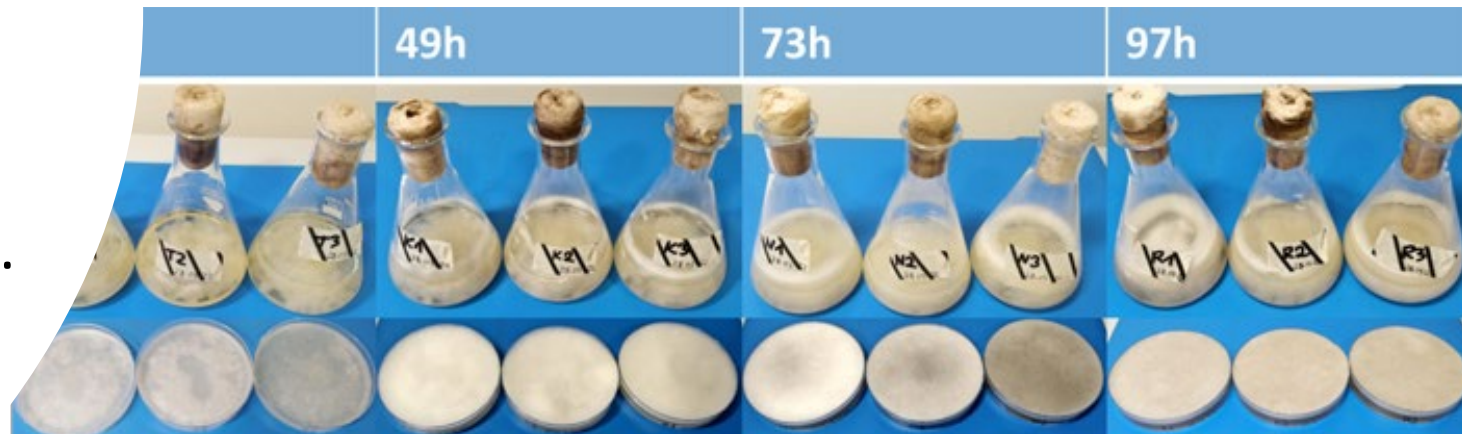


# Community metabolic modelling



# TFTAK's new focus: filamentous fungi

- We see **increased interest** of **filamentous fungi** cultivation.
- The fungi can grow on very **broad range of substrates**:
  - Cereal grains, wheat bran, brewery spent grain, corn cob meal
- Different applications:
  - Food: **single cell protein**.
  - Fertilizer: **Fungal spore production**.
  - **Metabolite production**



# Common request: solid state vs submerged fermentation

- **Solid state** cultivation is **easy to perform**, but difficult to scale.
- **Submerged** fermentation is difficult to perform, but **easier to scale**.
- Which approach to choose?
  - Strains must be chosen specifically to for the cultivation approach.





**We are always open for collaboration!**

Ranno Nahku, PhD  
Microbial Bioprocess Group Leader  
[ranno@tftak.eu](mailto:ranno@tftak.eu)

