



MICROBION

Open Innovation in Agri-Food Microbiology

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WHO WE ARE

Microbion is a CRO providing **microbiology R&D** services to

discover, control, exploit

the **best performing** microbes (strains) for each application,
through innovative **DNA-based methods**.

- ✓ Problem solvers
- ✓ Innovation enablers



OUR STORY



Spin-off
Verona
University

2011



1st business
partner

2012



1st Strain
licenced

2014



1st Patent
deposit

2015



1st EU project
+ EIT Food
acceleration

2017



OUR STORY



Spin-out
from campus

2018

- ✓ **300 m² labs**
- ✓ 5 lab technician
- ✓ 4 R&D managers
- ✓ 3 freelance specialists

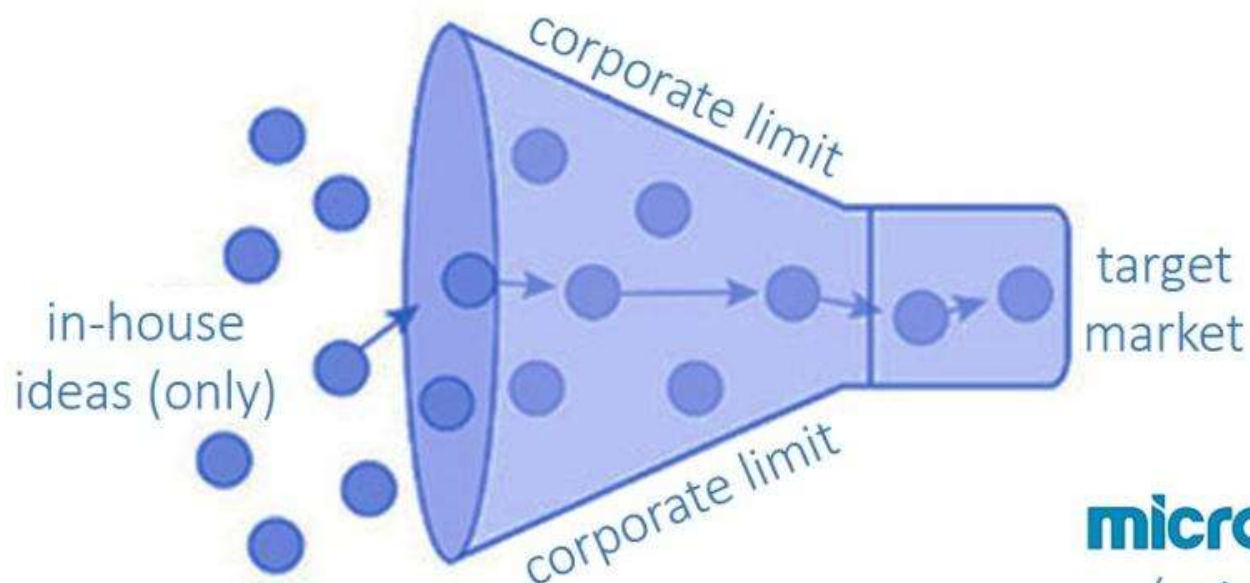
- Microbiology lab (BSL2)
- Molecular biology lab
- Bio-banking unit
- Bio-informatics unit

> 60 customers served
> 1 M€ service sales
(cumulative)



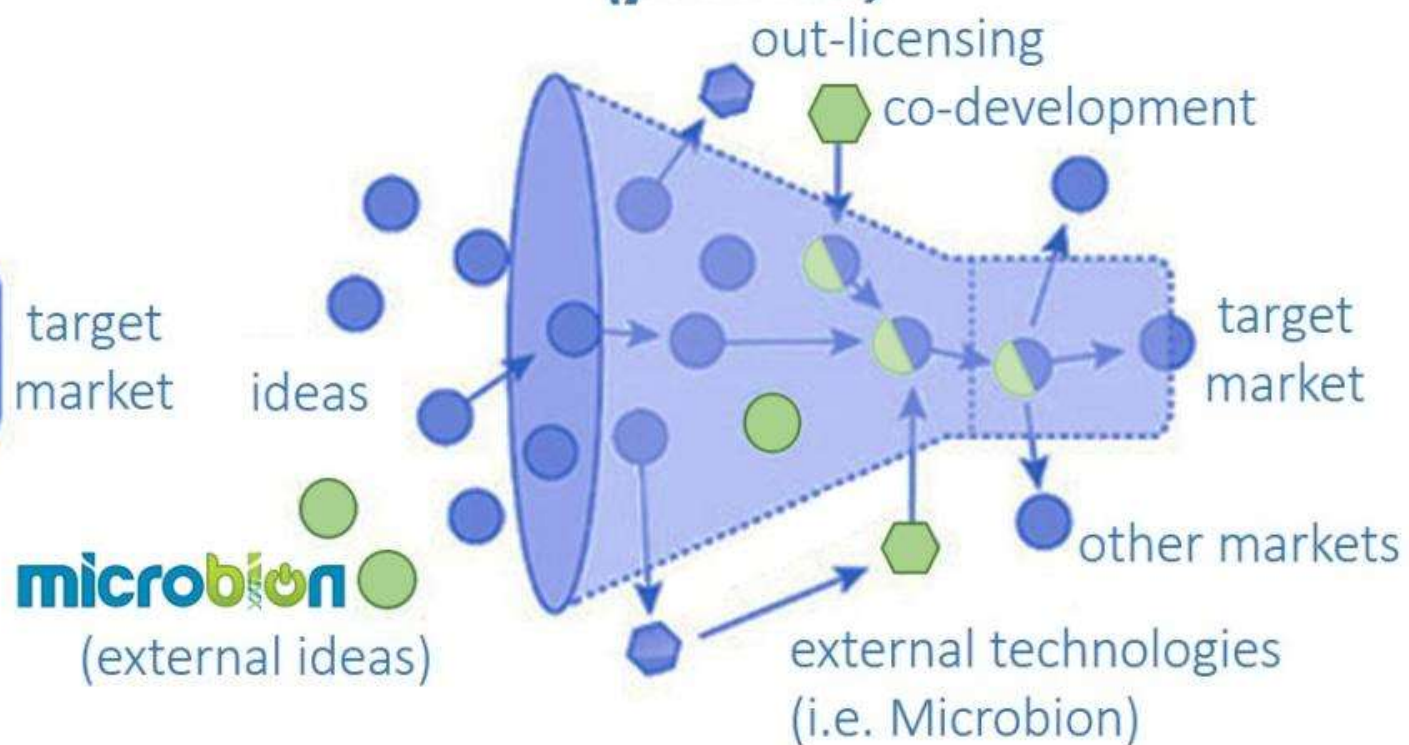
THE OPPORTUNITY

Closed Innovation (past)

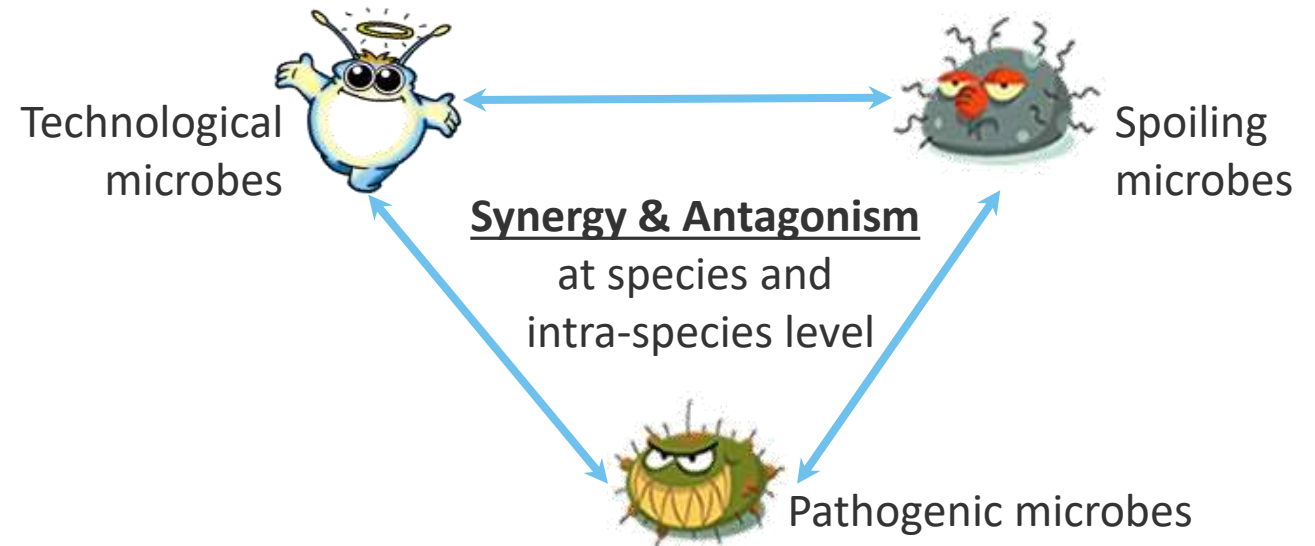
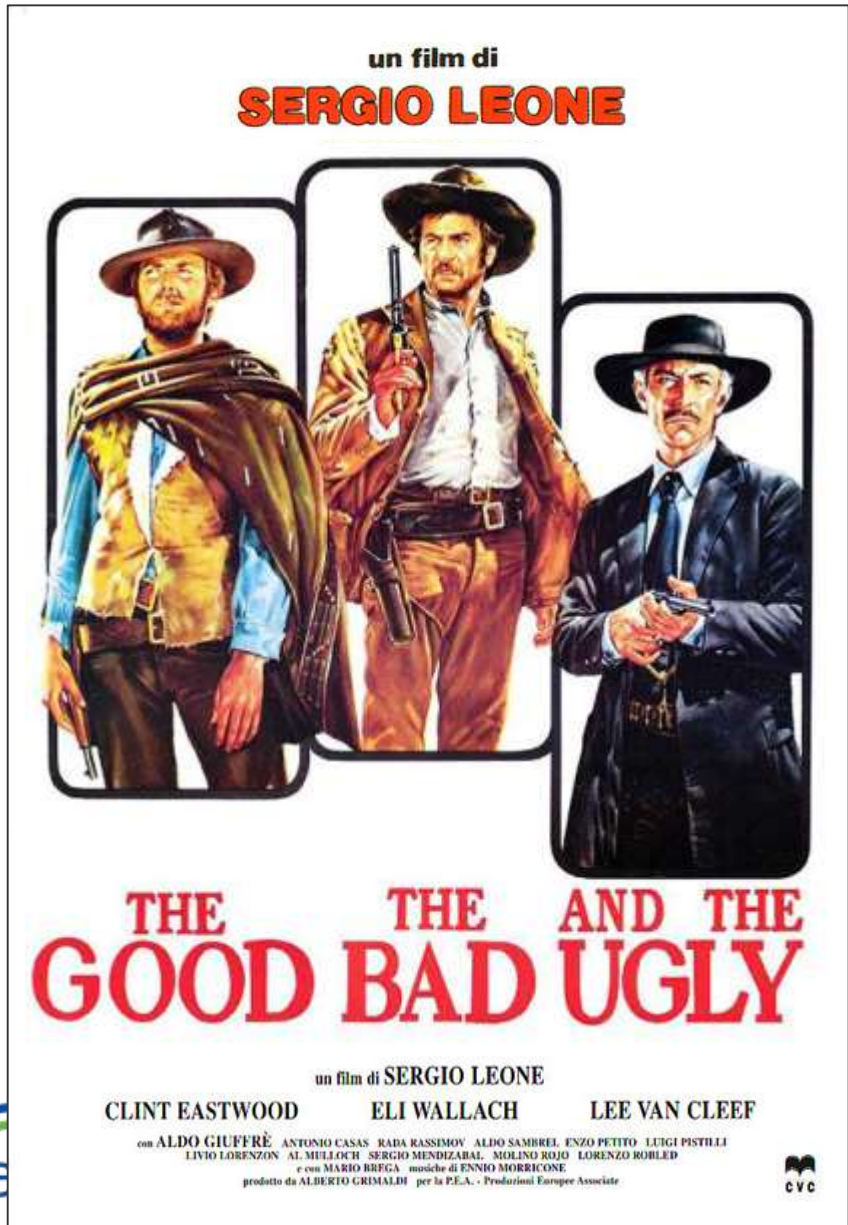


Vs

Open Innovation (present)



OUR PLAYGROUND: MICROBIAL BIODIVERSITY



OUR PLAYGROUND: MICROBIAL BIODIVERSITY



OUR EXPERTISE



Microorganisms
Identification



Microorganisms
Characterization



Microorganisms
Validation



Challenge
Tests



Technical
Problem Solving



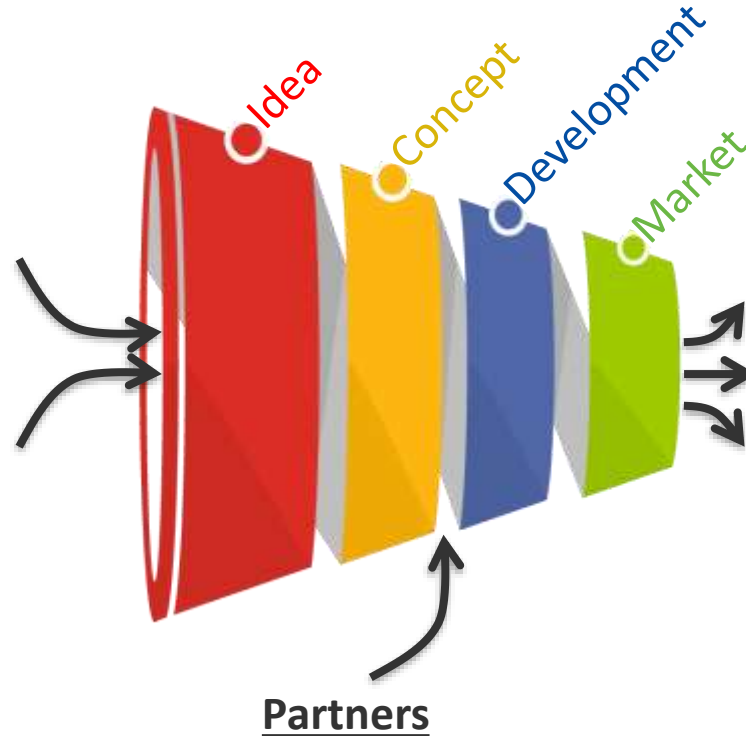
IPRs & Regulatory
Support



OUR KNOW-HOW AT WORK

Know-how:

- Molecular microbiology
- Species identification
- Strain characterization
- Strain authentication
- Bio-banks screening
- Genome analysis
- Comparative genomics
- Metagenomics
- Culturomics
- Patents expertise
- Agri-Food & Pharma Regulatory



Services provided:

- ✓ Starter selection
- ✓ Strain tracking
- ✓ Fermentation monitoring
- ✓ Safety assessment
- ✓ Strain manufacturing & quality control
- ✓ Microbial stability tests
- ✓ Microbiota analysis
- ✓ Challenge-tests of product/plant
- ✓ Bio-banks of contaminants/strains
- ✓ Strain-specific diagnostics
- ✓ Intellectual Property Rights
- ✓ Business intelligence
- ✓ Regulatory Compliance



OUR TECHNOLOGIES

MICROBIOLOGY

- ☐ Plate counts
- ☐ Antagonism assays
- ☐ Phenotypic assays
- ☐ Antimicrobials resistances
- ☐ Fermentation
- ☐ Stability-tests
- ☐ Lyophilization
- ☐ Cryopreservation
- ☐ Microscopy

..and more

MOLECULAR BIOLOGY

- ☐ End-point PCRs
- ☐ Fingerprinting PCRs
- ☐ Real-Time PCRs
- ☐ Quantitative PCRs
- ☐ Viability PCRs
- ☐ LAMP-PCRs
- ☐ Multi-locus sequence typing
- ☐ In-situ FISH
- ☐ Optical mapping

...and more

INNOVATIVE TECHNOLOGIES

- ☐ Whole genome sequencing
(long reads & short reads)
- ☐ Bioinformatics
- ☐ Transcriptomics
- ☐ Metabarcoding
- ☐ Metagenomics
- ☐ Flow Cytometry
- ☐ Infrared spectroscopy
- ☐ MALDI-TOF

...and more



INNOVATIVE STRAINS SELECTION

Practical example of one of our projects

The problem:

Amarone wine is made from 2 months dried grapes

➔ only 2 strains commercially available can work at this sugar/alcohol concentration ranges

The solution:

- Bio-based fermentation optimisation
- Regulatory compliance (DOC)
- Distinctive traits and improved quality wines

MASI
AGRICOLA



Native yeast populations study (1000+ yeasts)



MASI Yeast Bio-Bank (100+ yeasts)



Experimental wine production (10+ yeasts)



Scale-up winemaking (2 yeasts)

***S. cerevisiae* & Non-Saccharomyces**



Distinctive flavours



Cost saving & less CO₂ footprint

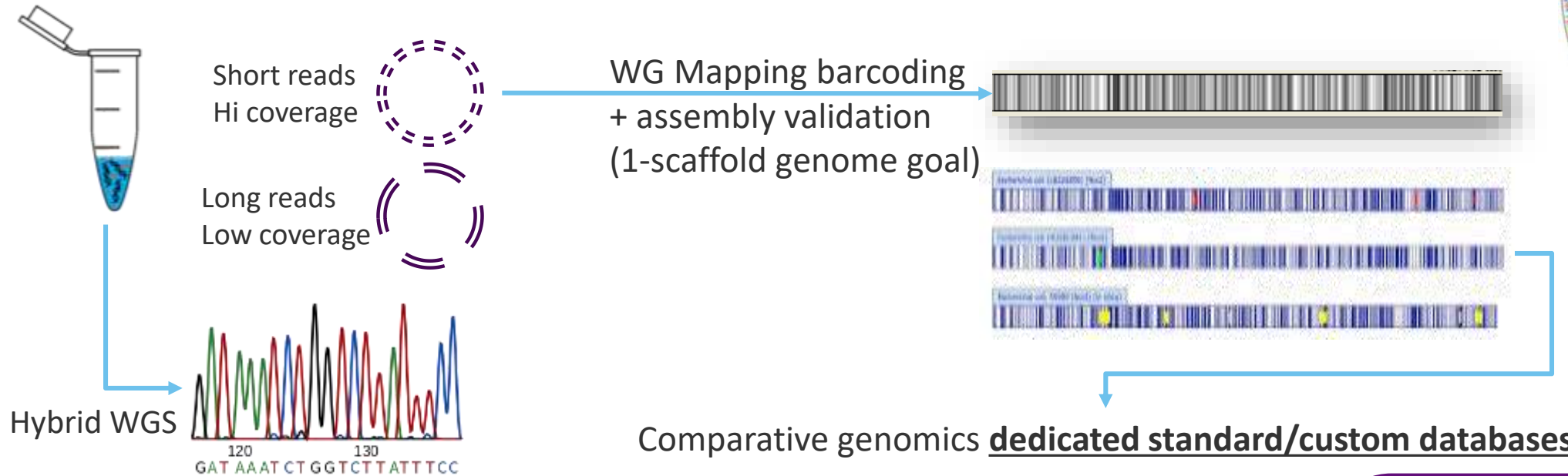


Seasonal consistency



Unique on the market!

COMPARATIVE GENOMICS PIPELINE



- Pathogen antagonism
- Adhesions genes
- Short chain fatty acids
- Bacteriocins
- Mechanism of action genes



- Virulence genes
- Antibiotics resistance
- Biogenic amines
- Antigens
- Horizontal gene transfer



- Diagnostics biomarker
- Field trials tracking
- Genome stability
- Differentiation from prior patented strains

REGULATORY COMPLIANCE

Experience with international regulatory authorities:

EFSA (EU)
EMA (EU)
FDA (USA)
EPA (USA)
SAHPRA (South Africa)
CFIA (Canada)
MFDS-KFDA (Korea)

Experience in compliance of product categories:

Agro-chemicals
Food/Feed Ingredients
Food/Feed Additives
Food/Feed Supplements
Medical Devices
Drugs (Live Biotherapeutic Products)

Experience with the demonstration process:

Genome-bases safety assessment
QPS status
GRAS status
Field Trials for claims substantiation
Clinical Trials for claims substantiation



Microbion is among the panellist that set the new standard for genome sequencing and analysis!

INTELLECTUAL PROPERTY RIGHTS

Business Intelligence services:

- ✓ collect strains from IDA bio-banks anonymously
- ✓ compare your strains with competitors and with prior-art strain
- ✓ technology scouting and market research
- ✓ competitive advantage analysis

Patent filing services (microbes and/or their application):

- ✓ prior-art search
- ✓ requirements check
- ✓ IDA compliant deposit
- ✓ technical description to the patent attorney
- ✓ reply to evaluators with the patent attorney

Examples of patents registered by our customers:

EP3194565A2 - Strain of the yeast species *Saccharomyces cerevisiae*, strains essentially derived from it and use thereof

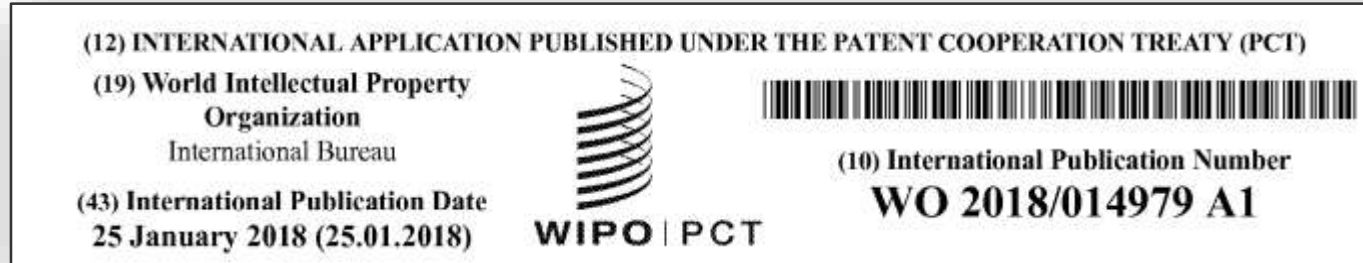
WO2019123329A1 - Composition for use in the treatment and/or improvement of sleep and mood disorders (probiotics)

ITUB20152796A1 - Ceppo di *Saccharomyces cerevisiae* CS1, sue composizioni e suoi usi



We can collaborate with your favourite patent attorney, or we can offer turnkey service together with N&G law firm

MICROBION PROPRIETARY TECHNOLOGY



Highly polymorphic and modular extragenic (**HPME**) markers within specific taxa of microorganisms and use thereof for their differentiation, identification and quantification:

- TRL 9 Probiotics application
- TRL 8 Agriculture bio-control application
- TRL 7 Fermented foods application

Distinguish genetically close-related microbes even in mix
Solve the problem of very similar 16S rRNA sequences!

- Microbion unique services
- License for diagnostic devices



Granted 2024



In progress

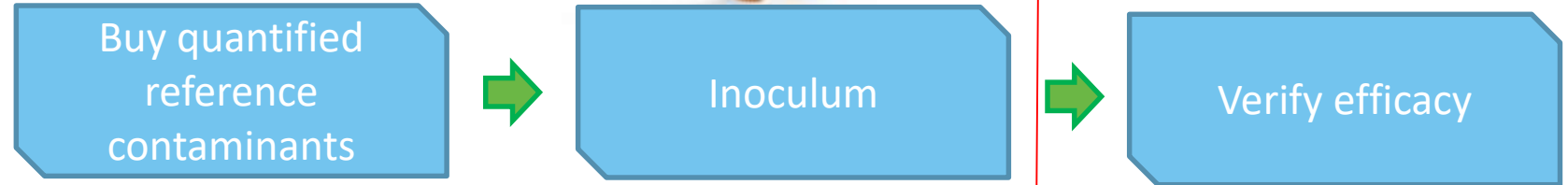
Validated differentiation of all species of:

- ✓ ***Lactobacillus***
- ✓ ***Bifidobacterium***
- ✓ ***Bacillus***
- ✓ More genera with HPMEscan

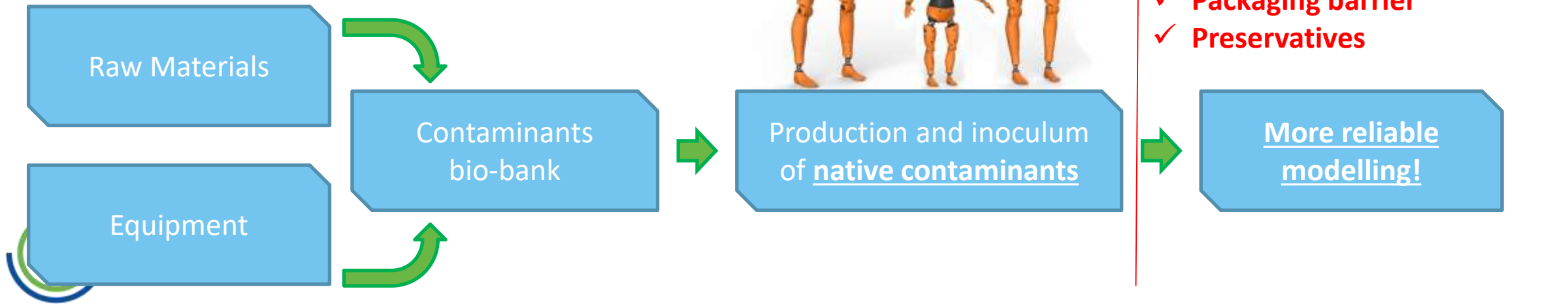


CHALLENGE TEST 2.0

Classic Challenge-test



Challenge-test 2.0



OUR MARKETS

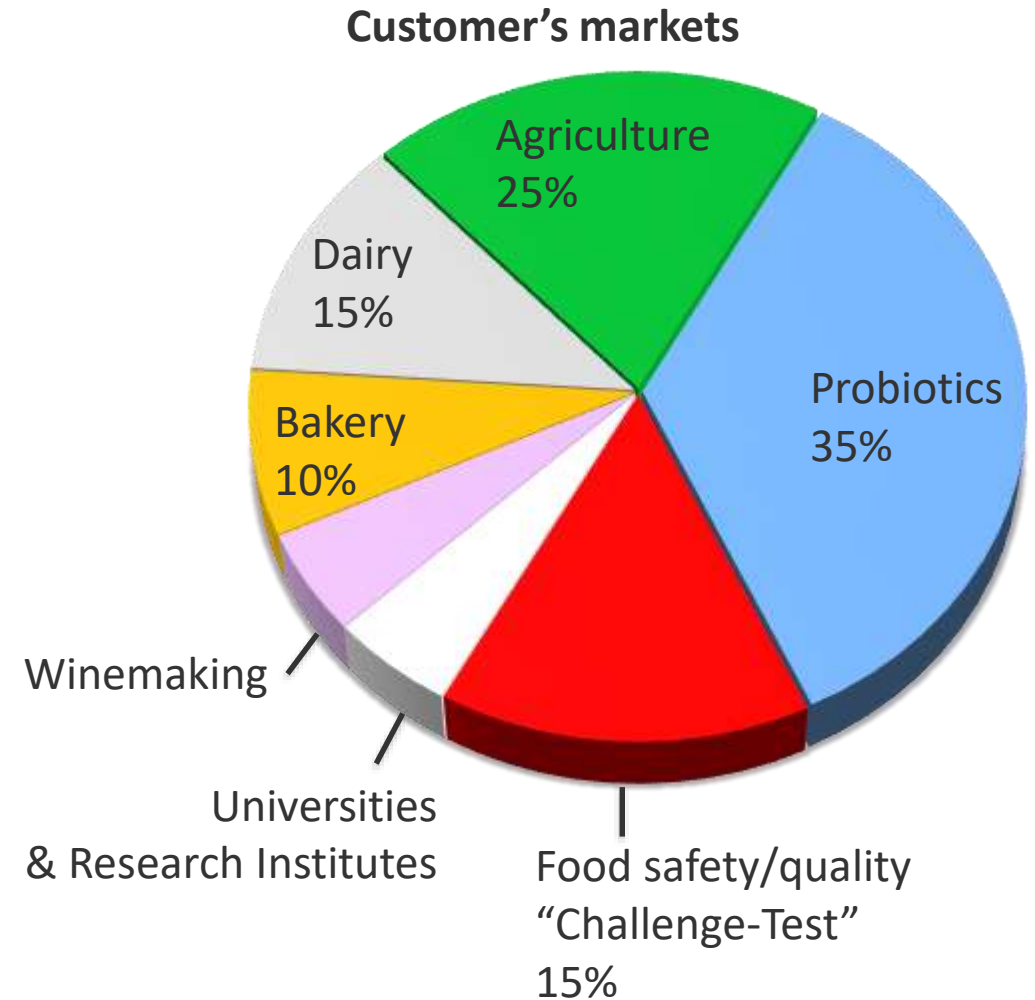
Best-selling services:

- ✓ Genome-based safety assessment reports
- ✓ Customised molecular analyses (PCRs)
- ✓ Strains selection and characterization
- ✓ Food Challenge-Tests & cleaning validation
- ✓ Open Innovation microbiology services

Our products:

- ✓ SAFEbion-V (SARS-CoV-2 surrogate)
- ✓ Biological Standards for validation of microbial load reduction and sanitization

International markets served:



WORKING ON





EIT FOOD INVOLMENT



Food
RISINGFOODSTARS

EIT FOOD FOCUS AREAS

2.11 Alternative Proteins

- Fungi based foods
- Microalgae as protein source
- Bacteria for texture in meat analogues

2.12 Sustainable Agriculture

- Plant growth promoting rhizobacteria
- Bacteria for biological control of plant disease
- Nematocides moulds
- Post-harvest treatment to increase shelf-life

2.13 Targeted Nutrition

- Probiotics, prebiotics, post-biotics and synbiotics
- Microbiome changes
- Fermented foods

2.14 Sustainable Aquaculture

- Fermentation based feed ingredients
- Bacteriophages for aquaculture disease control

2.16 Circular Food System

- Fermentation of side products for feed
- Shelf-life extension with bio-preservatives

EIT FOOD PAST PROJECTS



INNOPOULTRY *BP2018*

- New feeds for poultry industry
- Probiotics
 - Microbiome improvement

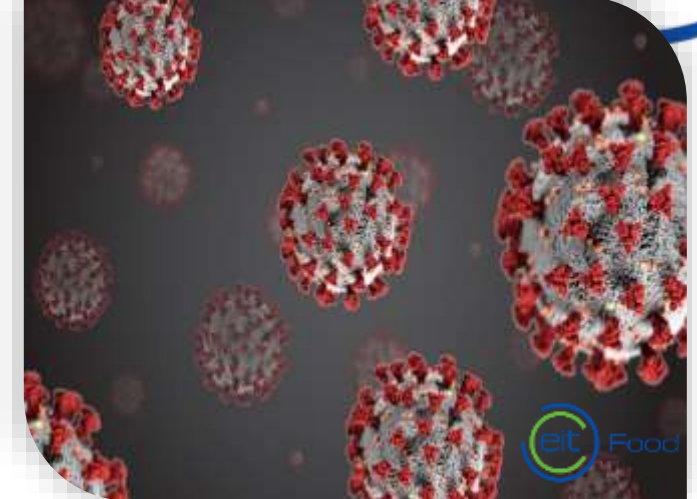
[click here to know more](#)



FISH TRUST *BP2018 & 2019*

- Portable device for fish fillets quality & *safety*
- Microbial load
 - Listeria detection

[click here to know more](#)



COVID-19 BEAM IT UP *BP2020*

- SARS-CoV-2 model to validate detection and sanitization products and protocols
- Surrogate virus
 - Portable, fast, easy-to-use diagnostic device

[click here to know more](#)

ONGOING EU PROJECTS

Horizon Europe (2022-26)



TITAN

Transparency solutions for transforming the food system

- **27 EU partners:**
Universities, Industries, NGOs
- **15 Solutions in 3 domains:**
 - Solutions for Safety
 - Solutions for Sustainability
 - Solutions for Health
- **Disruptive technologies:**
 - DNA-based Rapid Detection
 - Blockchain
 - Artificial Intelligence
 - Internet of Things

T4.1C (leader)

Transparency of fermented foods and supplements

T4.1D (member)

Safety and sustainability of long shelf-life foods



CTAAGGCCTTA..

[Click here to know more](#)

Project Leader



ONGOING EU PROJECTS

COST Actions (2021-25)



PIMENTO


Promoting Innovation of ferMENTed fOods

- **200+ experts:**
Universities, Industries, NGOs
- **Main WPs:**
 - Cartography of Fermented Foods (FF)
 - Health benefits and risks of FF
 - **Federating scientists and FF producers to boost innovation for society (co-leader)**
- **Microbion's role:**
Research-Industry connector and catalyser



SCAN ME!



- ✓ Survey on bottle-necks of innovation in FF 
 - Regulatory
 - Food Safety
 - Tech & Processing
- ✓ Position paper to EU Commission
- ✓ Partnership with EFSA for guidelines
- ✓ Association of the European FF industry

Project Leader



[Click here to know more](#)



THANK YOU!