THE MASTER PLAN:

Microbiome Applications for Sustainable food systems through Technologies and EnteRprise

Project Co-ordinator:

Prof Paul Cotter, Teagasc, Ireland

@pauldcotter; paul.cotter@teagasc.ie

http://www.master-h2020.eu/

@MASTER_IA_H2020
#MASTER

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Microbes are everywhere in the food system

Microbial communities are essential for food chain health, for food security and climate change mitigation.

Small numbers of potentially harmful microbes are a natural part of these communities.

Soil
Soil microbial communities differ: fungi form spider webs in the soil to connect plants, bacteria are near plant roots.

Animals and disease
Potentially harmful microbes are often part of the natural host microbial community and attack when immunity is weak. The animal food chain may also spread anti-microbial resistances.

Microbes on food
Foods like yoghurt and sauerkraut are rich in beneficial bacteria that outnumber those microbes which cause food go rotten. In food production, yeasts are often used for bread and beer.

Aquatic animals
Fish have microbial communities that support their health.

Plants
Microbes are on and in plants, supporting plant health.

Water bodies
Microbes in phytoplankton communities are food for fish.

Humans
Humans have many beneficial microbial communities: our gut bacteria is influenced by the food we eat.

Humans and disease
Microbial infections are common when immune systems are weak.

Shellfish and disease
Some microbial compounds accumulate in shellfish and cause food poisoning.

ingle celled algae
ingle-celled algae re a food source for us.

Agriculture
Some bacteria help crop growth and defend plants against diseases.

Plants and disease
Some microbes can cause plant disease and food losses, in the right environment.

Animals
Animals have microbial communities that are supportive of the animal's health.

Microbes in foods
Wrong food storage causes food to go rotten as moulds take over the microbial community. These microbes often cause food poisoning.

Food waste
Rotting of food means microbes recylce food leftovers so that nutrients can be released back into the environment.

The project MicrobiomeSupport (www.microbiomsupport.eu) has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818116.

A revolution in Microbiome research

Traditional, culture-based, approaches to microbiology only reveal the 'tip of the iceberg'

The success of culture based approaches is dependent on having types of agar/culture media/growth conditions that allow all microbes to grow

Such an agar does not exist!!

Indeed only a small % of microbes are easily cultured in the laboratory.

DNA sequencing-based approaches can allow an analysis to the entire population regardless of whether it can be grown or not

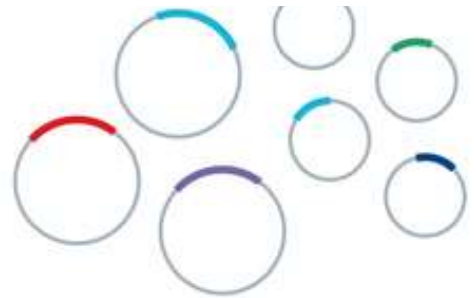
All of the DNA from the microbes present in a particular environment = Metagenomic DNA

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

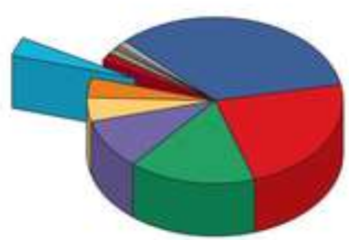
DNA-based community analysis

Community DNA

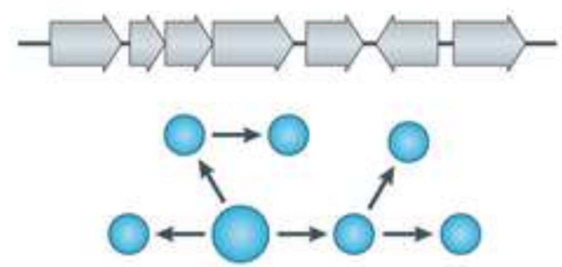
Whole metagenome Shotgun sequencing



Community Composition



Genes or Pathways

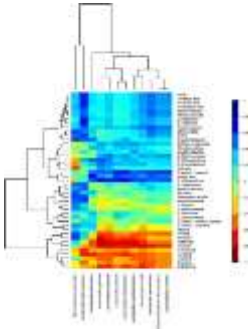


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Pre-MASTER: The Back Story

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Fermented beverage microbiome



Water kefir

Marsh et al
FEMS 2013

Kombucha

Marsh et al
Food Microbiol 2014

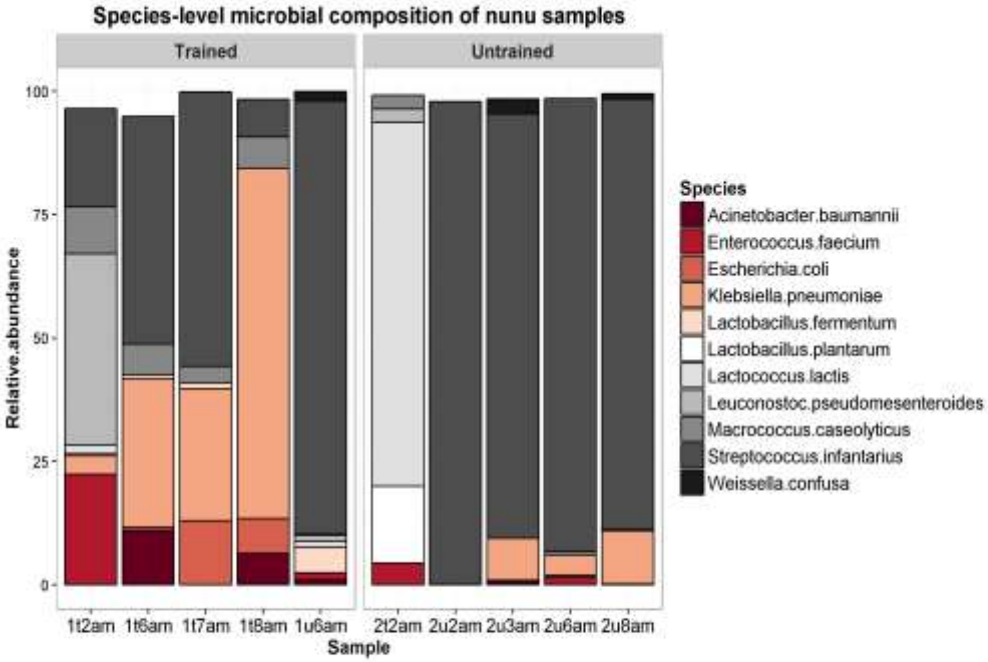
Kefir

Walsh et al.
mSystems 2016

Nunu

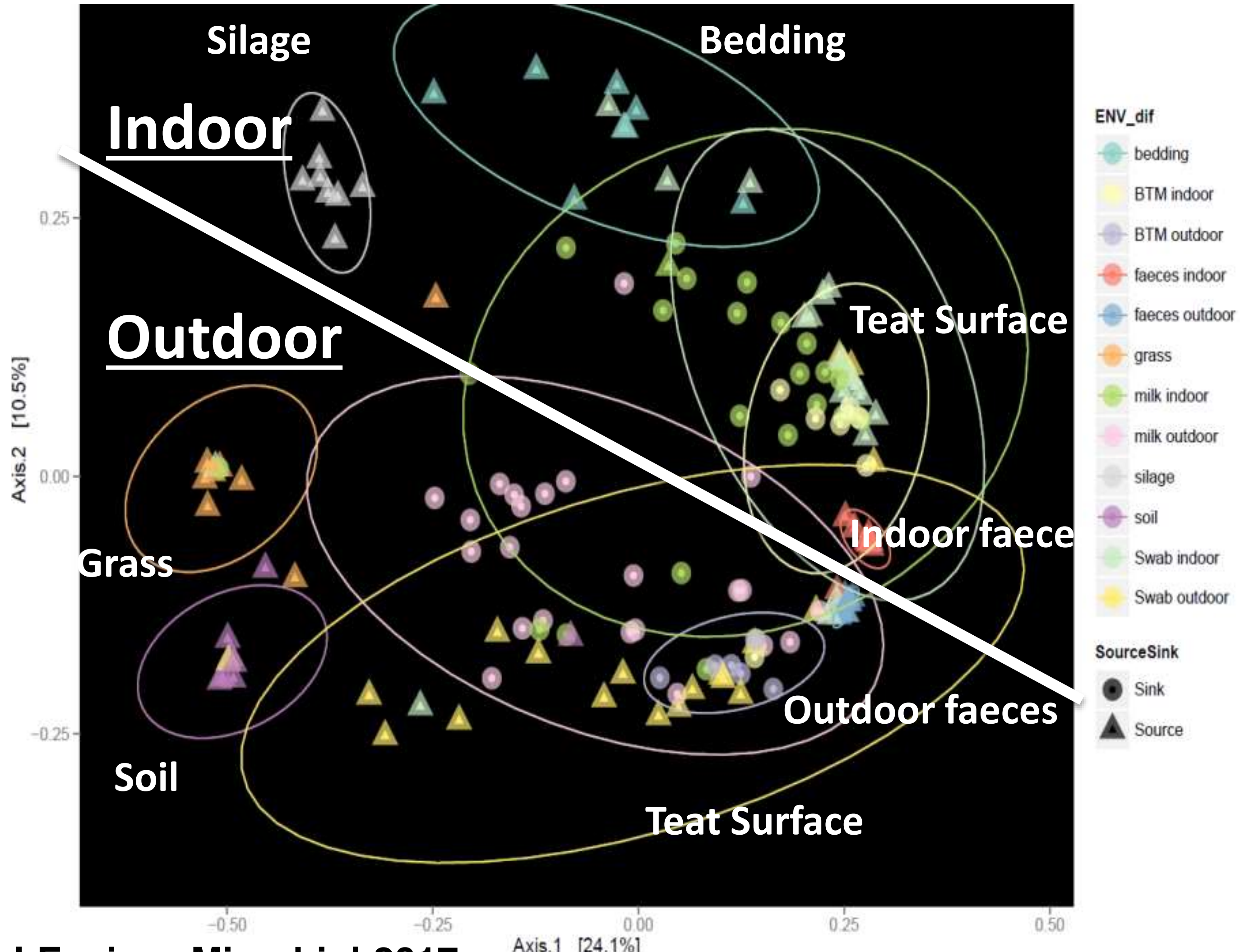
Walsh et al
Appl Env Microbiol 2017

- Spontaneously fermented yoghurt-like milk product in Africa
- Short shelf-life
- Trained vs Untrained producers



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Compositional analysis reveals primary source of contaminants in raw milk across different seasons

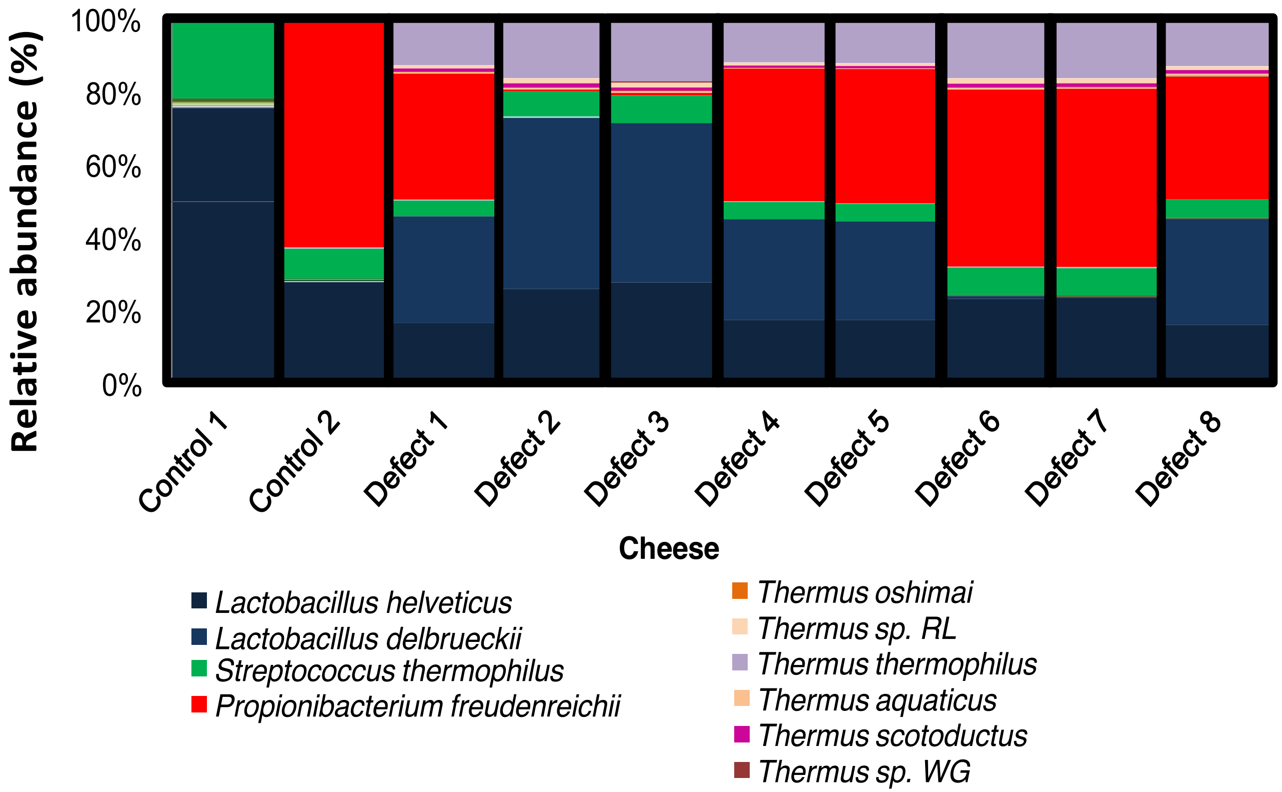


Doyle et al. Appl Environ Microbiol 2017

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Shotgun metagenomic analysis of commercial cheese samples

Pink discolouration defect in cheese (Swiss, Cheddar, Italian) has been a world-wide problem over many decades.

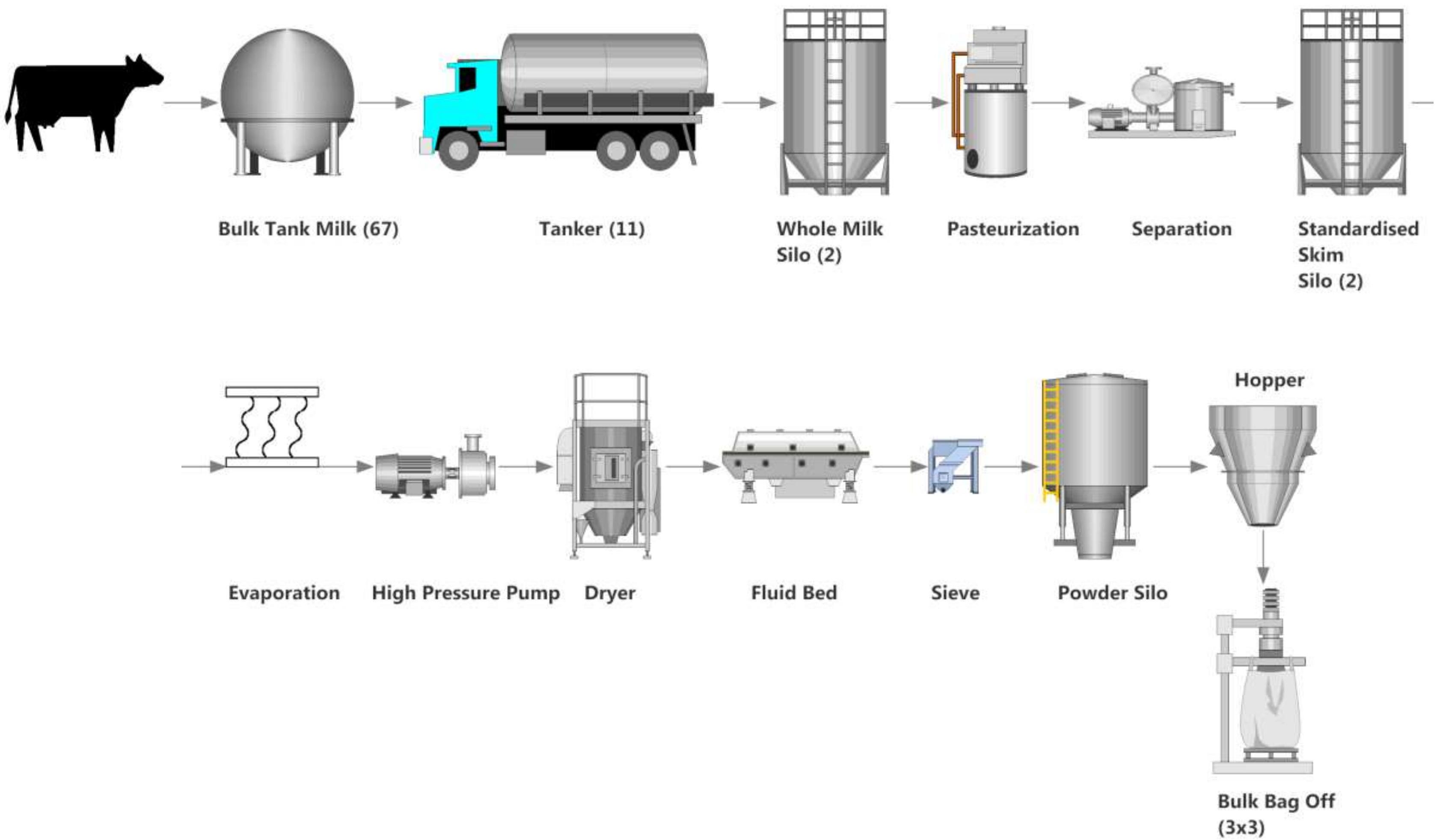


Defect cheese is enriched with *Thermus thermophilus in particular*

Quigley et al MSystems

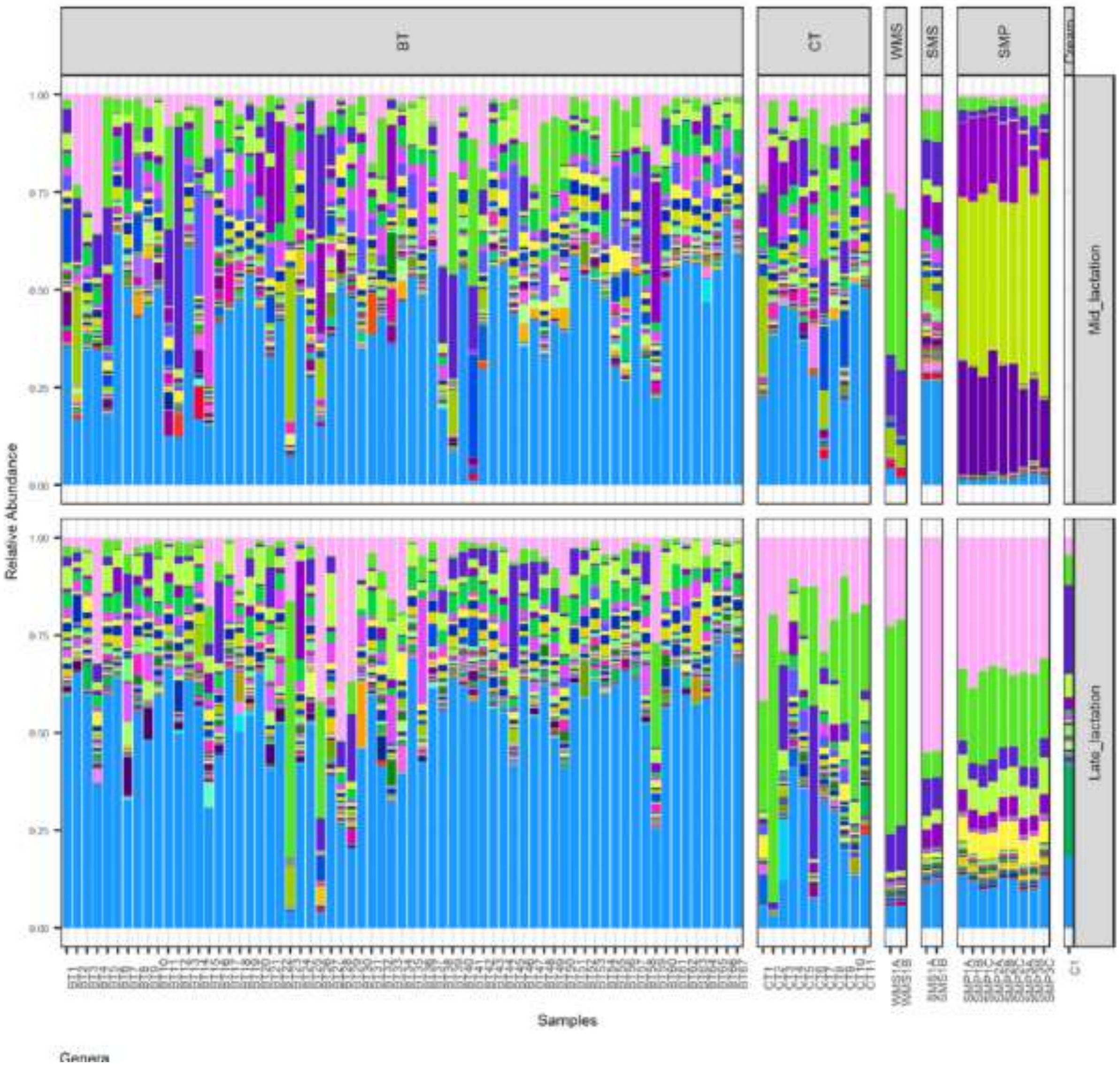
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

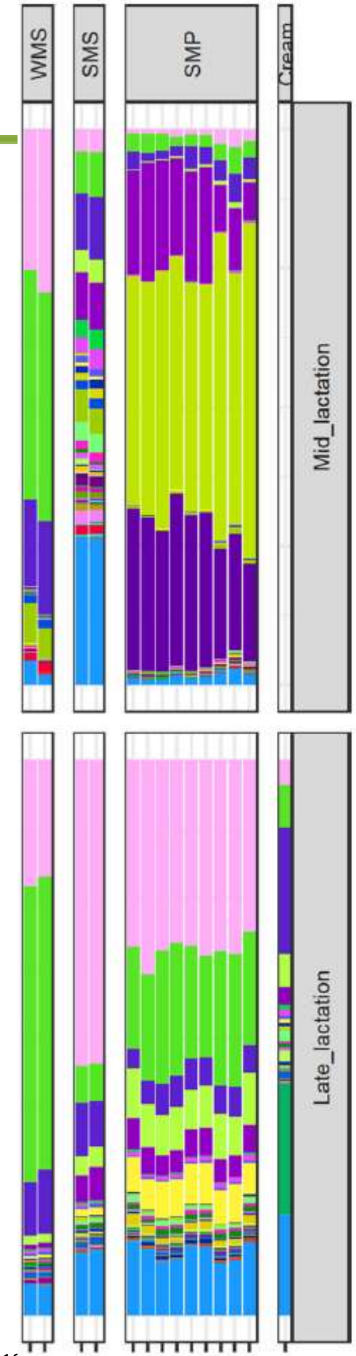
Movement of microbes through the food chain



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Dairy chain microbes





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

The MASTER Plan

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

master partners

Teagasc

INRA SCIENCE & IMPACT

UCC

FFoQSI

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

INOQ

4D pharma plc

The Circa Group Europe

Queen's University Belfast

ICBF.com

Anadiag

Università degli Studi di Napoli Federico II

University of Trento - Italy

CSIC Consejo Superior de Investigaciones Científicas

universidad de león

Ifremer

DEVENISH

TRITECC

QIAGEN

CHR HANSEN

NOVOLYZE

BASECLEAR

matís

FishVet Group

WAGENINGEN UNIVERSITY & RESEARCH

Oxford NANOPORE Technologies

DANONE ONE PLANET. ONE HEALTH

Luke

ABInBev

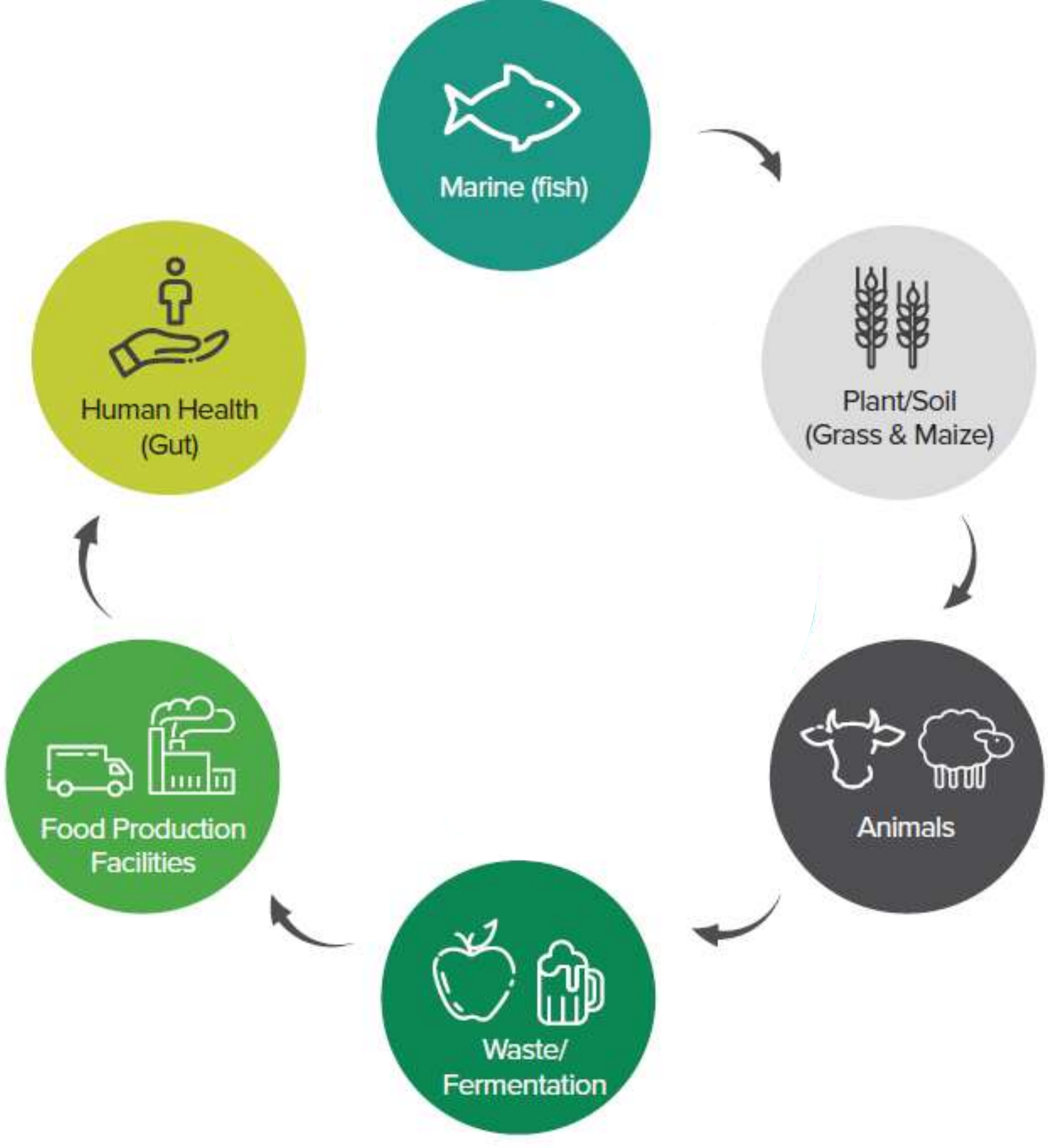
afbi

Microbiome Applications for Sustainable Food Systems through Technologies and EnteRprise

MASTER takes a global approach to the development of microbiome products, foods/feeds, services or processes with high commercial potential.

This will benefit society through **improving the quantity, quality and safety of food** across multiple food chains. These include marine, plant, soil, rumen, meat, brewing, fruit and vegetable waste, and fermented foods.

The MASTER project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368



Marine (fish)
Plant/Soil
(Grass & Maize)
Animals
Waste/
Fermentation
Food Production
Facilities
Human Health
(Gut)

Objectives of MASTER

1. Develop microbiome-based solutions for **improving important traits of fodder crops** (**grass & maize**) and **employ microbiome-based diagnostics** (for use in real time by food operators) to improve primary production of these crops

2. Develop microbiome-based solutions to **increase bioavailability of sustainable feeds** for enhanced fish growth and employ microbiome-based **diagnostics** (for use in real time by food operators) to assess **fish health & detect pathogens**

3. Target the rumen microbiome (**increased feed efficiency, reduce methane emissions**) by utilising host genomics & novel feeding technologies to beneficially alter the rumen microbiome & to develop technologies to monitor microbiome markers & other tools and models which predict ruminant phenotype

4. Optimize **fermented food microbes** and processes to add to the **value and health**-promoting properties of substrates, including those resulting from waste streams.

5. Contribute to the design of **novel functional foods** on the basis of the study of available data on **food/human gut microbiome inter-relationship** and provide effective tools to test the potential of food ingredients to move the gut microbiota away from dysbiosis to that reflective of healthy individuals.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Objectives of MASTER

6. Develop, optimize, standardize and validate technologies, as well as **software tools and targeted reference databases** for microbiome analysis and pathogen detection in foods and to map the microbiome of food producing facilities

7. Develop **long-term databases, tools and resources** supporting the food-chain industry after the end of the project

8. Promote an understanding of, engagement and interest in, microbiome-related applications for the food industry through communication and **engaging with diverse end-users**

9. Create a clear **knowledge exchange plan** between all participants, developing mutual specialisation, standard operational procedures, supporting management and training, thus strengthening the complementarity and trans-disciplinarity of the partners

10. **Bring to market new and cost-effective commercial applications** to assist different stages and processes throughout the food chains, by 2025 and, in the process, move available solutions from TRL (Technology Readiness Level) 5/6 to TRL 7

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Plant and soil microbiomes

WP2: Plant, Soil and Marine Microbiomes – Microbiome-based improved production of fodder crops & aquaculture *Lead AIT (Sessitsch), Co-Lead MATIS (Marteinsson), partners Teagasc, INOQ, Qiagen, ONT, AIT, Anadiag, CH, IFREMER, FVG in close interaction with WPs 1, 3, 5 and 6*

Objectives:

Microbes to improve nutrient uptake, provide biocontrol of *Fusarium* and lower mycotoxins in fodder crops (maize and grass).

Develop microbiome-based diagnostic tools enabling detection of pathogens and prediction of the responsiveness of a system (based on fodder maize) to microbial applications

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

Teagasc Agriculture and Food Development Authority

INOQ

QIAGEN

Oxford NANOPORE Technologies

ANADIAG

CHR HANSEN

Microbiome solutions for improving traits of fodder crops

- Work plan overview

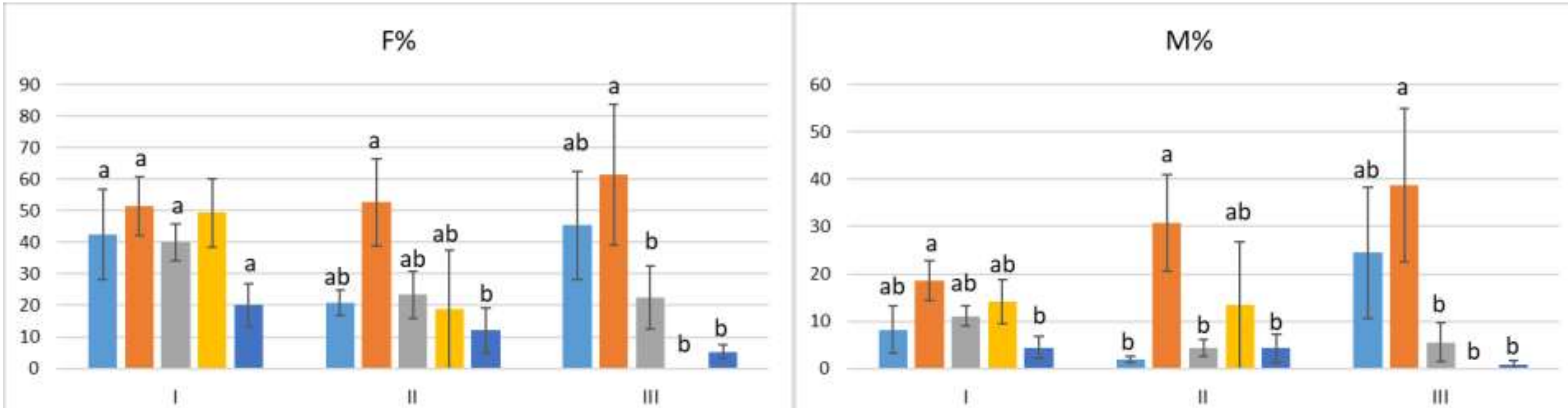
Fodder maize	Fodder grasses
Biofertilizing strains: • *Rhizophagus irregularis* • *Funneliformis mosseae* • *Funneliformis caledonium* Biocontrol strains (against *Fusarium* spp.): • *Bacillus subtilis* • *Bacillus licheniformis* AB12	Biofertilizing strains: • *Rhizophagus irregularis* • *Funneliformis mosseae* • *Funneliformis caledonium* • *Bacillus* sp. AB20 • *Paraburkholderia phytofirmans* PsJN
Field trails (2020 & 2021) • two consecutive years • three representative locations (Italy, France, Spain)	Field/on-farm trails (2020 - 2022) • two consecutive years • Ireland • assessment of: agronomic traits, colonization of applied bacteria & fungi and effect on plant-associated microbiome

Agronomic traits, colonization of applied bacteria & fungi, mycotoxin concentration, fodder/silage quality and effect on plant-associated microbiome

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Microbiome solutions for improving traits of fodder crops

- Highlight: mycorrhizal colonization of the plants improved or altered depending on the bacterial strain



The presence of *B. subtilis* tends to lower the mycorrhizal colonization of the roots, whereas *Bacillus* sp. improves it. This effect is dependent on the concentration of AMF (arbuscular mycorrhizal fungi) in the substrate.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Microbiome-based diagnostics to improve primary production of fodder crops

- **Kit** facilitating the **isolation and enrichment of microbial DNA from plant material**
- Adaptation of available sequencing pipelines for **detection of relevant pathogens** as defined in the literature
- **Microbiome markers** -prediction of the response of a system to microbial inoculants
- Development and validation of **sequencing and analysis pipelines** for the identified markers
- Microplot trials

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Marine microbiomes

WP2: Plant, Soil and Marine Microbiomes – Microbiome-based improved production of fodder crops & aquaculture *Lead AIT (Sessitsch), Co-Lead MATIS (Marteinsson), partners Teagasc, INOQ, Qiagen, ONT, AIT, Anadiag, CH, IFREMER, FVG in close interaction with WPs 1, 3, 5 and 6*

Objective:

Develop microbiome-based solutions to increase bioavailability of **sustainable feeds for enhanced fish growth** and **employ microbiome-based diagnostics** (for use in real time by food operators) to assess fish health & detect pathogens.

Approach:

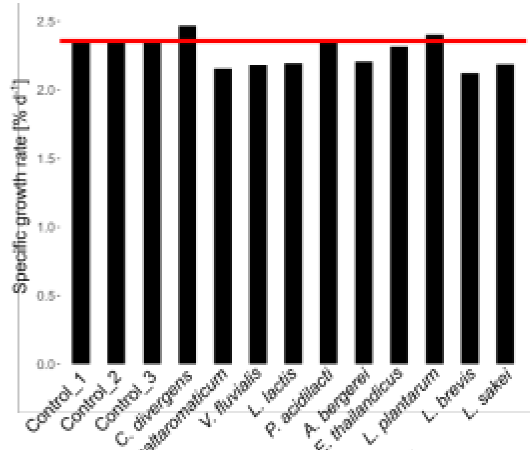
Comparative growth trials with juvenile Salmonids fed with alternative protein sources, prebiotics and probiotic strains.

Pathogen detection in aquaculture systems using on-site ONT sequencing.

Marine and aquaculture microbiomes

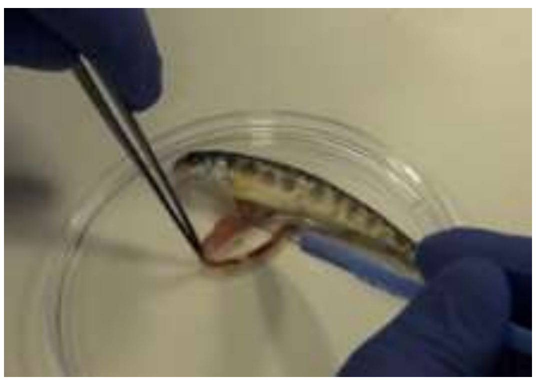
Sustainable feeds for enhanced fish (juvenile salmonids) growth

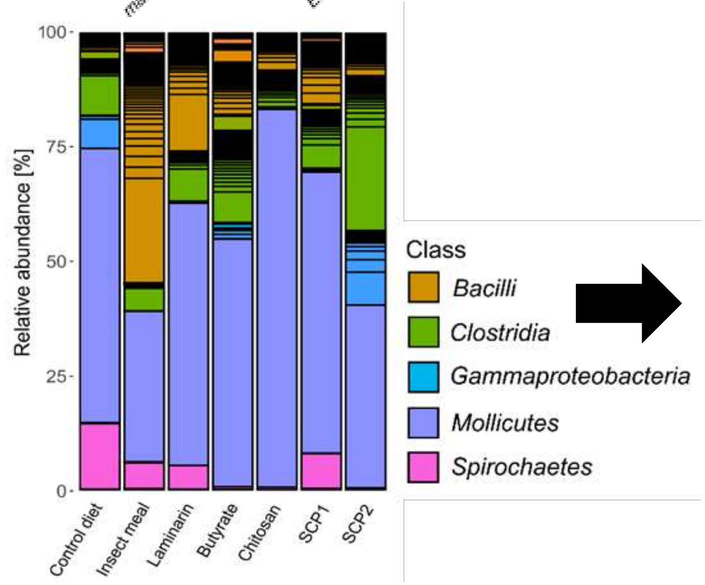
Comparative growth trials



Comparison of growth rates between diets (insect meal, SCP, prebiotics) and probiotic supplementation

Gut microbiome analysis



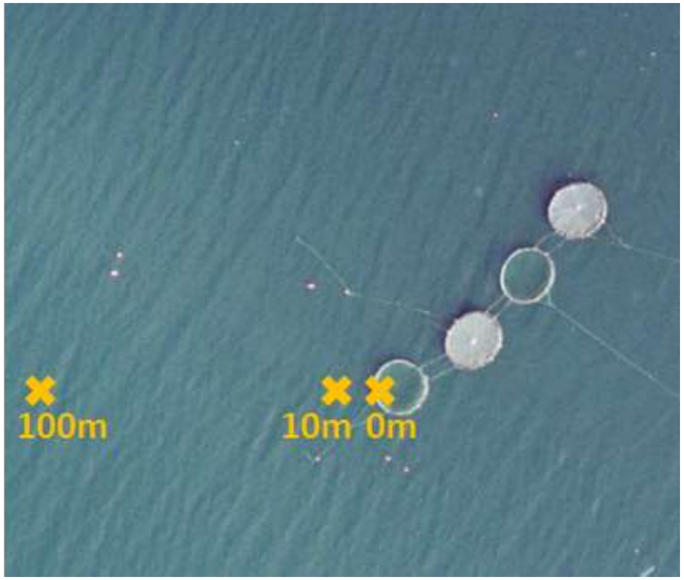


Detection of alterations in the gut microbiome based on diet

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

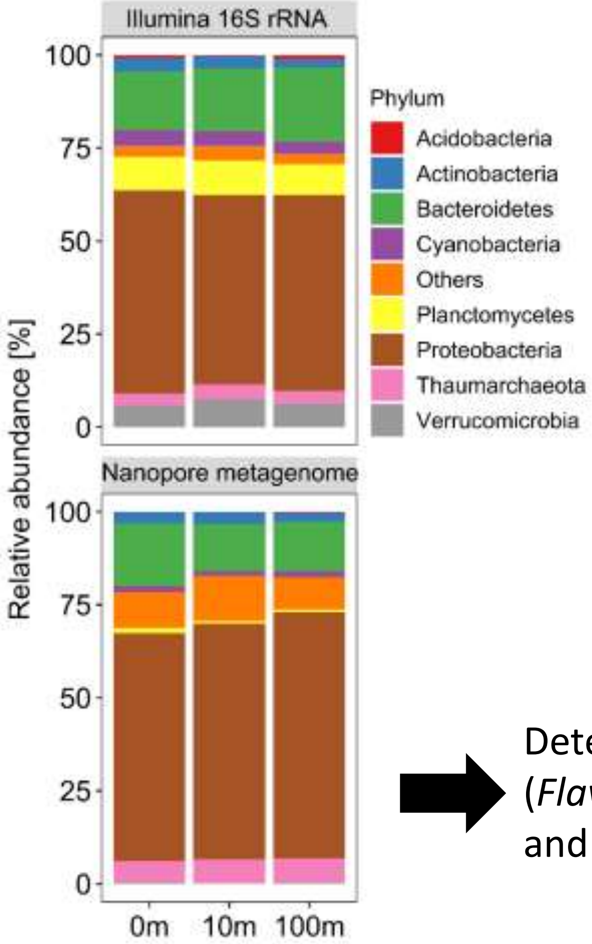
Marine and aquaculture microbiomes

Pathogen detection in marine aquaculture systems – Reliable screening pipeline



Aerial view of marine aquaculture net cages. Water samples collected at 0, 10 and 100 m distance

Whole shotgun metagenomic sequencing on Nanopore MinION



Detection of fish pathogens (*Flavobacterium psychrophilum* and *Alivibrio salmonicida*).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

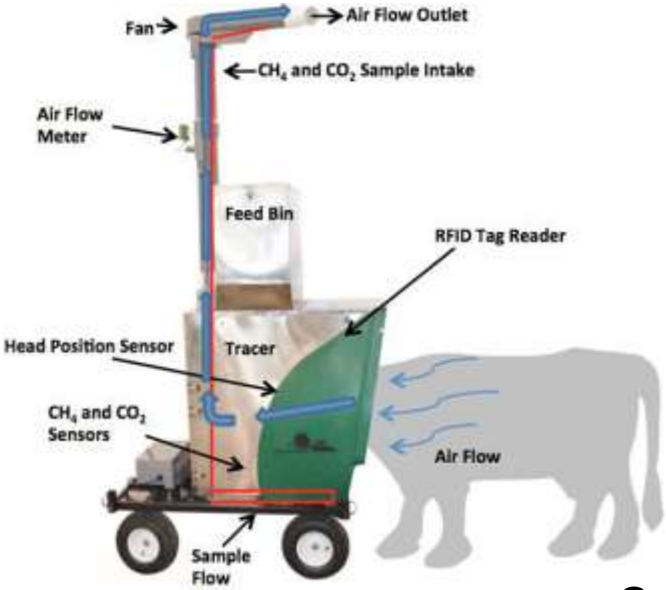
Rumen microbiome

WP3: Rumen Microbiome – Improving animal production and reducing environmental impact through manipulation of the rumen microbiome *Lead QUB (Huws), Co-Lead CSIC (Yanez-Ruiz), partners Teagasc, LUKE, INRA, Devenish, ICBF, AFBI, .*

Objective:

- Utilise host genomics to alter the rumen microbiome and animal phenotype.
- Define the rumen microbiome (different life stages) to improve efficiency, reduce greenhouse gases emissions & improve the fatty acid content of meat and milk.
- Develop microbiome-based tools to predict animal phenotype.

Define the rumen microbiome to improve efficiency, reduce greenhouse gases emissions & improve the fatty acid content of meat and milk.



Green Feed

Portable accumulation chambers

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Dietary manipulations of the rumen microbiome for improved animal phenotype.

- Meat
  - 2 days
    - Legs
    - Shoulder
    - Loins
  - 7 days
    - Legs
    - Shoulder
    - Loins






ALS Life Sciences Ltd
Trading as ALS
Carrigeen Business Park, Clonmel, Co. Tippera
Tel: +353 (0) 52 617 8100
Fax: +353 (0) 52 617 8103
www.alsglobal.ie

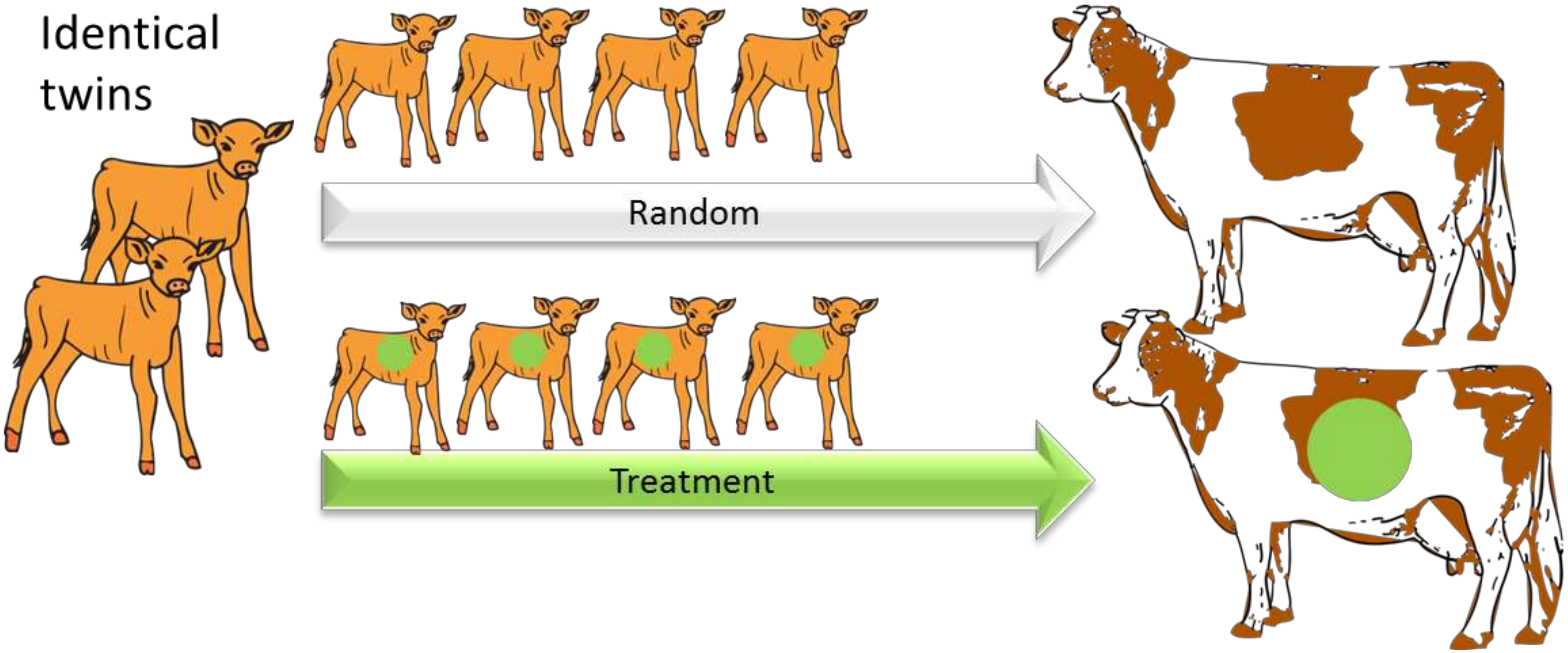
Test
Presumptive Coliforms
Escherichia coli O157
Thermotolerant Campylobacter
Aerobic colony count
ß-Glucuronidase + E. coli
Salmonella
Listeria spp.

pH; Fatty acid (raw and cooked meat); Oxidation - shelf life;

Sensory profiling; Human intervation; Hyperspectral image; REIMS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Utilise host genomics to alter the rumen microbiome and animal phenotype.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Microbiomes & food processing, waste streams and gut health

WP4: Microbiome in Food Processing, Valorisation of Waste Streams and Human Gut Health

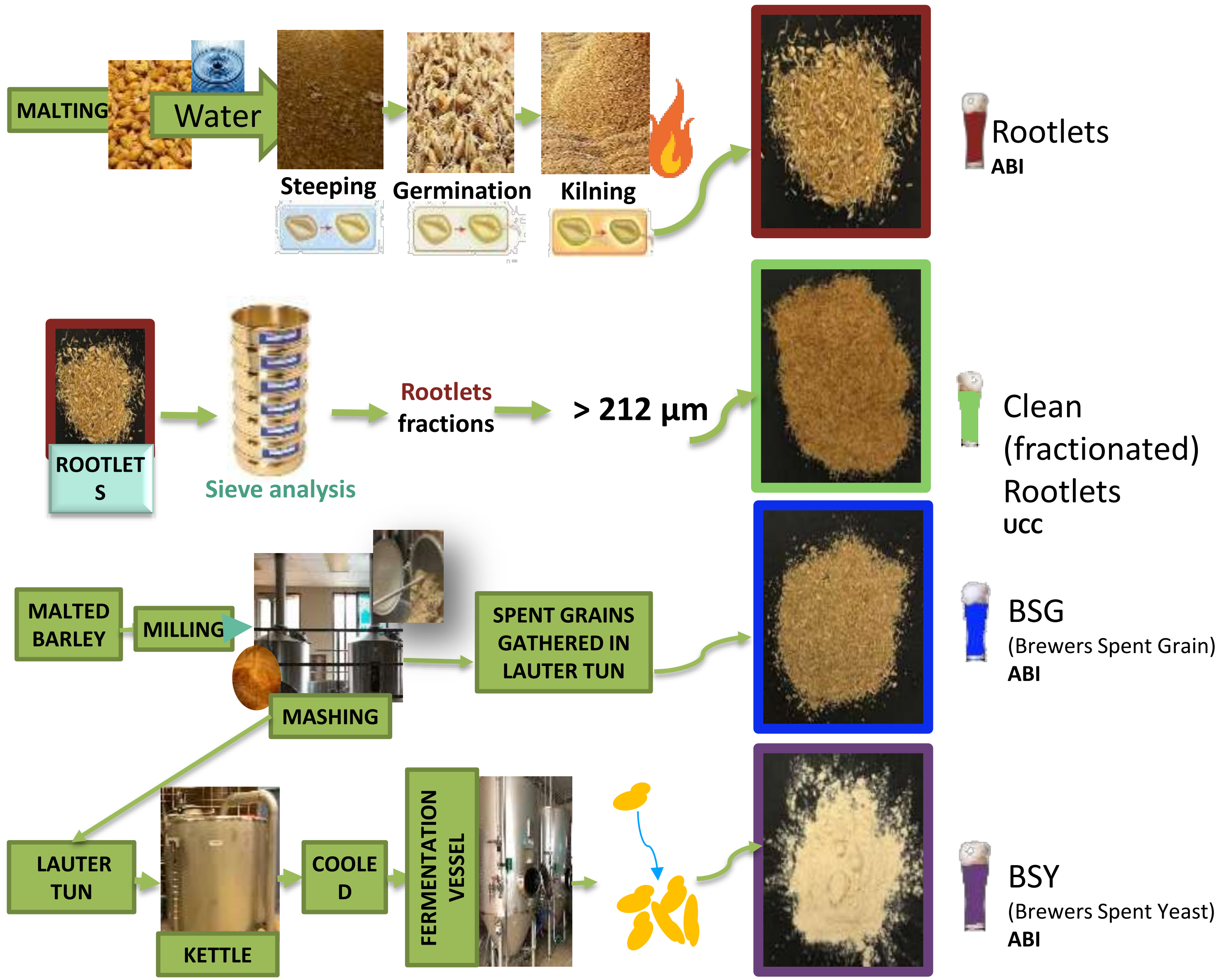
Lead UCC (Arendt), Co-Lead UNINA (Ercolini), partners Qiagen, Teagasc, 4DC, ONT, ULE, Novolyze, FFOQSI, CSIC, Danone in close interaction with WPs 1, 3, 5 and 6

WP4 will cover a variety of areas. The first task relates to testing of microbiome mapping workflows and tools in the food industry.

WP4 will also have a number of activities relating to preventing waste, through biopreservation or fermentation, or adding value to waste streams/low value raw materials.

Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Brewery by-products and their production



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Brewery by-products and their production

PASTA

- **Incorporation of BSG into pasta formulas proved successful**

High fibre BSG and FBSG pastas superior to wholemeal control

- **Effect of Fermentation on BSG**

- Causes an effect on proteins and starch

BREAD

- **BSG and FBSG can be incorporated into a bread**

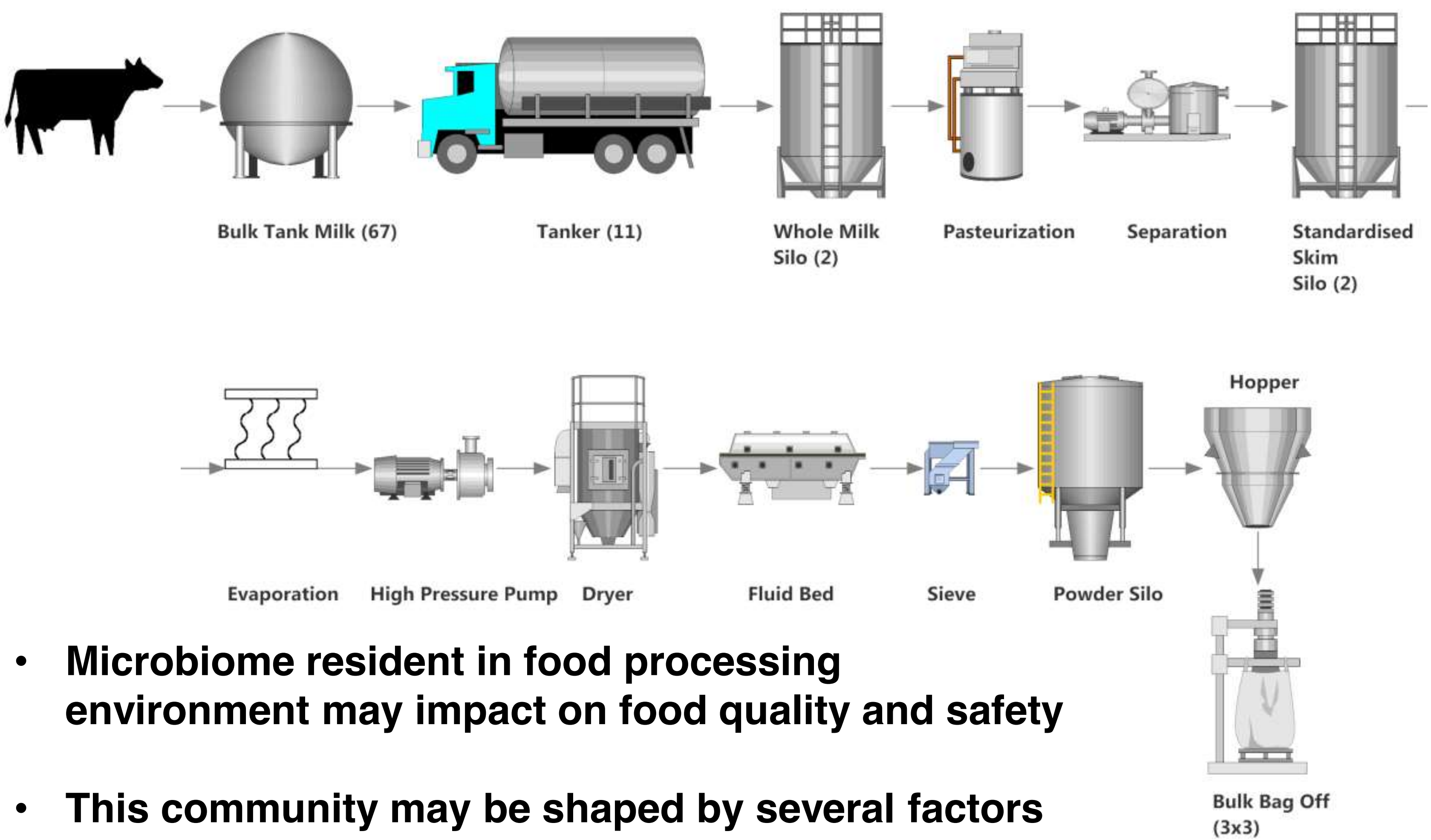
Source of fibre breads more promising than High in fibre breads

- **Fermentation of BSG**
  - Aids textural properties of bread (lower hardness, chewiness and gumminess)
  - Lighter colour bread produced

BSG-based ingredients can be used to enhance the fibre content of pasta and bread cereal products

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Food processing microbiome

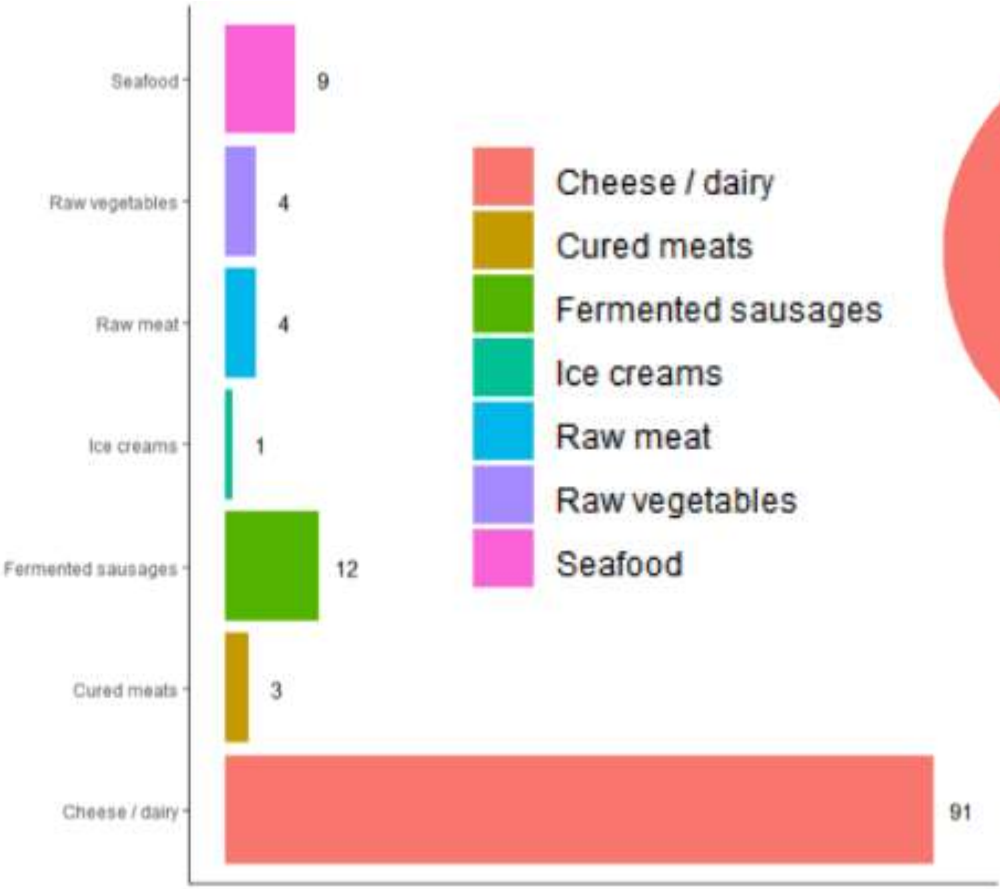


- **Microbiome resident in food processing environment may impact on food quality and safety**
- **This community may be shaped by several factors**
- **Develop SOPs and apply to 200 companies**

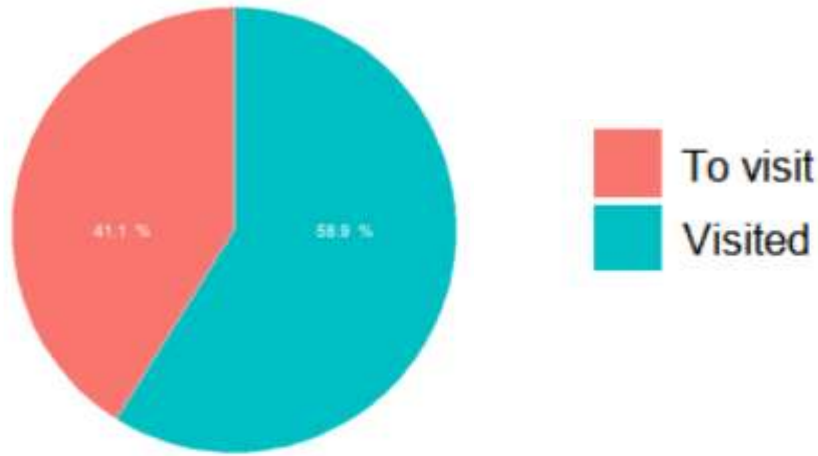
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

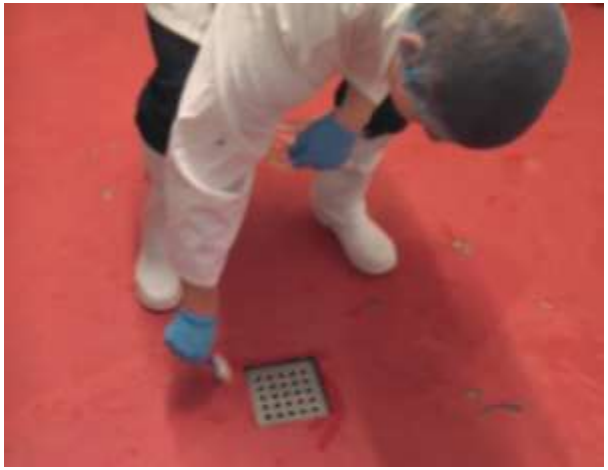
Microbiome sampling at the food industries

Visits targeted



Visits completed





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Global Fermented Food Initiative

id	Sample N	Name	
1	FS00a_2016	Wagashi	Chee
2	FS01_2016	Bread Kvass	Bever
3	FS02_2016	Carrot Kimchi	Ferm
4	FS03_2016	Boza	Bever
5	FS04_2016	Lemon	Prese
6	FS05_2016	Turnip	Ferm
7	FS06_2016	Orange	Prese
8	FS07_2016	Krauthehi	Ferm
9	FS08_2016	Tepache	Bever
10	FS09_2016	Ginger Beer	Bever
11	FS10_2016	Tempeh	Ferm
12	FS11_2016	Cucumber	Ferm
13	FS12_2016	Milk Kefir	Bever
14	FS13_2016	Water Kefir	Bever
15	FS14_2017	Sushi Ginger	Cond
16	FS15_2017	Fukujin Zuke	Cond
17	FS16_2017	Tofu Chilli	Ferm
18	FS17_2017	Daikon	Ferm
19	FS18_2017	Pickled Bamboo	Cond
20	FS19_2017	Pickled vegetables	Cond

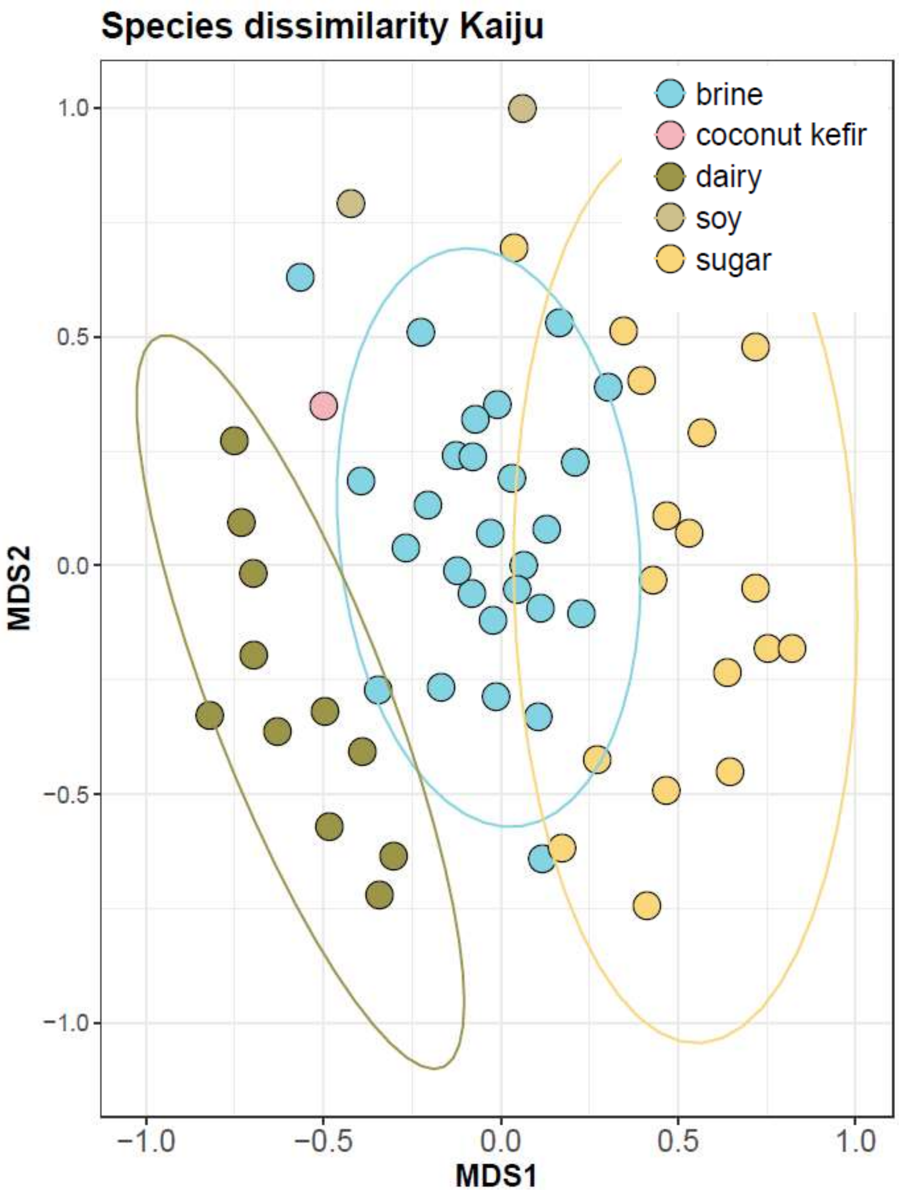
Bread Kvass, Carrot Kimchi, Boza, Turnip, Orange, Krauthehi (sauerkraut), Tepache, Ginger Beer, Tempeh, Cucumber, Milk Kefir, Water Kefir, Tofu Chilli, Daikon, Pickled vegetables, Raw Sauerkraut & Juniper berries, Brown rice amazake, Beetroot Kvass, Kefir and fennel soup, Mead, Sauerkraut, Dill dearg (sauerkraut), Kimchi, Golden child (sauerkraut), Water Kefir Hibiscus, Water Kefir lemon, Water Kefir Ginger, Kombucha Vinegar, Sauerkraut, Kombucha, Apple Cider Vinegar, Water Kefir(Pear, Ginger & Honey, Water Kefir(Pear, Ginger & Sugar), Dilly Carrots, Brussel Sprout Kimchi , Kimchi, Garlic Kraut, Dukkah Kraut, Ginger Sliced in 2% Brine, Daikon Radish in 2% Brine, Okra in 2% Brine, Tomatoes & mustard seeds in 2% Brine, Kombucha, Cherry Water Kefir, Beet Kvass, Coconut Kefir, Carrot sticks, Lemon and Ginger Fizz, Scallion Kimchi

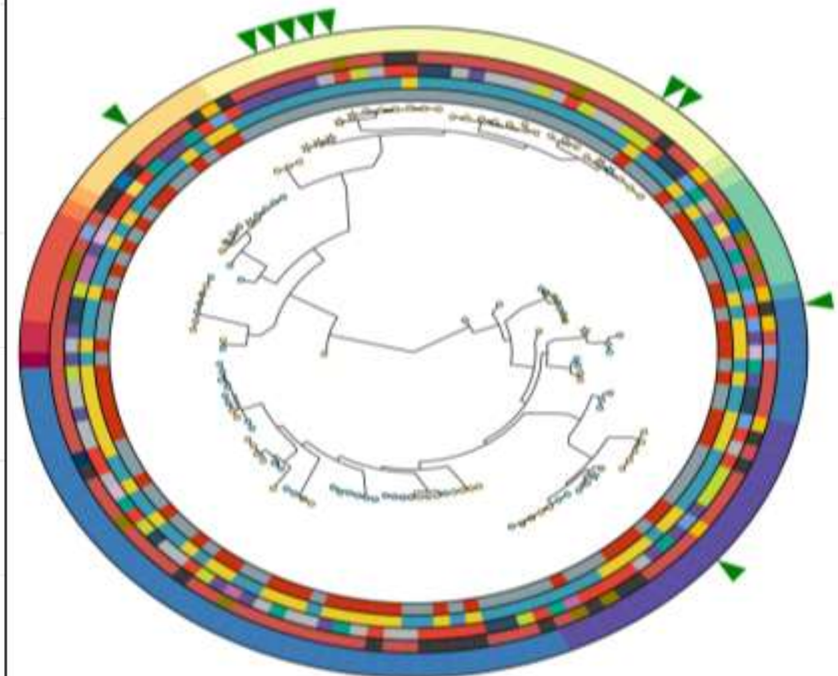
Type	Origin
ndiment, Pickeld vegetables	England
eeses, Dairy product	Cyprus
bbage	Ireland
wn Rice	Japan
etroot	Ireland
iry Soup	Ireland
mented honey	Ireland
bbage	Ireland
rkraut	Ireland
bage	Ireland
urkraut	Ireland
verage	Ireland
verage	Ireland
verage	Ireland
uid condiment	Ireland
verage	Russia
verage	Russia
ack	Russia
eeses, Dairy product	Russia
verage	Ireland

Leech et al Under review

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Microbial diversity across a range of fermented foods





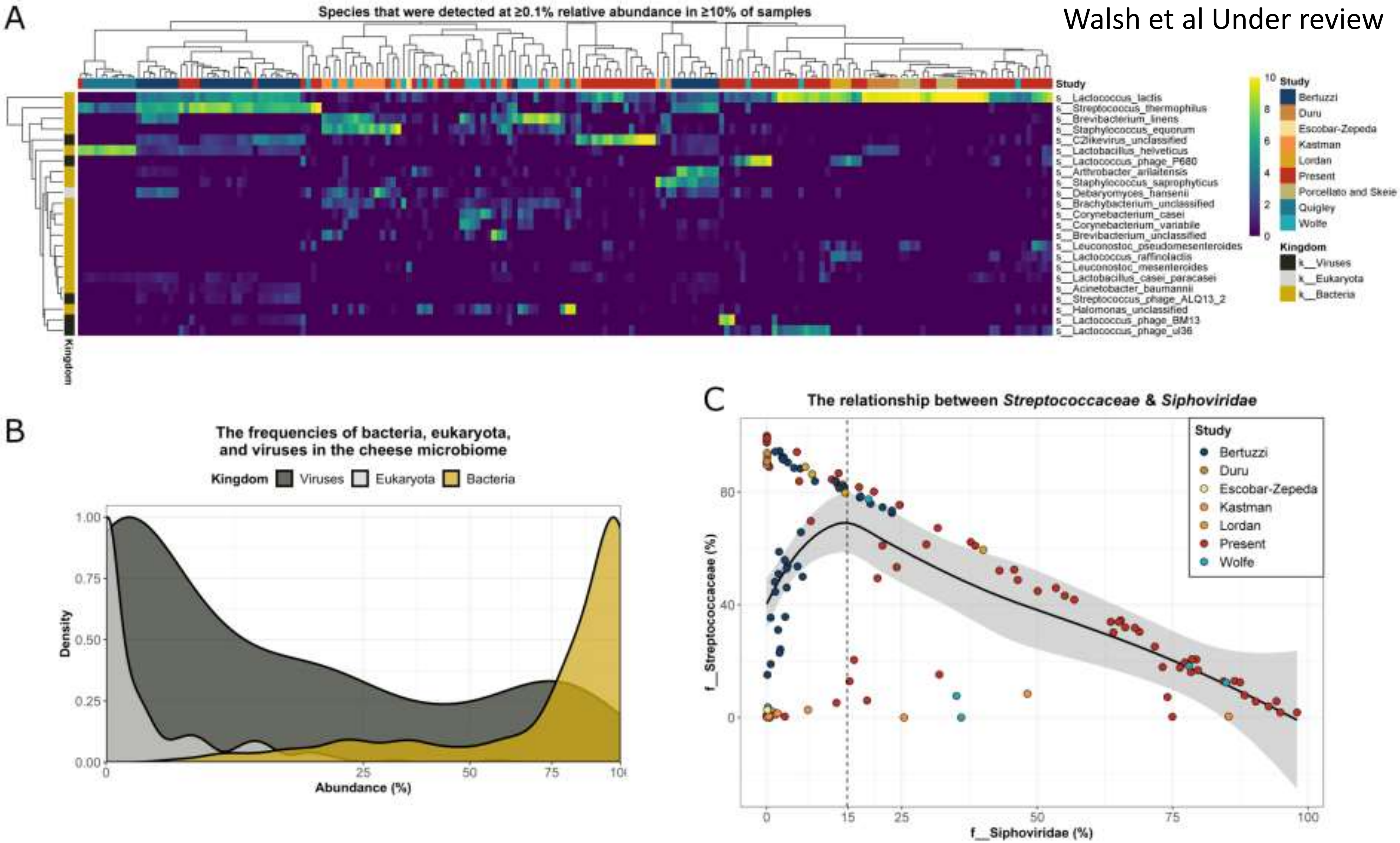
Entirely novel species

Leech et al Under review

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

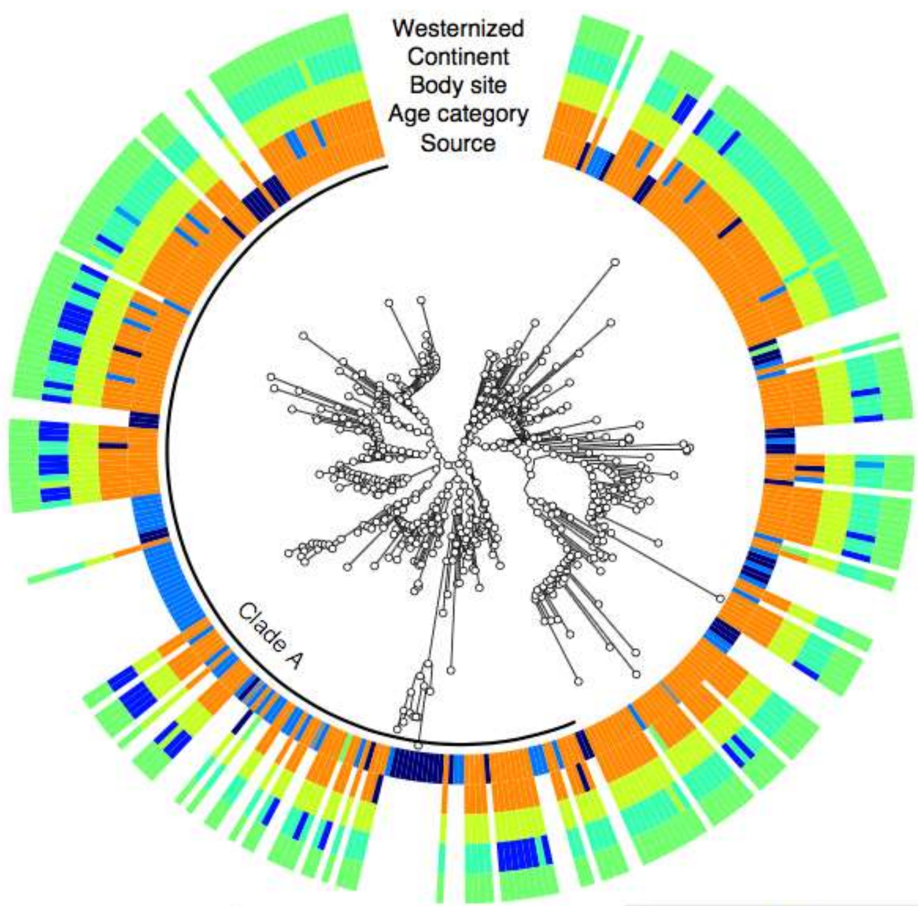
Fermented Foods – the Cheese Microbiome

Walsh et al Under review



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Food and gut health



- **Comparative genomics of MAGs obtained from fermented food and human gut metagenomes**

- **LAB strains transmission between food and gut microbiome**

- **Fermented foods as source of potential probiotics**


nature COMMUNICATIONS

ARTICLE

OPEN

Large-scale genome-wide analysis links lactic acid bacteria from food with the gut microbiome

Edoardo Pasolli[1,2], Francesca De Filippis[1,2], Italia E. Mauriello[2], Fabio Cumbo[3], Aaron M. Walsh[4,5], John Leech[4,5], Paul D. Cotter[4,5], Nicola Segata[3] & Danilo Ercolini[1,2]

Source	Food (Isolate)	Food (MAG)	Other	Human	NA		
Age category	Newborn	Child	Schoolage	Adult	NA		
Body site	Airways	Oral cavity	Skin	Stool	Vagina		
Continent	Africa	Asia	China	Europe	N. America	Oceania	S. America
Westernized	No	Yes					

S. thermophilus

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Integrated microbiome technologies

WP5: Integrated Microbiome Technologies for the Food Chain *Lead UNITN (Segata), Co-lead QUB (Creevey), partners WU, Teagasc, UCC, 4DC, ULE, ONT, FFOQSI, Novolyse, Qiagen, Baseclear, Danone in close interaction with WPs 1, 2, 3, 4 and 6*

WP5 will provide the technological, computational, and analytical tools to (i) support the other WPs, (ii) establish standardized tools and procedures for companies in the food chain, (iii) meta-analyse the produced data, and (iv) build user- and company-friendly resources to support all the microbial tasks associated with the food chain.

Integrated Microbiome Technologies for the Food Chain

Provide the technological, computational, and analytical tools to

(i) **Support** the other parts of MASTER

(ii) Establish standardized **tools for companies**

(iii) Build **user- and company-friendly resources** to support all the microbial tasks associated with the food chain

(iv) Meta-analysis

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

WP5: Integrated Microbiome Technologies for the Food Chain

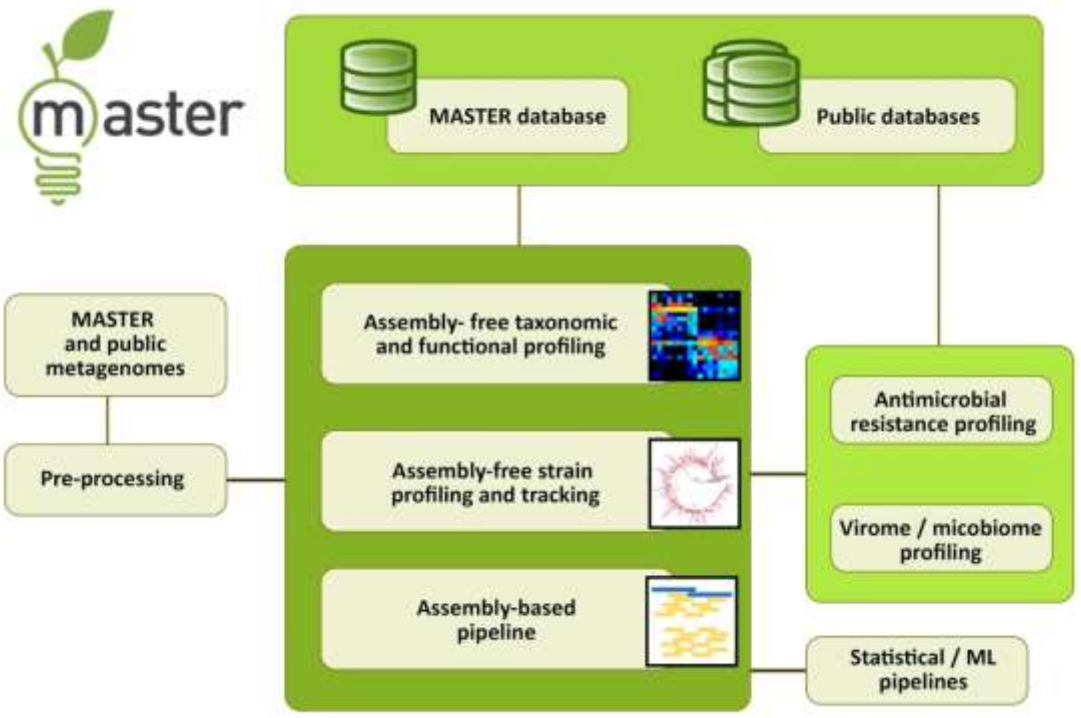
SOPs

SOP for validated sample collection and storage

SOP for validated 16S rRNA-based microbiome processing

SOP for validated shotgun metagenomics based microbiome processing

Pipelines/Tools



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

WP5: Integrated Microbiome Technologies for the Food Chain

Resources

***curatedFoodMetagenomicData*:**
database of MASTER generated data + all the available microbiome samples associated with environments relevant for the food chain industry

***foodGenVir*:**
database at the level of single microbial strains or genes associated with traits of interest (virulence, pathogenicity, spoilage potential, antibiotic resistance).

+

Implemented tools & pipelines

Meta-analysis of thousands of samples that will crucially highlight specific microbiome characteristics associated with environments, geography, specific foods, and safety characteristics

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Advisory Boards

Rachel Dutton
Bart C Weimer
Jack Gilbert
Mick Watson
Linda Kinkel
Curtis Huttenhower

Kelley Eversole
Sandrine Miller
Colette Shortt
John Conroy
Pamela Byrne
Aine MackenWalsh

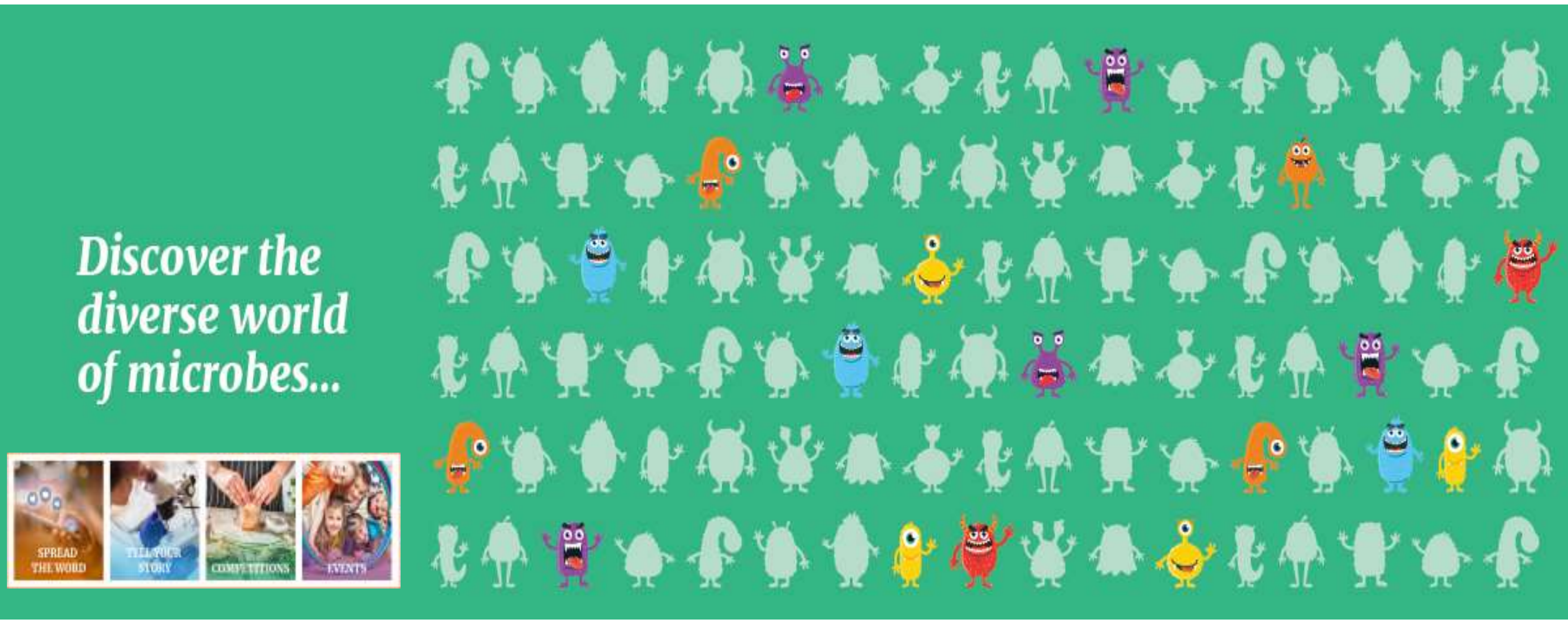
MASTER is an Innovation Action funded by the European Commission under the Horizon 2020 Programme under grant number 818368

World Microbiome Day | 27.06.2020

@WMicrobiomeDay

@worldmicrobiomeday

#WorldMicrobiomeDay; #DiversityMatters



www.worldmicrobiomeday.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 8

Acknowledgements

Special thanks to Dr Mairead Coakley – Project Manager

The MASTER Consortium

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

@MASTER_IA_H2020
http://www.master-h2020.eu/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818368

Acknowledgements

Aaron Walsh
John Leech
Raul Cabrera Rubio
Liam Walsh
Edoardo Pasolli
Danilo Ercolini
Nicola Segata
Fiona Crispie
Guerrino Macori
Aoife McHugh
Ben Bourrie
Mairead Coakley
Laura Finnegan
Orla O'Sullivan
Marcus Claesson
Paul O'Toole
Diarmuid Sheahan, Kieran Kilcawley
Alan Marsh, Paul Ross, Colin Hill
Lisa Quigley, Ger Fitzgerald, Tom Beresford
Marcel van de Wouw, Kieran Rea, John Cryan
Karen Scott (Aberdeen)
Ben Willing (Edmonton)

Conor Feehily
Bhagya Jonnala
Cathy Lordan
Chloe Matthews
Ciara O' Donovan
Enriqueta Garcia
Garreth Lawrence
Tais Kuniyoshi
Miguel Ullivari
Min Yap
Veronica Peterson
Elhadji Seck
Therese McNamee
Paula O'Connor
Arghya Mukherjee

Dara Leong
Trudy Quirke
Dinesh Thapa
Elaine Lawton
Grace O'Callaghan
Gwynneth Halley
Sara Arbulu Ruiz
Serena Boscaini
Wiley Barton
Calum Walsh
Katie Fala
Laura Wosinska
Eugenia Jimenez
Natan Pimentel
Sheila Morgan
Beatriz Gomez Sala