

# Paving the microbiome way for improved food systems

## MicrobiomeSupport setting the scene

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**“It takes a network of humans to study a network of microbes.”**

Scott Klasek

Tiny creatures with a big impact: microorganisms. It is widely recognised that when living in communities, a.k.a. microbiomes, microorganisms hold untapped potential to transform our food system. Yet, for microbiome research to deliver on its promise, coordinated efforts between different fields along the food system chain and greater attention to their benefits and potential applications are needed.

Our living environment is shared by microorganisms that substantially influence our lives without us even being aware of it most of the time. Microbiomes play a key role in our health, the environment and food production. In the years to come, research in this field will significantly influence innovations in health and disease management, food safety, productivity and ecosystem health. Despite the promising opportunities microbiomes offer, awareness and support for this area still need to be strengthened. Driven by this mission, the Coordination and Support Action ‘MicrobiomeSupport’ was brought to life in 2018.

### What solutions do microbiomes offer?

The world is in a race to unearth the mystery of microbiomes. These microscopic organisms—comprising bacteria, archaea, unicellular eukaryotes, fungi and viruses populated the earth long before humans did. In their collective function, microbiomes form an essential part of our ecosystems and are important for the health of soils, plants, oceans and other waters, animals and people. New scientific techniques, such as advancements in sequencing technologies, are contributing to an increased understanding of the fascinating ‘micro-world’ and how we could harness this knowledge to benefit our society.

Innovation momentum in the microbiome field is growing, not least because of the business potential that it holds. For example, microorganisms are used in agriculture to better control plant pests and increase soil biodiversity, while simultaneously reducing the use of chemical



pesticides. Microbiomes are also being investigated for degrading and revalorising waste and wastewater. And our expanding knowledge about the human microbiome and its involvement in health and disease could radically transform the way we practice medicine and manage public health. In short, the potential of microbiomes opens up great avenues to address pressing issues, from increasing resilience to food insecurity and improving human health to supporting the European Green Deal and the UN Sustainable Development Goals.

### What are the main hurdles to microbiome innovations?

Despite our ever-growing interest and understanding of microbiomes, we have so far only succeeded to a limited extent in translating this knowledge into practical applications. According to Angela Sessitsch, Head of Bioresources at the AIT Austrian Institute of Technology and coordinator of MicrobiomeSupport, there are three main issues that currently hinder innovative microbiome applications from achieving market readiness. On the one hand, there are substantial regulatory issues that need to be addressed. Above all, coherent regulation at the national and EU levels is needed to ensure safe products and efficient regulatory approval, allowing rapid market access for new microbial products. The fragmentation observed at the regulatory level is also apparent in the funding landscape.

Significant investment is needed for pan-European, large-scale research projects that test and improve the efficiency of microbial applications under real-life conditions. For instance, a project of such nature is underway in the US. Field trials across nine US states are currently being conducted to investigate the potato microbiome and its implications for yield, soil health and crop diseases, involving 20 million US dollars of private-public investment. Lastly, validated methods for storing microbiome samples and their functional properties in biobanks must be worked out, as they help to leverage research data across disciplines.

### Outcomes of the MicrobiomeSupport project

Tackling the challenges described requires a coordinated effort. Or as Scott Klasek, researcher at the Department of Plant Pathology at the University of Minnesota, said during the project’s final symposium in Brussels this year: “It takes a network of humans to study a network of microbes.”

With this ambition, the MicrobiomeSupport project came about four years ago, bringing together all the key players in microbiome research and innovation across the food system in Europe and beyond. At first, the partner network mapped the research, infrastructure and policy landscape. The project then addressed technical issues, including recommending harmonised



Figure 1: Microbiome experts meet during the project's final symposium in Brussels.

scientific methods, defining biobanking needs across different disciplines, and proposing an updated definition of the microbiome to ensure a common language among researchers. Moreover, the project partners came together as experts to provide guidance for funding, regulation and education, with a focus on fostering cross-disciplinary research on a global level. Public concerns about the potential benefits and risks of microbial applications were also addressed, and awareness campaigns were organised, for example, through collaborations on the annual World Microbiome Day on 27 June.

### A strategic research and innovation agenda

One of the most important messages MicrobiomeSupport has conveyed is the need for an aligned approach to microbiome research and funding priorities around the globe. Until now, research on microbiomes has been fragmented, with most studies confined to a single ecosystem or scientific

discipline, preventing the discovery and understanding of the full complexity of microbiomes. However, as microbiomes within one ecosystem are connected to other ecosystems (think about pathogens which can spread from foods or animals to humans), researchers argue that the field urgently needs to adopt a systems approach.

Through a process of brainstorming and consultations across various sectors, the project consortium set out to conceptualise a strategic agenda for microbiome research and innovation with the overarching goal of reducing fragmentation and promoting collaboration. The agenda addresses specific gaps and needs in collaborative research, for instance, understanding and leveraging microbial biodiversity and reducing antimicrobial resistance in food systems. It also points to the urgent need for multi-stakeholder engagement and the improvement of key policy challenges that can lead to innovative applications in the promising microbiome field. The full document will be made available shortly at [www.microbiomesupport.eu](http://www.microbiomesupport.eu).



### PROJECT SUMMARY

MicrobiomeSupport's mission is to guide the creation of a sustainable and circular microbiome-based bioeconomy. The project has contributed towards establishing standards for microbiome research and aligning research funding globally. Furthermore, it has developed a set of recommendations for a strategic research and innovation agenda in Europe and worldwide, addressing key policy challenges that can lead to innovative microbiome applications.

### PROJECT LEAD

The project coordinator, Dr Angela Sessitsch, is a microbiologist and heads the Health and Bioresources Unit at the AIT Austrian Institute of Technology, GmbH. She is an internationally recognised expert on beneficial plant-microbe interactions and is a co-inventor of several patents. She has coordinated various national and international projects and was a member of the EFSA panel of Genetically Modified Organisms.

### PROJECT PARTNERS

MicrobiomeSupport is a close collaboration of 28 academic and governmental partners from 13 EU countries, alongside Canada, the USA, Australia, New Zealand, China, India, Argentina and Brazil, most of which are members of the International Bioeconomy Forum (IBF).

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