

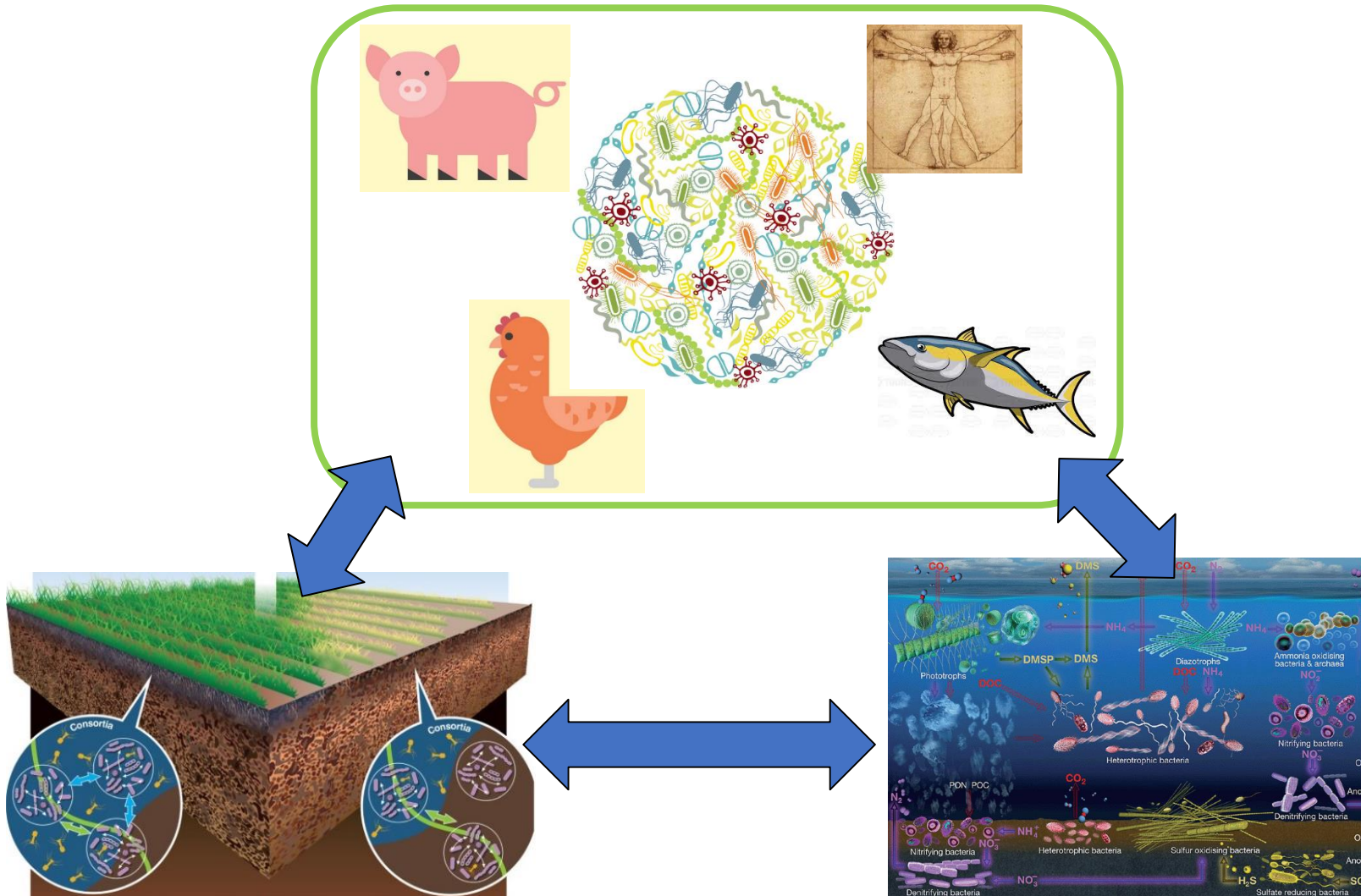
Italian Microbiome initiative for improved human health and agri- food production

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On behalf of the CNBBSV Microbiome initiative Working Group

Microbiomes play a key roles across the whole food system

Microbiomes structures and dynamics define features and health in all compartments of the food systems (from soils and marine habitats, to plants, animals and the deriving foods) and directly and indirectly affect human microbiomes and health (“*One Health*” view).



Soil/rhizosphere microbiomes mediate the cycle of C and other nutrients, the maintenance of soil fertility and soil C sequestration potential. Sediment microbiomes apparently play similar roles.

Such microbiomes affect microbiome structures of plants and animals and thus the growth and health of the latter. This in turn impacts on the quantity, quality and sustainability of primary production and food production and ultimately on human health.

The CNBBSV Microbioma initiative: justification

Microbiomes contribute to the health and functions of soils, marine habitats, plants, animals and the deriving foods, thus impacting on human microbiome and health → **possible microbiome management-based approaches to promote a higher, healthier, and more sustainable productivity across the whole food system and higher benefit on human health.**

New R&I is required to fully **clarify the interplay between microbiome and environment, nutrition and host variables to better design microbiome-based interventions** to promote a more productive, healthier, safer and more sustainable food system.

The EU Commission invested about €530 M to advance knowledge and technology **on such priorities** during the last 5 years. **USA and some EU Countries** (DE, IRL, BE, DK) **have launched a national Microbiome Initiative.**

Italy is playing a minor role in such emerging field mostly because its qualified expertises, infrastructures and actors active in the different microbiome domains, are fragmented and without a common/integrated strategy

→ **the CNBBSV Microbiome initiative.**

The CNBBSV Microbiome initiative: the Working Group

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The CNBBSV Microbioma initiative: Road Map



Needs & Gaps

April 2018>> Set up of the initiative and roadmap;

May-June 2018 >> mapping of most relevant national expertise (via analysis of the EU funded R&I projects) and infrastructures and identification of the main R&I and policy gaps, needs and opportunities and of the boundary conditions for their implementation.



Vision

July – September 2018 >> Drafting of the Vision Document and its sharing (via CNBBSV web site and mailing list) with the most relevant national scientific communities, industrial associations and stakeholders;

October-December 2018>>Revision of the Vision Document and its publication on CNBBSV web site.



Action

Presentation of the Vision document to the Presidency of Council of Ministers, the EU commission and the main scientific/industrial associations and initiatives interested in sustaining its implementation

The CNBBSV Microbioma initiative: the scenario

EXPERTISES AND KNOW-HOW: IT has relevant expertise and know-how on human microbiome and virome (at preclinical and clinical levels) and on microbiomes in foods, plants, terrestrial and aquatic animals, soils and sediments but they are developed and exploited in parallel in the different domains of the food system. IT researchers are present in a large number of prominent international publications and in about 25 funded FP7 and Horizon2020 projects in the microbiome domains. However, the such EU projects are only 5% of those funded as part of FP7 and H2020 programmes (more than 500) and IT is coordinating only 5 of them.

INFRASTRUCTURES: IT also possesses relevant and complementary infrastructures in the biomedical and the main domains of the food systems, like advanced NGS, proteomic and metabolomics platforms, Simulator of Human Intestinal Microbial Ecosystem (SHIME), animal facilities, databases and bioinformatics pipelines, Human and animal model phenotyping, etc.. **But we are missing others (germ free facility, data storage, etc) and have difficulties in maintaining/updating/renewing the existing ones.**

THE PRIVATE SECTOR: There are national industries of the biotechnology, pharmaceutical, food and agriculture domains interested in the microbiome opportunities but they need to be better engaged to effectively and responsibly apply this new knowledge.

The CNBBSV Microbioma initiative: main needs and opportunities

GENERAL: Create a national network of experts, public and private actors and infrastructures to interconnect the different domains of the microbiome food system and to better exploit its potential in Italy and on national specificities. Increase awareness, education and training.

TECHNICAL: To standardize the approaches and improve technological tools used for analyzing and characterizing microbiomes to minimize noise and bias and a better comprehension of the microbiome functionality along with more robust data banking and analytics.

In the Health domain: data on the baseline microbiota profiling of Italian healthy subjects in different body districts, different ages and lifestyles; new microbiome biomarkers for disease and diagnostic tools; new therapeutic approaches; metagenomics/metabolomics-based medicinal chemistry campaigns; neglected lifestyle, dietary and environmental drivers of dysbiosis; more robust demographic databases (dataset); nutritional protocols and physical activity programs; Mediterranean diet factors promoting a healthy microbiome structure; complete host virome analyses; probiotic formulation on gut microbiota eubiosis and host health; characterize next generation probiotics; evaluate novel food and traditional foods impacts on gut microbiota; role of microbiome on the drug metabolism and on cancer immunotherapy.

In the Agrifood domain: more knowledge on soil/marine sediment/water plant and animal associated microbiomes and its exploitation for a) the protection of national primary production from nutritional, biotic and abiotic stresses and the improvement of its sustainability and the specificity, quality and nutritional and healthy properties the products and deriving food and feed.

The CNBBSV Microbioma initiative: actions required

- ❑ To **establish a national network of experts and of public and private actors working on microbiomes in the different domains of the food systems**, to share existing national data, knowledge, and infrastructures in the area of human, animal and plant microbiome;
- ❑ To **foster cooperation between public and private sectors**, also in close cooperation with the Italian Technology Clusters Health and Agrofood, **for boosting innovation and maximizing the leverage effects** of public and private investments;
- ❑ To **plan and implement joint R&I and policy actions at regional and national levels**, by creating **more investments in R&I and spin offs/start-ups**, and facilitate their interconnection with international networks to **promote applicability of microbiome know-how** as well as **best practices, standards and consistent protocols**;
- ❑ To **promote researcher careers, training and mobility**, and in general the development of skills in the different microbioma domains; and
- ❑ To **exchange knowledge across the scientific and political community** and ensure an efficient use of the available resources, while **advocating public understanding** of the value of microbiomes for the human, plant, animal and planetary health.