Collaboration efforts and research directions of European microbiome funding
1. Breakthrough 2010
2. Trends & challenges
3. Future
MetaHIT
2008-2012 €11M

• Broad catalogue of 3.9 M microbial genes
• Identified >19000 different functions
• Discovered 3 distinct Enterotypes
• Low diversity is less healthy
• Established IHMC

http://www.metahit.eu/

Qin et al, NATURE 2010
Arumugam et al, NATURE 2011
Dusko Ehrlich
MetaCardis  
2012-2018 €12M

- Cardiometabolic diseases
- 9,9 M microbial genes of >2000 people
- Systems biology: Gut microbes, metabolites, lifestyle, clinical data, drugs
- Software tools analysing functionalities and predicting disease development
- Low gene richness & functional pathways
- Bariatric surgery & obesity
- Beneficial bacteria & causalities

http://www.metacardis.net/

GUT Journal 13.6.18
Pathology 9.7.2018
Laurent Genser
Karine Clement
SYSCID
2017-2022 €14.5M

- Chronic inflamm. diseases
- >60% of heritable risks are unexplained by genetics
- Systems medicine
- Roadmap to clinical practice
- Western diets & increased inflammation
- Maternal microbiome & microglia

Schultze et al, Immunity 17.4.2018
Christ et al, Cell 2018
Thion et al, Cell 2018

http://www.syscid.eu/
## EU funded projects, budget & areas

<table>
<thead>
<tr>
<th>Period</th>
<th>Health</th>
<th>Non-health</th>
<th>All</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Projects</td>
<td>€ M</td>
<td>Projects</td>
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<tr>
<td>2007–2013 (FP7)</td>
<td>40</td>
<td>153.4</td>
<td>51</td>
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<tr>
<td></td>
<td>2014–2019 (H2020)</td>
<td>99</td>
<td>251.7</td>
</tr>
<tr>
<td>2007–2019</td>
<td>139</td>
<td>405.1</td>
<td>125</td>
</tr>
</tbody>
</table>

Eat2beNICE
2017-2022 €11.1M

- Maladaptive impulsivity, compulsivity, antisocial and addictive behaviours
- Effects on brain health: dietary components, lifestyle, exercise, genetics
- Promote policy changes

http://eat2benice.eu/

Concept of work packages, Alejandro Arias Vasquez
JPI HDHL
2016-2021 €2M

• Improving public health and health-impacting behaviour
• Understand diet-related diseases
• Healthy dietary interventions
• Healthy levels of physical activity
• Standardisation & harmonization
• Data knowledge & data sharing
• Addressing knowledge gaps

https://www.healthydietforhealthylife.eu/
Health topic 'SC1-BHC-03-2018':

"Exploiting research outcomes and application potential of the human microbiome for personalised prediction and prevention of disease"

- Existing data and new complementary data
- Functionalities, healthy conditions, resilience
- -omics, dietary data, lifestyle, ...
- Clinical tools for predicting and preventing
- € 10-15 M (total budget € 50 M)

→ Deadline 18 April 2018: 27 applications
ONCOBIOME
2019-2023
€15M

- Gut Microbiome Signatures for 4 types of cancer ("Cancer Microbiota Atlas")
- large cohorts enrolling >9,000 cancer patients across 10 countries
- Prediction of responses (chemo- / immuno-therapies)
- Influence cancer progression (companion diagnostic tests)

MICROB-PREDICT
2019-2024 €15M

• Acute-on-chronic liver failure
• Microbiome data of >10,000 patients
• Find functional microbial traits and interactions
• Validated tools for clinical and therapeutic decisions
• Easy-to-use nanobiosensors (PoC)
• Patient Organisation involved

Autism
Involves 600 at-risk infants
Understand multifactorial risks
Interactions between gut microbiome, intestinal barrier and immune response
Integrative analytical platform using Artificial Intelligence and multi-omics
Preventive nutritional formulation

GEMMA
2019-2023
€14,2M

autismspeaks.org
CDC estimate 2018
Alessio FASANO

EU-STANDS4PM
2019-2021 CSA €2M

- Assess standardisation strategies for health data integration
- Recommendations and guidelines
- Improve data sharing and governance for collaborations
- Outreach events

[https://standards.cen.eu/]

Forschungszentrum Jülich
Marc Kirschner
International Flagship Collaboration

CINECA
EUCAN-Connect
iReceptor Plus

2019-2022/2023
3 x € 6 - 7,8 M

- Store, Share, Integrate, Standardise
- Interoperability of data from different repositories
- Bioinformatic tools to support the analysis

Trends and challenges

- Isolated position → Expansion into other areas
- Big vision: modulate health via microbiome
- Effects of specific food & faecal transplantation
- Mechanisms are more complex (confounders)
- Multi-omics, lifestyle, drugs, geography, ...
- Agree on meta-data (medication, disease stage, age, lifestyle, ...)


Future Microbiome research

- Beneficial microbes (Presence & quantity)
- Associations → Causations (molecular)
- Health research: Find trends in sets of big data, use multitude of data (AI), integration & combination of real-world-data (≠ data silos)
Funding in future

- Real-life implementation of approaches
- Digital tools for faster clinical decisions
- Move from reactive to proactive approaches: Prediction & Prevention
- Personalised, patient-centred solutions
- Fact: R&I are drivers of growth and jobs
Funding in future

- Link different actors, partnerships, involve patients (who benefit), end-users & citizens (multi-disciplinarity)
- International collaboration
- Standardisation for data comparability
- Focus on high impact applications & tools
Horizon Europe 2021 - 2027

• Lab-Fab-App report (Lamy report)
• More impact, more relevant to society, more breakthrough innovation
• Effective policy missions with clear targets
• Proposed budget € 100 Billion
• 20.3.19: Provisional political agreement
• European Innovation Council (EIC)
• Health: 3 challenges & 6 intervention areas
• 1st WP 2021 to be developed
International Human Microbiome Consortium

Barcelona Congress 25 – 28 June 2020

Palau de Congressos de Montjuïc

Programme in 6 different halls: Cutting-edge science
Top level speakers, Young scientists, General public

www.ihmc2020.com
www.human-microbiome.org
• Historic venue in downtown Barcelona
• 60,000 m² available in 6 halls
• 12,000 m² outdoors
• 1,609 seats in main auditorium hall
Some more EU projects & their focus

<table>
<thead>
<tr>
<th>EU project and ID no.</th>
<th>research area and keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALLERGUT – 716718</td>
<td>allergic disorders and predisposition, environmental factors</td>
</tr>
<tr>
<td>MAARS – 261366</td>
<td>skin microbiomics, allergy, autoimmunity, atopic dermatitis and psoriasis</td>
</tr>
<tr>
<td>CURE – 767015</td>
<td>asthma, dysbiotic respiratory microbiome, phage therapy</td>
</tr>
<tr>
<td>CrUCCial – 694679</td>
<td>Crohn's disease and ulcerative colitis, index of pathogenic mechanisms</td>
</tr>
<tr>
<td>Eat2beNICE – 728018</td>
<td>maladaptive impulsivity and compulsivity and predispositions to antisocial and addictive behaviours</td>
</tr>
<tr>
<td>MultipleMS – 733161</td>
<td>multiple sclerosis, multi-omics, lifestyle, nutrition</td>
</tr>
<tr>
<td>INDIGO – 612116</td>
<td>Graves' orbitopathy, thyroid eye disease, gut-associated lymphoid tissue, biomarker discovery</td>
</tr>
<tr>
<td>HARC – 316300</td>
<td>ageing population in the Lodz region, upgrade the research potential, microbiome and immune system interactions</td>
</tr>
<tr>
<td>INNODIA – 115797</td>
<td>clinical EU infrastructure to recruit type 1 diabetes patients, living biobank, biomarker discovery</td>
</tr>
<tr>
<td>FORECEE – 634570</td>
<td>four different female cancers, environmental factors, lifestyle, hormonal and reproductive factors</td>
</tr>
<tr>
<td>GALAXY – 668031</td>
<td>alcoholic liver fibrosis, gut-liver-axis, lifestyle</td>
</tr>
<tr>
<td>EnteroBariatric – 715662</td>
<td>bariatric surgical treatment, obesity, type 2 diabetes</td>
</tr>
</tbody>
</table>
Challenges

• Bigger prospective cohorts & easy open access

UK Biobank data on 500,000 people paves way to precision medicine

EU DECLARATION OF COOPERATION
Towards access to at least 1 million sequenced genomes in the European Union by 2022

• Harmonised methods to increase data comparability

→ Sample collection, storage, data processing
Health topic 'SC1-BHC-05-2018':
"International flagship collaboration with Canada for human data storage, integration and sharing"

- Collaboration in Europe and Canada for repositories to store and share "omics" data
- Integrate and standardise data deposition and exchange procedures for better data reuse
- Develop ethical and legal governance
- 1 CA partner per project
- € 4-6 M, total € 40 M, Deadline 18 April 2018
Health topic 'SC1-BHC-01-2019'
"Understanding causative mechanisms in co- and multimorbidities"

- Validate mechanisms
- Exploit existing and generate new data
- Integrate lifestyle, behaviour, etc.
- € 4-6 M, total budget € 70 M
- Deadlines 2.10.18 & 16.4.19
Health topic 'SC1-BHC-25-2019'
"Demonstration pilot for implementation of personalised medicine in healthcare"

- Linking different actors & use multitude of data
- Show benefit, implementability, economic viability of Personalised Medicine in real life
- Going beyond cancer and rare diseases
- Pilot tailored to the needs of citizens
- IA for € 18-20 M, total € 60 M
- Deadlines 2 October 2018 & 16 April 2019
CLUSTER 1: Health

Everyone has the right to timely access to affordable healthcare of good quality (EU Pillar of Social Rights, UN SDGs).

3 Health challenges:

- **Threats to citizens and public health:** rise of non-communicable diseases; spread of antimicrobial drug resistance; emergence of infectious epidemics; health risks in a rapidly changing social, urban and natural environment

- **Sustainability of social and health care systems:** increasing costs for European health care systems; lack of effective health promotion and disease prevention; persistence of health inequalities, affecting disproportionally the vulnerable

- **Competitiveness of EU's health and care industry:** personalised medicine approaches and digitalisation in health and care; increasing pressure from new and emerging global players in health innovation

These challenges are **complex, interlinked and global.**
CLUSTER 1: Health

6 Intervention areas:

1. Health throughout the life course
2. Environmental and Social Health Determinants
3. Non-Communicable and Rare Diseases
4. Infectious Diseases
5. Tools, Technologies and Digital Solutions for Health and Care
6. Health Care Systems
What is new?

➢ Digitalisation and personalisation of health and care cut across all intervention areas

➢ Health economics and health systems are key for uptake of results and achieving impact

➢ Patient-centered solutions and technologies for health and care call for integrated approaches from medicines to medical devices (supported in Horizon 2020 under the pillar ‘Leadership in Enabling and Industrial Technologies’)