Final Conference of the MyNewGut project

Funding human microbiome research in the EU

Dirk Hadrich
Health – Personalised Medicine
Research and Innovation
European Commission

Stanhope Hotel
Brussels, 18 October 2018
1. Breakthrough in 2010
2. Development and trends
3. Challenges and conclusions
4. New projects starting in 2019
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
- Gut microbiome data of >2000 people
- Systems biology: Gut microbes, metabolites, lifestyle, clinical data, drugs
- Intestinal barrier damages
- Low gene richness & functional pathways
- Small intestine surface area increased
- Bariatric surgery needs to be complemented

http://www.metacardis.net/

GUT Journal 13.6.18
Pathology 9.7.2018
Laurent Genser
Karine Clement
Development and trends

- Huge hidden diversity of 100 trillion bacteria
- Isolated position of metagenomics
- Maturity of analytical technologies
- Expansion of metagenomics into other areas
- Hope on the potential of microbiome data
- Health research: Find trends in sets of big data
SYSCID
2017-2022 €14.5M

• Chronic inflamm. diseases
• >60% of heritable risks are unexplained by genetics
• Systems medicine
• 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/
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/
## EU funded projects, budget & areas

<table>
<thead>
<tr>
<th>Period</th>
<th>Health</th>
<th>Non-health</th>
<th>All</th>
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<tbody>
<tr>
<td><strong>2007–2013 (FP7)</strong></td>
<td>Projects</td>
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<td></td>
<td>€ M</td>
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<td><strong>2014–2017 (H2020)</strong></td>
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<td>€ M</td>
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<td><strong>2007–2017</strong></td>
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<td>€ M</td>
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<tr>
<td>EU project and ID no.</td>
<td>research area and keywords</td>
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<td><strong>ALLERGUT – 716718</strong></td>
<td>allergic disorders and predisposition, environmental factors</td>
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<td><strong>MAARS – 261366</strong></td>
<td>skin microbiomics, allergy, autoimmunity, atopic dermatitis and psoriasis</td>
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<td><strong>CURE – 767015</strong></td>
<td>asthma, dysbiotic respiratory microbiome, phage therapy</td>
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<td><strong>CrUCCial – 694679</strong></td>
<td>Crohn's disease and ulcerative colitis, index of pathogenic mechanisms</td>
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<td><strong>Eat2beNICE – 728018</strong></td>
<td>maladaptive impulsivity and compulsivity and predispositions to antisocial and addictive behaviours</td>
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<td><strong>MultipleMS – 733161</strong></td>
<td>multiple sclerosis, multi-omics, lifestyle, nutrition</td>
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<td><strong>INDIGO – 612116</strong></td>
<td>Graves' orbitopathy, thyroid eye disease, gut-associated lymphoid tissue, biomarker discovery</td>
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<td><strong>FUNMETA – 293714</strong></td>
<td>fungal diseases, local immune homeostasis, multi-omics, diets</td>
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<td><strong>INNODIA – 115797</strong></td>
<td>clinical EU infrastructure to recruit type 1 diabetes patients, living biobank, biomarker discovery</td>
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<td><strong>FORECCEE – 634570</strong></td>
<td>four different female cancers, environmental factors, lifestyle, hormonal and reproductive factors</td>
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<td><strong>GALAXY – 668031</strong></td>
<td>alcoholic liver fibrosis, gut-liver-axis, lifestyle</td>
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<td><strong>EnteroBariatric – 715662</strong></td>
<td>bariatric surgical treatment, obesity, type 2 diabetes</td>
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Challenges

• Big vision: modulate health via microbiome
• Mechanisms are more complex
• Multi-omics, lifestyle, drugs, geography, ...
• Microbes compete and adapt
• Interplay with environment (microbial transmission)
• Bigger cohorts & easy open access

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

• Harmonised methods to increase data comparability
→ Sample collection, storage, data processing
Conclusions: How to promote Personalised Medicine approaches in future

- Integration & Multi-disciplinarity ≠ data silos
- Involve people who hope to benefit
- Move from reactive to proactive approaches: predictive, preventive, and personalised medical solutions for the individual patient
- High impact applications for the benefit of all
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 treatment response
• 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


Jonel TREBICKA
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

- 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

autismspeaks.org
CDC estimate 2018
Alessio FASANO

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
Future

- Linking different actors, multi-disciplinarity, partnerships, involving end-users & citizens
- Use multitude of data, integration & combination of real-world-data
- Standards for data comparability
- Real-life implementation of approaches
- Digital tools for faster clinical decisions
- International collaboration
- Focus on impact
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 disproportionately 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’)