MICROBIOME RESEARCH AND SAFETY APPROACHES

Judith Fernandez-Piquer

Innovation in the Microbiome
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About Unilever
WE MAKE MANY OF THE WORLD’S FAVOURITE BRANDS
R&D: Facts & figures

~€1 billion annual investment
~6,000 R&D professionals
6 key R&D sites; around 90 locations around the globe
Portfolio of >20,000 patents and patent applications
>300 new patent applications filed each year
>220 research publications in 2016
Unilever’s Safety and Environmental Assurance Centre (SEAC)

PROTECTING CONSUMERS, WORKERS & OUR ENVIRONMENT BY ENSURING UNILEVER’S PRODUCTS & PROCESSES ARE SAFE & SUSTAINABLE BY DESIGN

CENTRE OF EXCELLENCE – SAFETY & ENVIRONMENTAL SUSTAINABILITY SCIENCES

APPLYING SCIENCE
GOVERNANCE
We provide scientific evidence to manage safety risks & environmental impacts for new technologies

ADVANCING SCIENCE
NEW CAPABILITY
We harness the latest science to create new tools to assess innovations of the future

SHARING SCIENCE
COLLABORATION
We partner with leading scientists from around the globe
Unilever’s Safety and Environmental Assurance Centre (SEAC)

LEADING SAFETY & ENVIRONMENTAL SCIENCES CAPABILITY

SEAC’S CAPABILITY
Chemistry, Environmental Safety, Environmental Sustainability, Exposure Science, Informatics, Life-Cycle Impact Assessment, Microbiology, Modelling, Occupational Safety, Process Safety, Risk Assessment, Toxicology

>550 PUBLICATIONS SINCE 2005

FUTURE TALENT
Working with Universities to support the development of future scientists

68% DEGREES OR HIGHER
27% PhDs
3 HONORARY PROFESSORS

20 NATIONALITIES
15 LANGUAGES
About Microbiome
Focus of today: the human microbiome

Bacteria that predominate in the human body (credit: National Human Genome Research Institute)
Skin microbiome research

Scalp Microbiome

Fungi

- Normal: 67.2%
- Dandruff: 58.8%

Bacteria

- Normal: 32.8%
- Dandruff: 41.2%

Xu et al 2016

Atopic Skin

- RT 4 and RT5 acne associated
- Importance of strain level analysis

Fitz-Gibbon et al 2013

Axillary Microbiome

-James et al 2013

Acne Microbiome

➢ RT 4 and RT5 acne associated
➢ Importance of strain level analysis

Fitz-Gibbon et al 2013
Future scientific challenges

Functional Profiling

Intelligent Antimicrobials

In Vitro Models

Data Analytics

Mathematical Models
About Safety by Design
Next-generation microbial risk assessment

THE FACT
Microbiome changes can be associated with human disease

THE OPPORTUNITY
Humans may be able to modify their microbiome for the better using personal care products

THE NEED
How can we ensure the safety of the change?
Proposed tiered framework to evaluate the safety of microbial reprofiling

1. History of use
   - Evidence of absence of adverse effect
   - Not applicable

2. Reversibility
   - Evidence of reversibility
   - Not applicable

3. Composition and diversity
   - Diversity change within levels for ‘balanced’ microbiome (as science/knowledge develops)
   - Evidence of commensals protected
   - Evidence of key functions protected

4. Functionality
   - Evidence of key functions missing/undesired functions
   - Evidence of commensals protected

Uncertain Risk

Safe Operating Space (Low Risk)
Research areas to develop the safety approaches

1. History of use
What is the impact of safe marketed technologies on the microbiome?
How can we benchmark technologies?

2. Reversibility
How can we predict a change?
How quickly does the microbiome revert back?

3. Composition and diversity
What are the key measurable elements of the oral and skin microbiome?
What is the relevance of variability between individuals for safety?

4. Functionality
What are the key functions of the oral and skin microbiome that must be protected?
How can we predict the ability to resist colonisation?
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Judith.Fernandez-Piquer@Unilever.com