



Dermocosmetic strategies to rebalance the skin's ecosystem

San Diego, October 29-30 , 2018



Care Creations™

BASF – We create chemistry

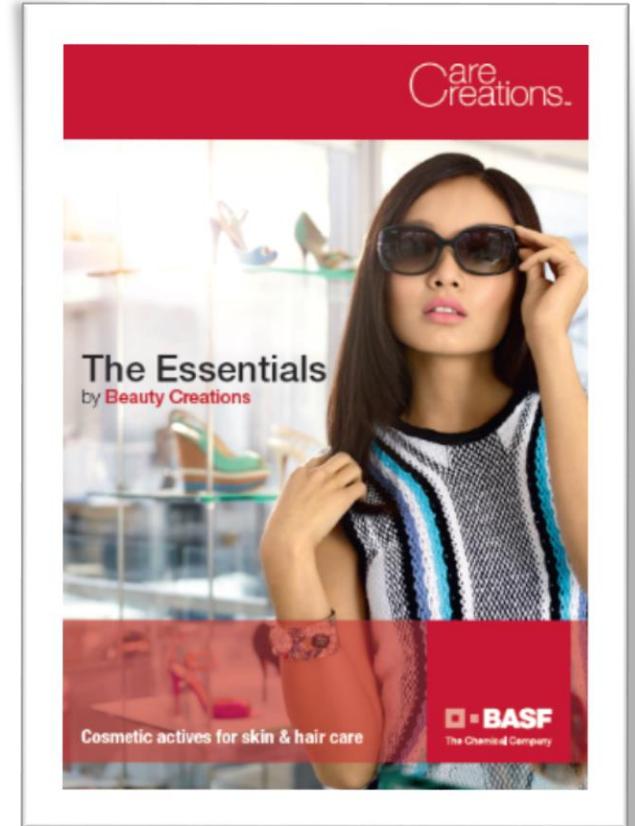
- Our chemistry is used in almost all industries
- We combine economic success, social responsibility and environmental protection
- Sales 2017: €64,475 million
- EBIT 2017: €8,522 million
- Employees (as of December 31, 2017): 115,490
- 6 Verbund sites and 347 other production sites



BASF Bioactives business Overview

**Beauty Creations is the cosmetic active ingredients business of
BASF Personal Care and is the leader in its field**

- Products are mostly plant extracts with focus on origin and sustainability
- Supported by a biological mechanism of action
- With scientifically, clinically proven performance

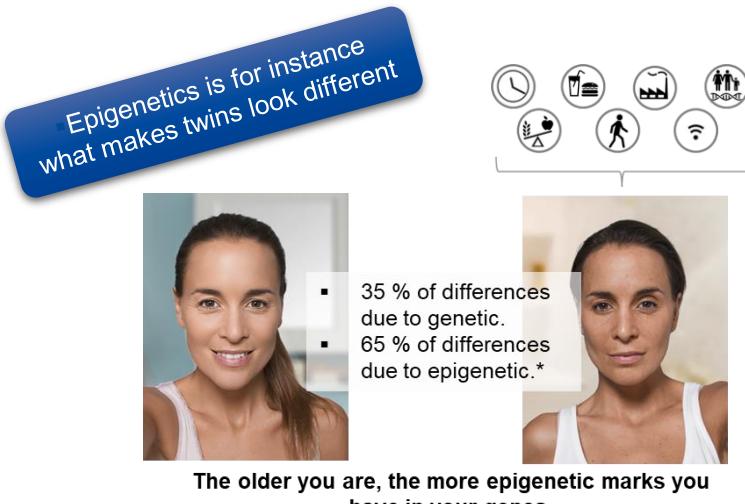


Bioactives are at the heart of the Personal Care market

BASF Bioactives business Overview

Epigenetics

Epigenetics refers to mechanisms regulating gene code reading that highly contributes to aging and environmental induced changes. Epigenetic management could help restore sleeping beauty.



* Graham Twins exhibit differences in gene expression. Scientific American. 2005



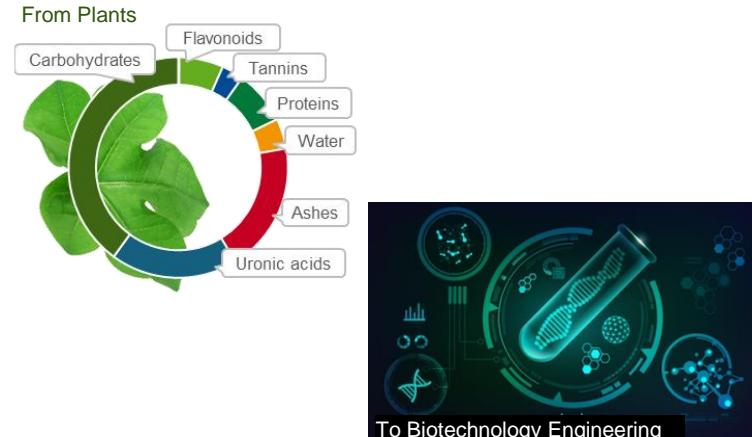
Microbiota

100 billion microorganisms use our skin as their habitat and are the guardians against potentially harmful invaders. But the balance is fragile.

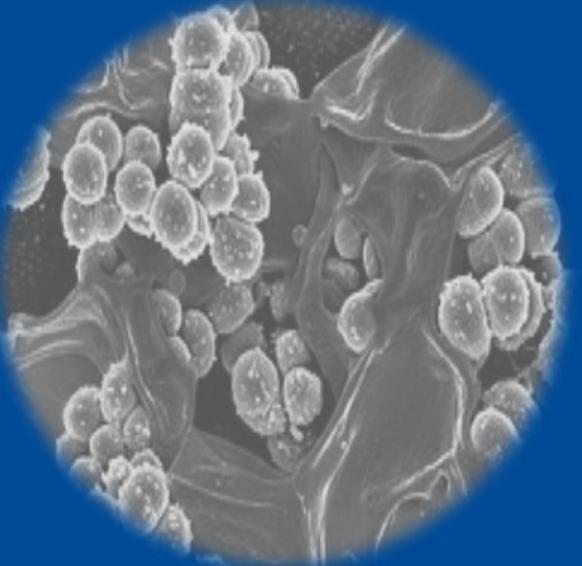
To push back the boundaries of skin care products, we have to look at every single element that participate to skin health and beauty.

Extraction & process differentiation

Increasing regulatory constraints reduce the open space for product innovation. Developing unique, socio- and eco-responsible extraction methods or processes is key to keep bringing innovative ingredients on the market.



We focus on 3 strategic innovation platforms to differentiate

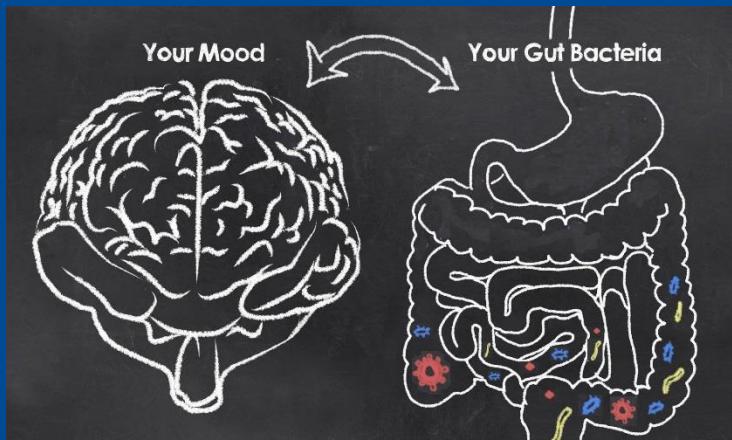
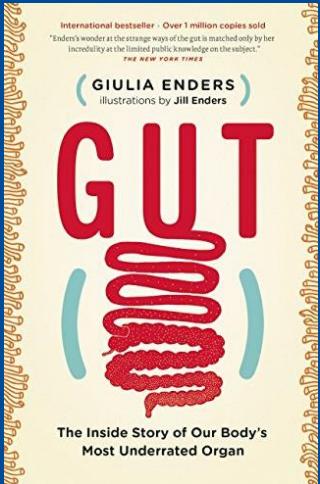


AGENDA

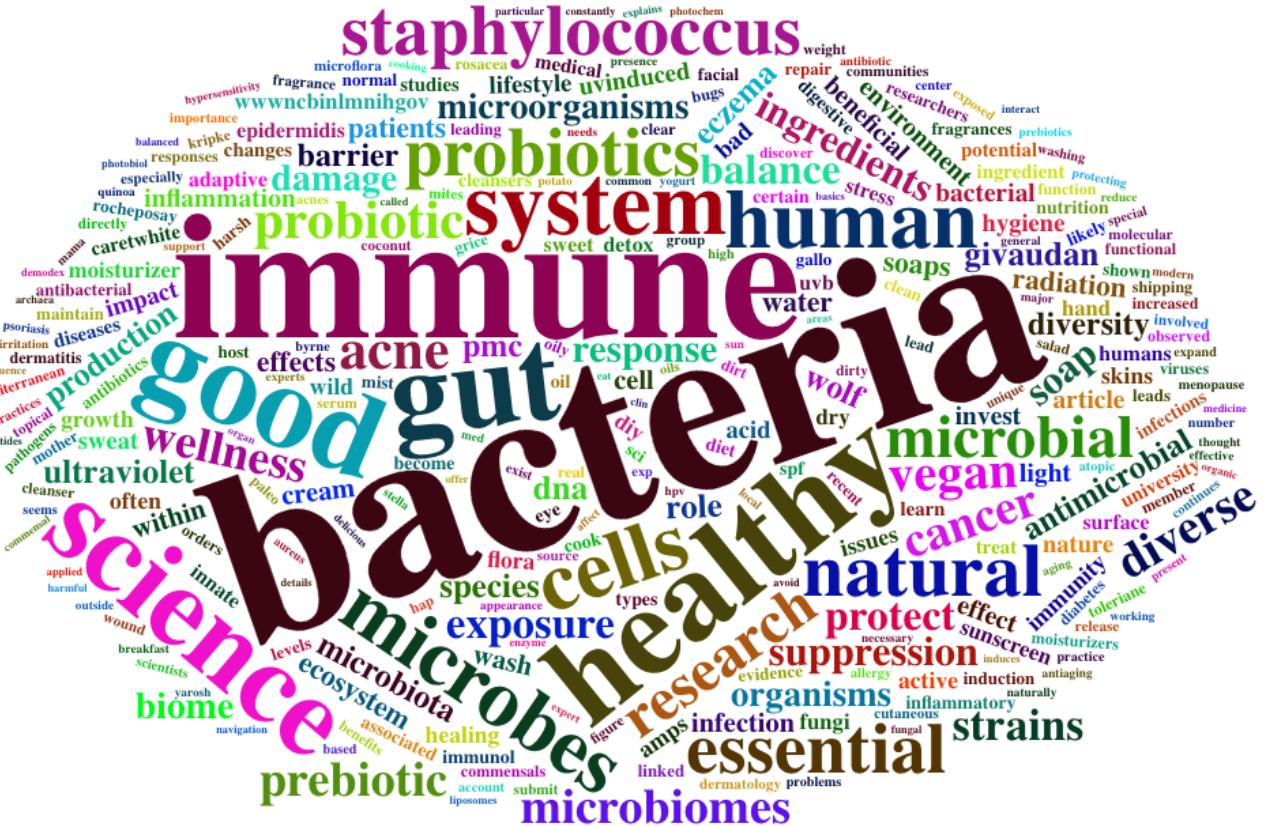
- Microbiome and market opportunities in Personal Care
- How do we address those opportunities?
- Our recent achievements

Microbiota revolution

From profound intimacy...



Microbiome trend in Personal Care Industry



Word cloud created based on BASF big data analysis

A science-based skin care trend



Fits healthy trend

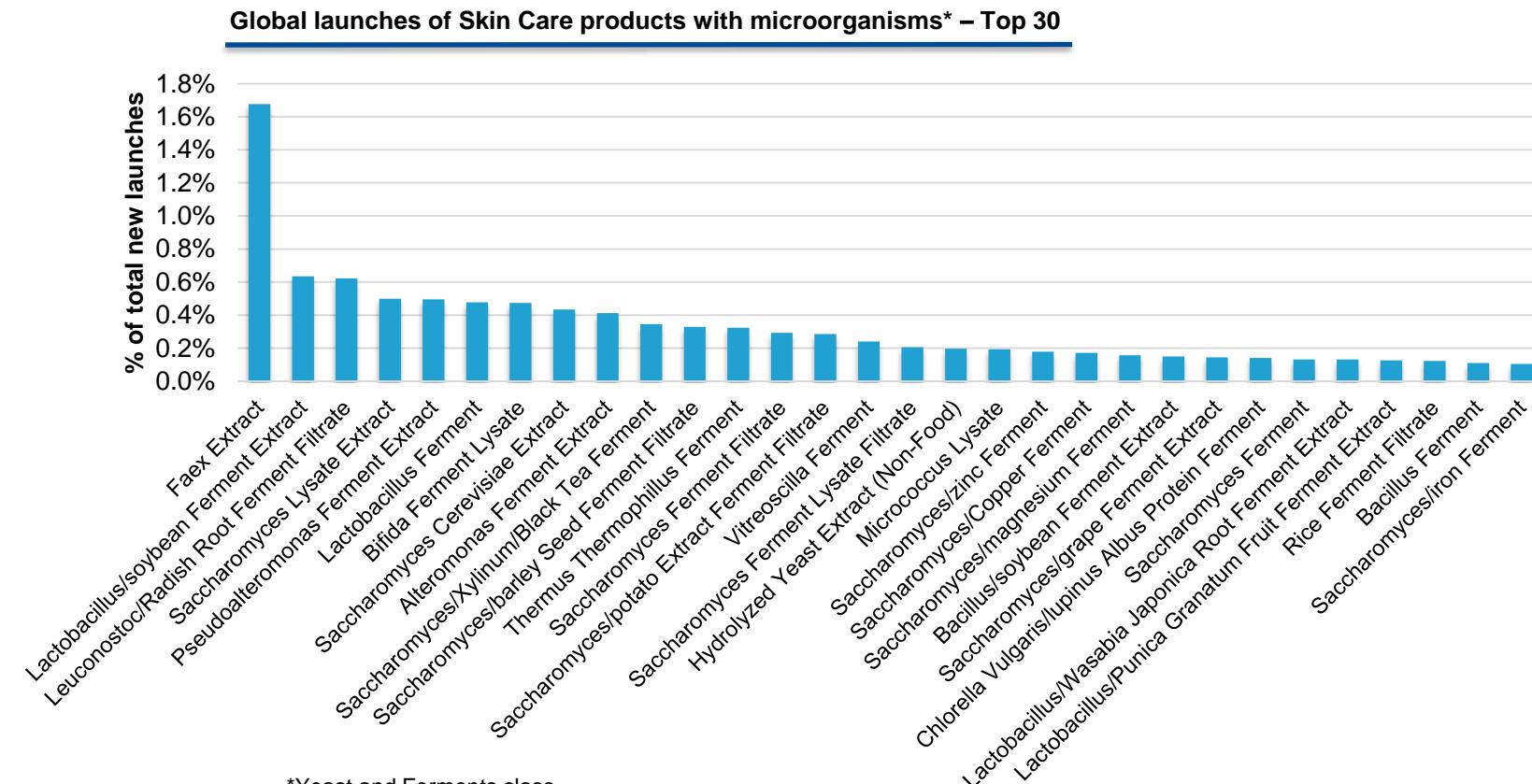
Protection and prevention



**Fits both natural and
dermocosmetic brand**

Microbiome: Probiotic fermented ingredients

Majority of “ingredients” are ferments, ferment lysates or ferment lysate filtrates generated from incubation of a microorganism (such as a probiotic) in culture with a food source



Formulated with
50% probiotic extracts



The major described claims address sensitive & aging skin and skin perfection (oily skin) or scalp.

Few skin microbiome analysis before/after application.

The microbiota lives with us and suffers with us!

Behavioral factors

Stressful life



The cult of hygiene...



External factors

Environmental factors

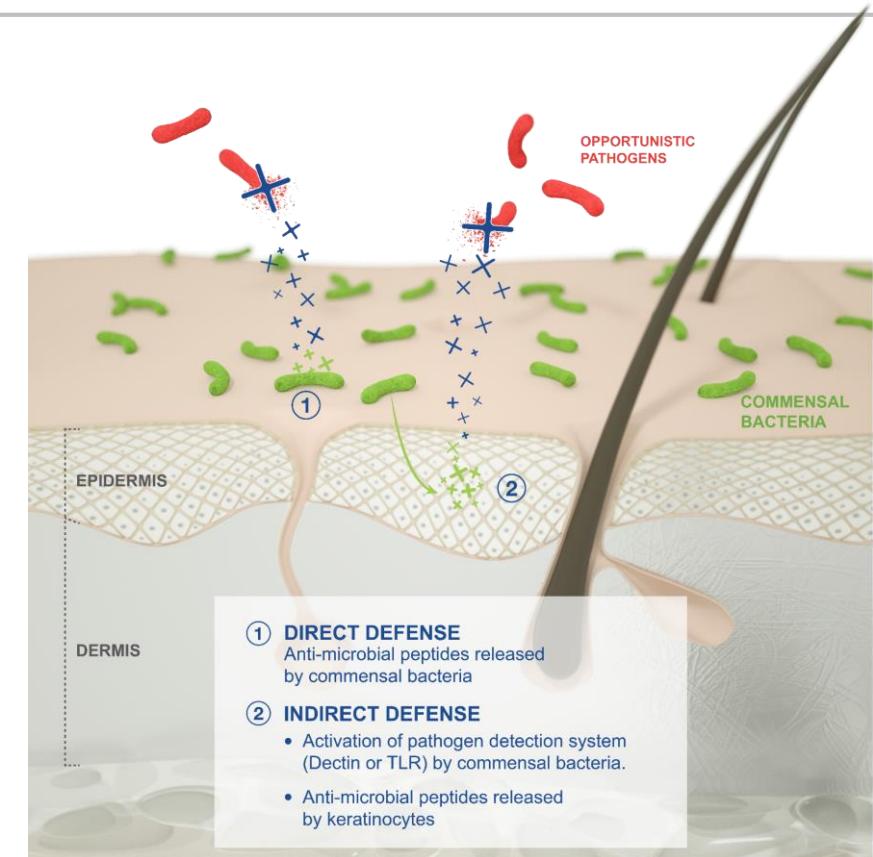


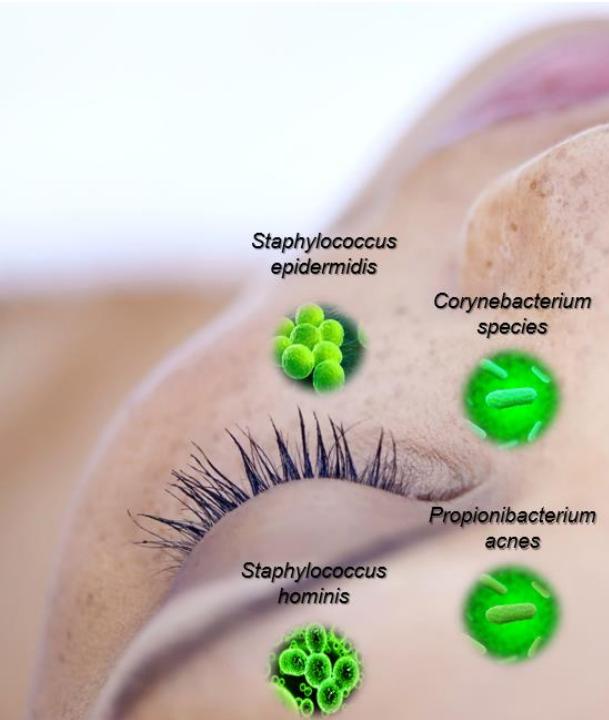
Skin microbiome - A fragile balance

Commensal bacteria live in community and in harmony with skin cells. This ecosystem is a fragile balance.

Skin cells bring nutrients and are the foundation on which commensal bacteria can multiply. In exchange, a healthy commensal flora actively prevents from the colonization of the skin by opportunistic pathogens.

By secreting anti-microbial peptides (direct defense) and stimulating the natural defenses of skin host cells (indirect defense), commensal flora forms a double line of defense against opportunistic pathogens.





COMMENSAL BACTERIA

Resident flora that lives in harmony with skin cell

- *Staphylococcus epidermidis*
- *Staphylococcus hominis*
- *Corynebacterium species*
- *Propionibacterium acnes*

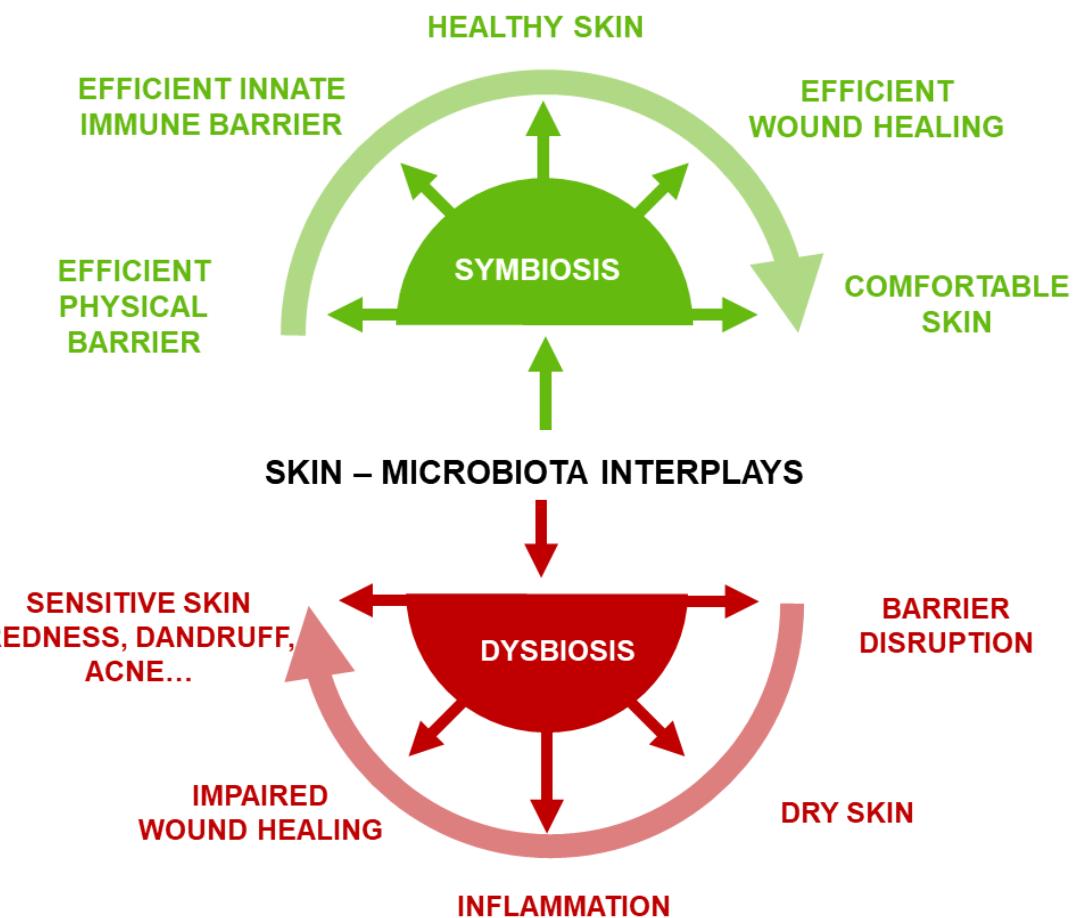
OPPORTUNISTIC PATHOGENS

Present on skin surface, but replace commensal bacteria and evade the immune system and cause inflammation

- *Staphylococcus aureus*
- *Pseudomonas aeruginosa*
- *Propionibacterium acnes*



Symbiosis & Dysbiosis



Imbalance of microbiota in skin conditions

Ultraviolet radiation (UVA and UVB)



The sensitivity of various microbes to UVR as well as their re-colonization potential following exposure differed

P582 SID 2015 - P591 SID 2017

Sensitive skin and inflammation



Bacillus cereus increases

PLoS One 2013 Nov 8;8(11): e78773

Scalp Dandruff



Association of *Malassezia* species with dandruff

Indian J Med Res. 2014 139(3): 431-437.

Dry Skin / Atopic dermatitis



Increased microbial burden particularly *S. aureus*

Analytical Cellular Pathology
Volume 2018, Article ID 1956403,

Dermal adipocytes protect against *S. aureus* skin infection thanks to cathelicidin secretion from differentiating adipocytes

Science. 2015 Jan 2; 347(6217): 67-71.

Acne



Propionibacterium acnes (now *Cutibacterium*) implicated in acne inflammation and pathogenesis

JEADV 2018 32(2):5-14.

Four main ways to enhance skin care to address the microbiome

Prebiotics

- Food ingredients that induce bacterial growth.

Probiotics

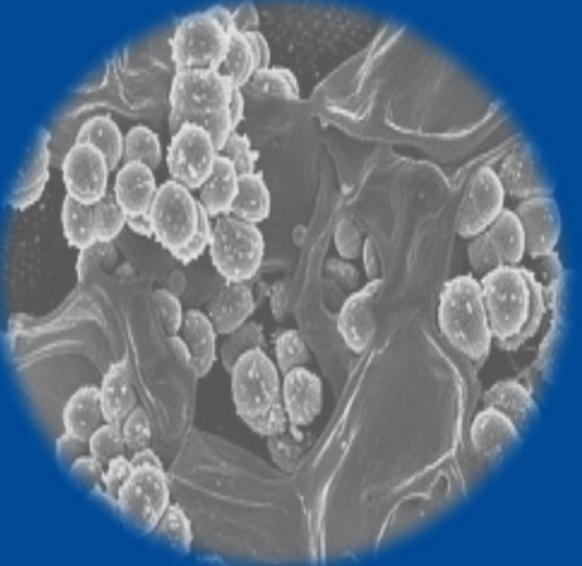
- Micro-organisms (usually living bacteria) believed to provide health benefits when consumed.

Postbiotics

- Bacteria-derived ingredients, such as enzymes, peptides, lactic acid, etc.

Biome- friendly

- Ingredients that do not harm the beneficial bacteria of the skin, and/or mimic the natural healthy skin barrier.



AGENDA

- Microbiome and market opportunities in Personal Care
- How do we address those opportunities?
- Our recent achievements

BCS Microbiota platform created in April 2016

As the recent advances in genomics have made it possible to reveal the complexity of skin microbiote composition, we are only now beginning to foresee the beneficial role of this cutaneous microbiota and to establish a link with the health of our skin.

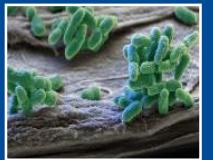


Through a platform dedicated to the study of this cutaneous microbiota, BASF is continually acquiring a deeper understanding of the interactions between the skin and its microflora to offer unique active ingredients able to rebalance cutaneous microbiota.

For an out of the box cosmetic, which regulates the cutaneous disorders by acting on the living.

BASF Performance Biologicals

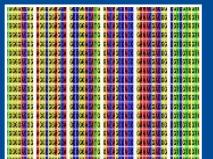
BASF Bioscience Research Competencies



Microbiology & Molecular Biology



Next Gen DNA Sequencing



Bioinformatics



Genetics



Biology



Phenotyping

Performance Biologicals

Leverage internal and external expertise

Deliver on consumer demands

Leapfrog to next generation products

Customer Demand



Agriculture



Personal Care



Nutrition

Product area

Disease control

Insect control

Skin Care

Scalp Care

Human Nutrition

Animal Nutrition

New Products

+

New Claims

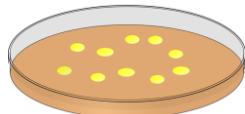
Our organization

A team with multidisciplinary competencies:

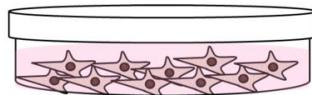
More than 25 experts (Market analysis, R&D, Data Mining) dedicated to:

- Increase our knowledge on skin microbiome and related skin care market
- Develop multifaceted models to study the impact of ingredients:
 - On microbiota, and skin cells and environmental aggressors such as UV, pollution particles, etc.
 - In the context of multiple categories of microorganisms

Bacterial cells



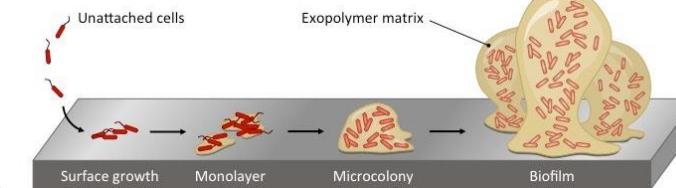
Skin cells



Environmental factors



Biofilm formation



Clinical studies+
genomics

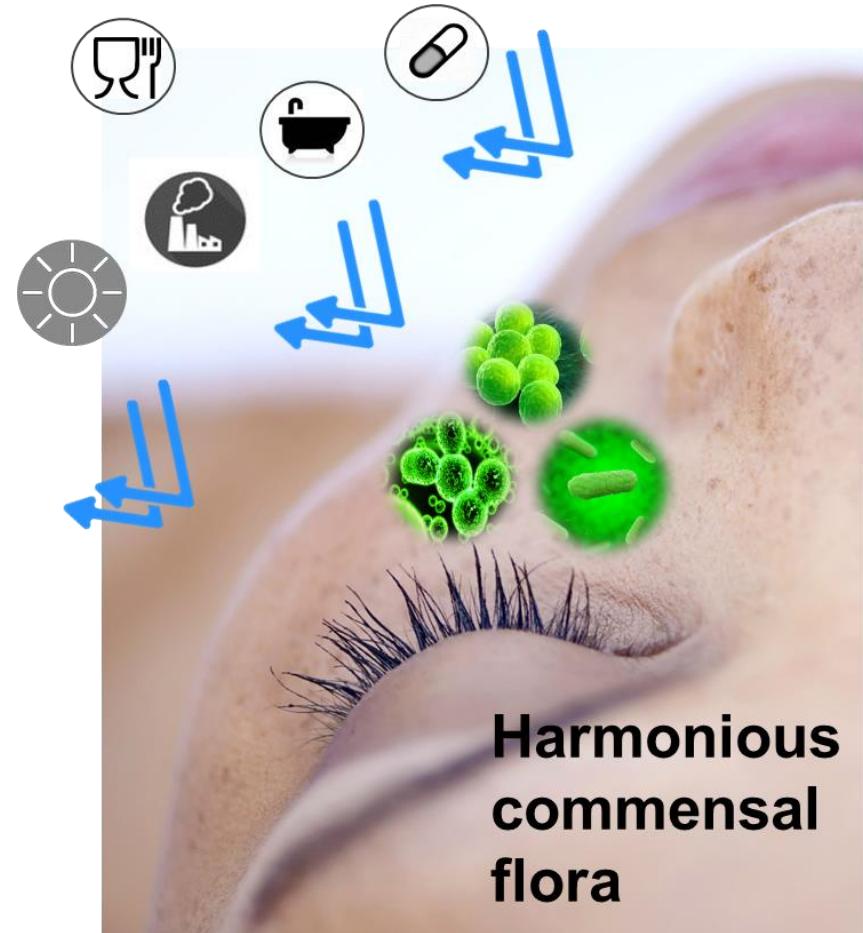


Our aim: To promote a healthy ecosystem

Dysbiosis is due to a change in the composition of the commensal bacterial ecosystem (increase or a decrease in the bacterial diversity of commensal flora).

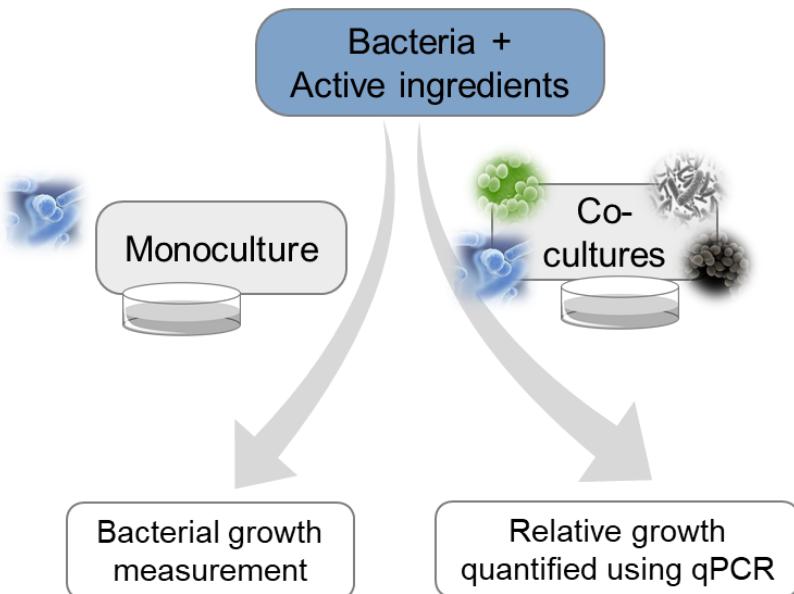
As a consequence, opportunistic pathogens colonize the skin. Dysbiosis may lead to inflammation and/or skin disorders.

Regulating the ecosystem not only means favoring commensal bacteria over pathogens, but also protecting the bacteria against environmental factors and controlling the behavior of the bacterial population (virulence factors).

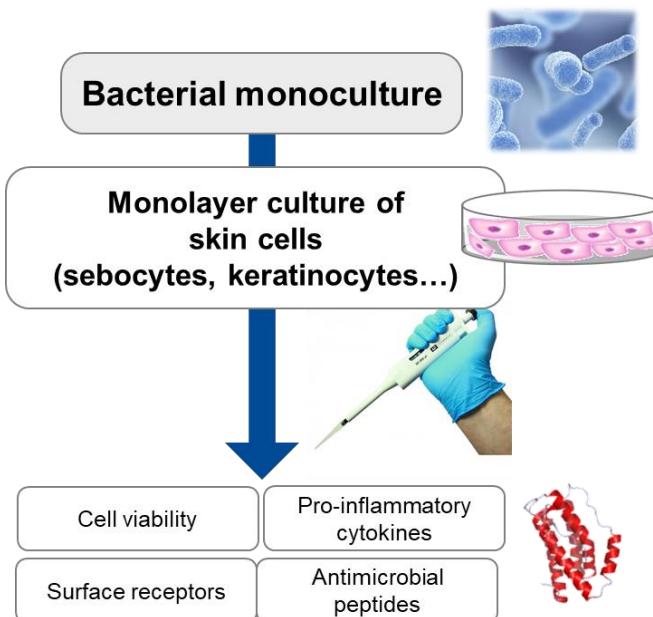


Models to study microbiota and skin interactions

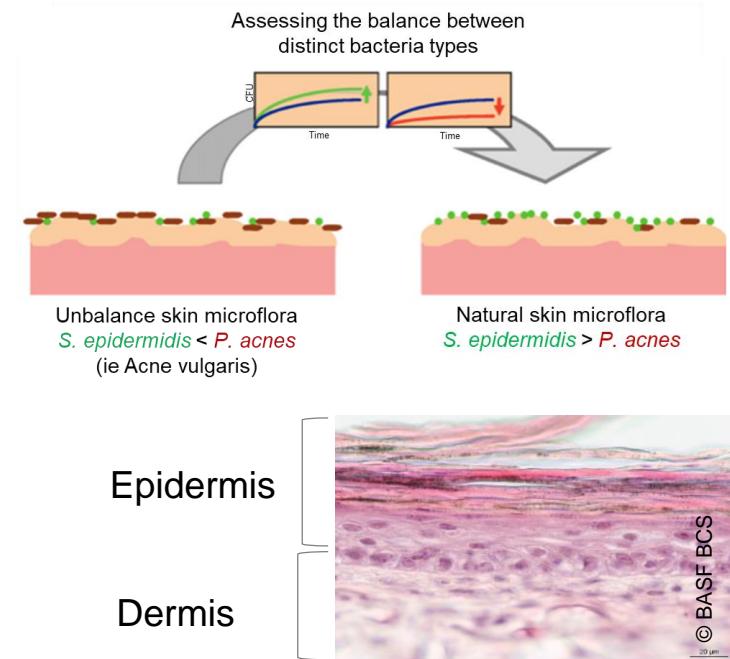
Active ingredient and single or mixed microbial cultures



Single layered Skin cells and single microbial co-cultures



Different types Skin cells and mixed microbes model

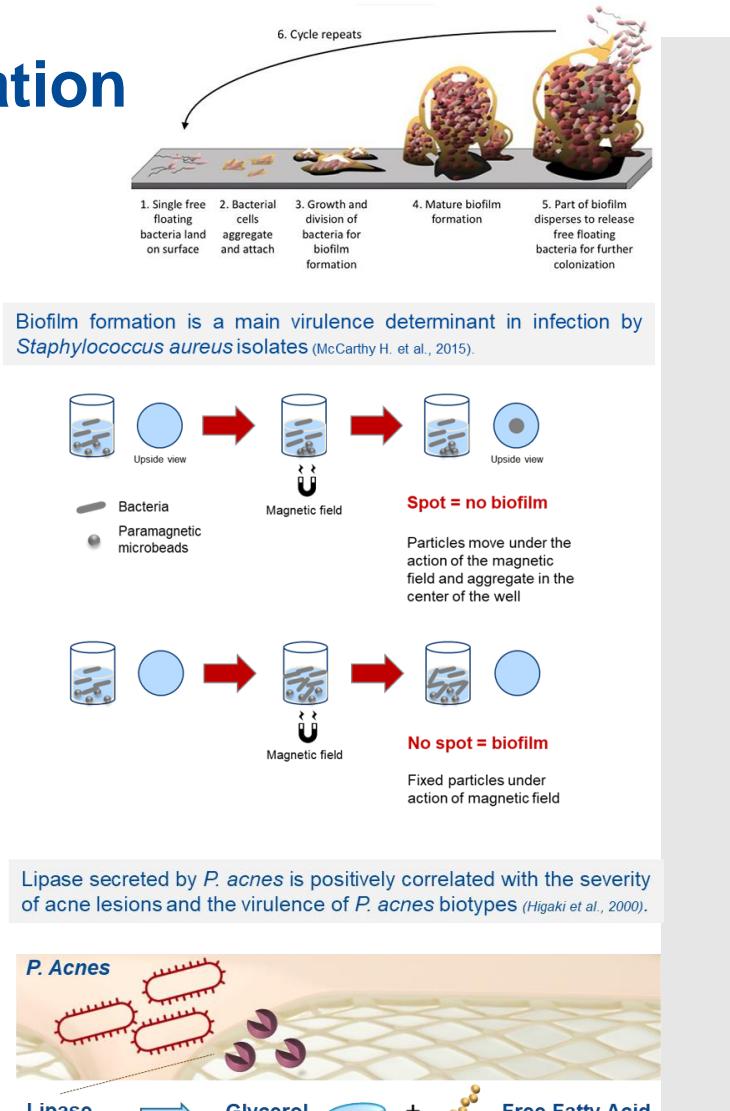
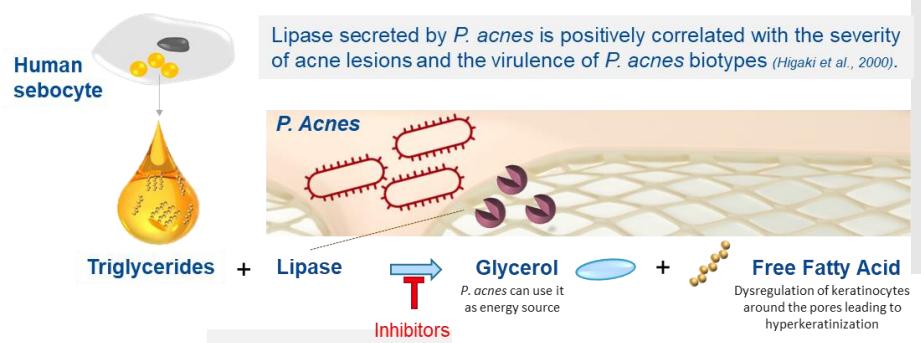


Need for complex models to study effect of ingredients on microbiota and its ecosystem

Advanced systems to study microbiota

Virulence evaluation

Biofilm formation



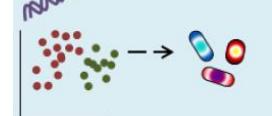
Studies on human panelists



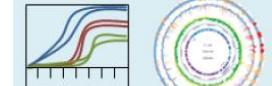
DNA-Based Approaches

Who is there?
What can they do?

16S rRNA, 18S, ITS gene sequencing



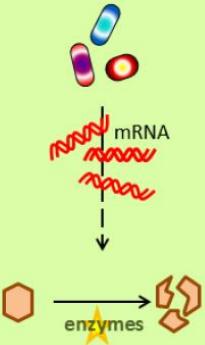
metagenomics



RNA-Based Approaches

How do they respond?
What pathways are activated?

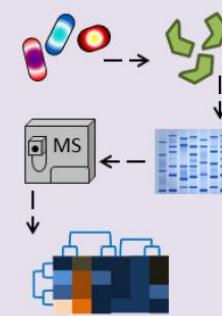
metatranscriptomics



Protein-Based Approaches

How are they interacting with the host?
What proteins are being produced?

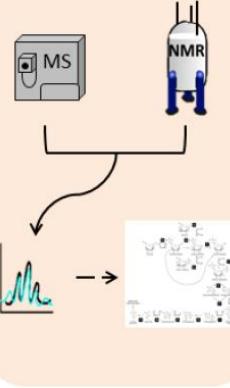
metaproteomics



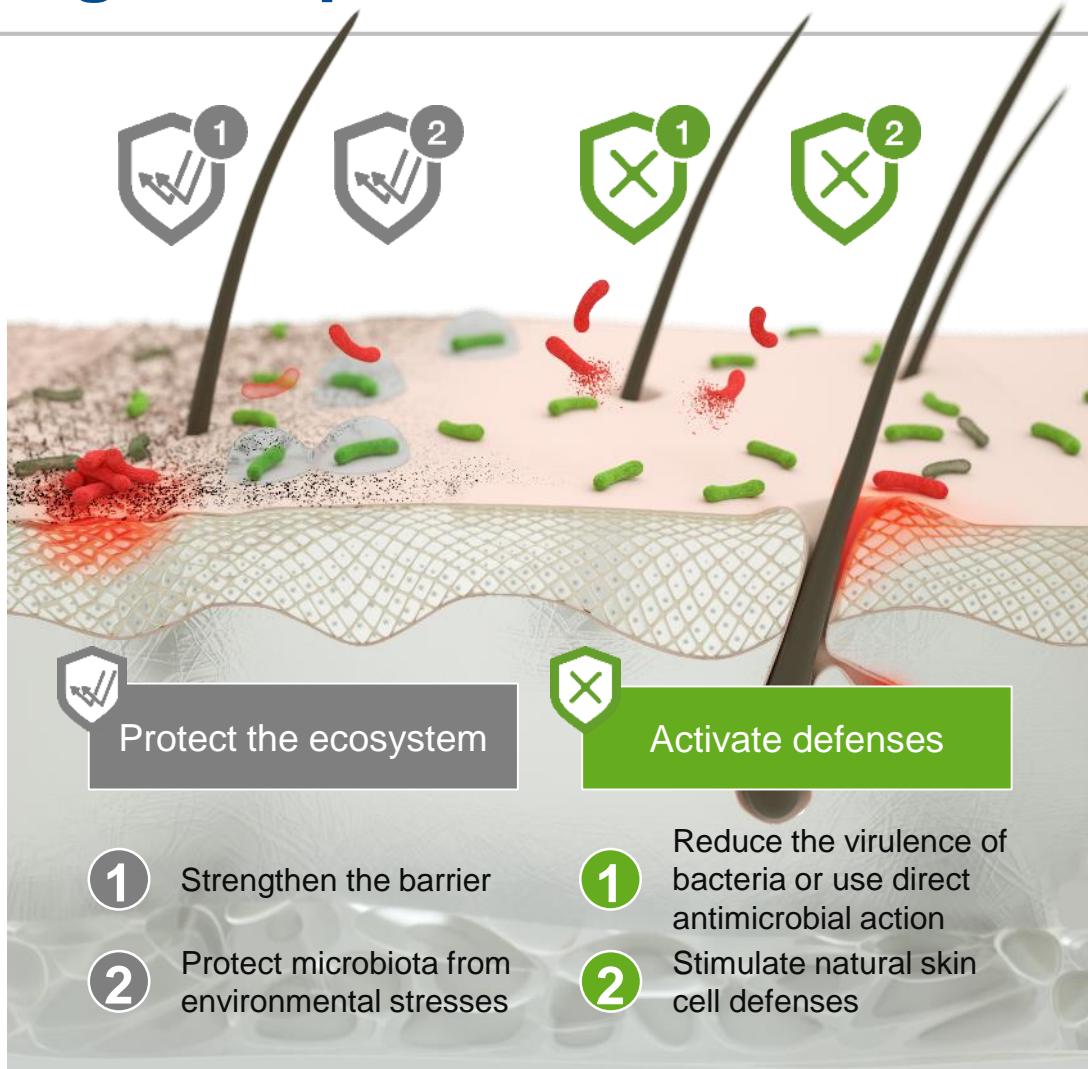
Metabolite-Based Approaches

What are the chemical outcomes of their activity?

metabolomics



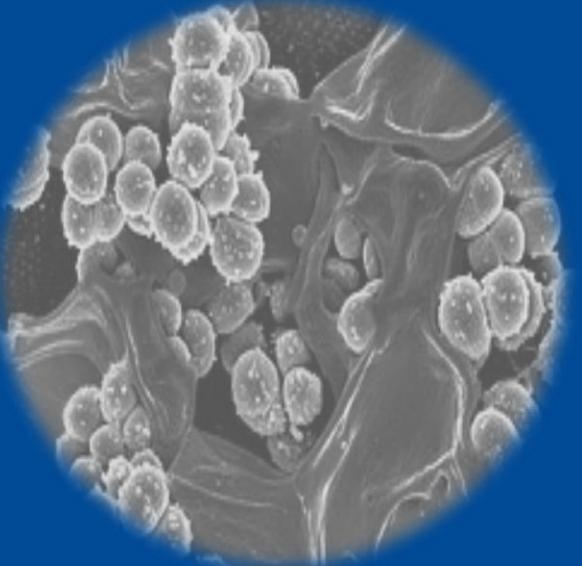
Our strategy: Enabling the optimization of the cutaneous microbiota



BASF develops ingredients **enabling the optimization of the cutaneous microbiota.**

The first strategy is a **dual protective approach** to promote a harmonious development of the ecosystem. Our ingredients **strengthen the barrier and/or protect the commensal flora** from the main environmental factors that may have a deleterious effect on bacteria.

The second strategy is to actively **promote innate defenses against opportunistic pathogens** at both microbiota and skin cells levels.



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- How do we address those opportunities?
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Our Solutions



	Betapur®	Bix'Activ®	Relipidium®	Phytosoothe®	PatchH ₂ O®	Purisoft®
Ecosystem						
Strengthens the barrier		●	●	●	●	
Protects microbiota			●	●	●	●
Defenses						
Anti-microbial / virulence action	●	●				
Stimulates natural skin cell defense	●		●			

Double line of
defense against
impure skin

Dual "protector and
defender" ally
against skin
imperfection

Healthy ecosystem
defender for dry skin

Double line of
protection for fragile
and sensitive skin

Comprehensive
optimizer of urban
skin health

Microbiota anti-
pollution shield

Purisoft®, PatchH2O® and Bix'Activ® - *in vitro* results



Purisoft®
Moringa Oleifera Seed Extract

PatchH2O®
Hydra-protect Technology

Bix'Activ®
Bixa Orellana Seed Extract

Microflora protection

2 x

1.5 x

Protects commensal bacteria against PM 2.5
(*S. epidermidis*)

Protects commensal bacteria against PM 2.5
(*S. hominis*)

Microbiota optimization



Preservation of beneficial skin microbiota
against pollution (*S. epidermidis* / PM 2.5)

Reduction of opportunistic bacterial virulence
(biofilm formation by *S. aureus*)

Microbiota virulence



P. acnes virulence (lipase) without direct
effect on bacteria growth

Betapur®, Relipidium® and Phytosoothe® - results



Betapur®

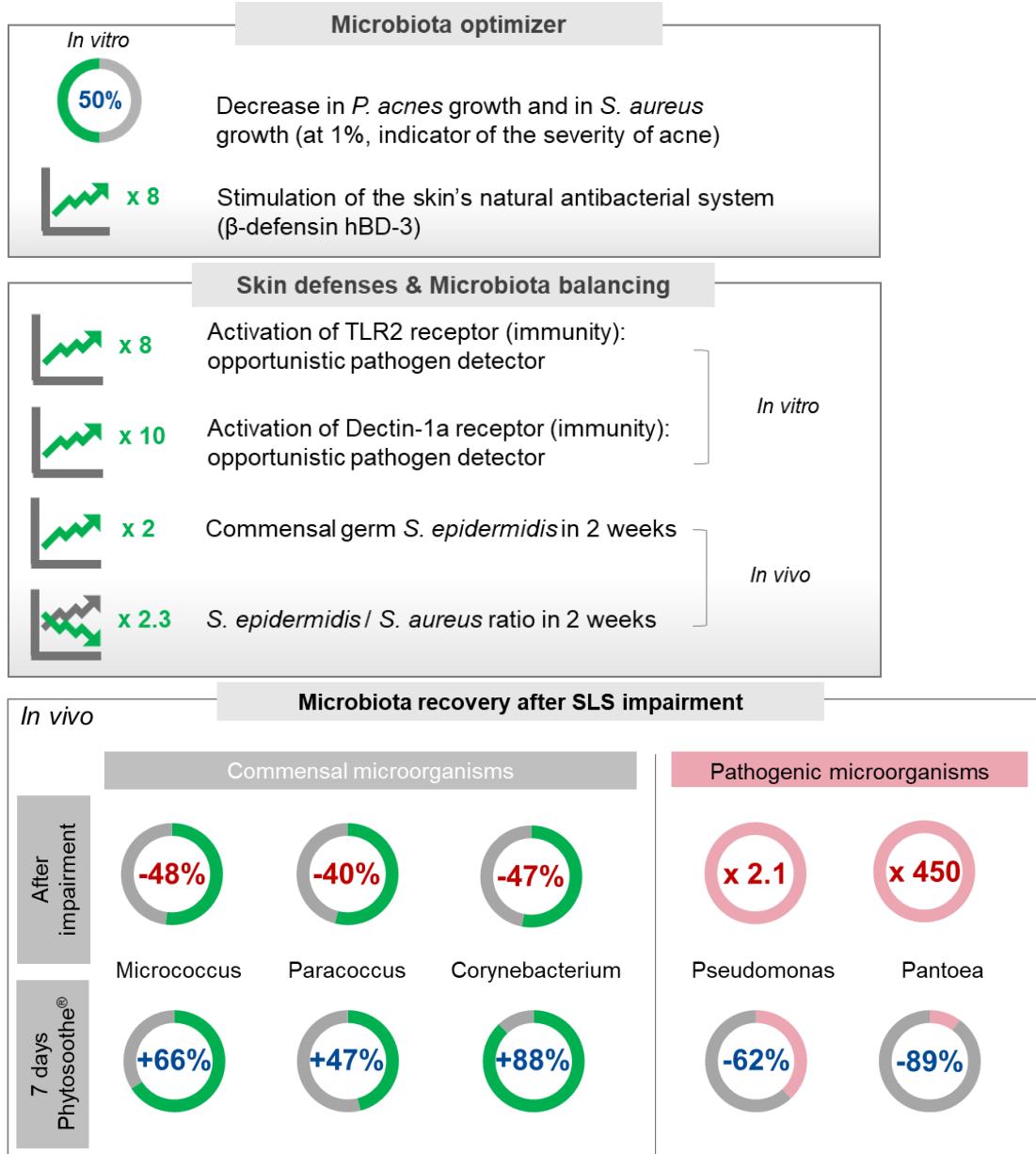
Peumus Boldus Leaf Extract

Relipidium®

Yeast extract biofermented by
Lactobacillus plantarum

Phytosoothe®

Brassica Campestris (Rapeseed) Sterols
and Cetearyl Alcohol



A 3D reconstruction of a skin cross-section, showing the epidermis with its distinct layers and the underlying dermis. Hair follicles are visible as vertical structures extending from the epidermis into the dermis. The image is color-coded, with the epidermis appearing in shades of orange and red, while the dermis is a darker blue.

**... and many more dermo-
cosmetic actives in our
pipeline!**

Thank you



BASF

We create chemistry

Care Creations™

