10/24 | Volume 150 | Thannhausen, Germany, October 08, 2024

sofw journal

150 YEARS SINCE 1874

Home & Personal Care Ingredients & Formulations

powered by SOFW

editor in chief

Meet the SOFW Team at SEPAWA® CONGRESS!

column

Real Sustainability Needs You!

10
2024
english

sustainability

Environmental Behaviour of Phosphonates – New Insights into their Abiotic and Biological Degradation

Defining Future of Cleaning in Home Care – New Surfactants Enabling Lower Carbon Footprint of Cleaning Products

UP Bio-Circular Solutions: A Sustainable Approach to Consumer Goods Formulation

laundry detergent

Fabric Cleaning with Care Effect: X-in-1 Detergents with Glucamide

Designing Liquid Laundry Detergent Formulations for Optimal Use of Enzymes

personal care

Revitalizing Skin Fitness: The Synergy of Sports Benefits and Plant Biotechnology

Immortelle Oil – A Luxurious Elixir for Stretch Marks and Skin Perfection

Skin-inspired and Easy-to-formulate Ceramide Innovations

#Novel Strategy in Skin Care: Postbiotics for Diverse Skin Conditions

Natural Oil and Ester Mixture as a High-performing, Sustainable Alternative to Silicone Oils in Hair Care

home care

Stability and Foam Study of Surfactant-Xanthan Gum Combinations

#Novel Strategy in Skin Care: Postbiotics for Diverse Skin Conditions

G. Graziadio

abstract

In the realm of skincare innovation, ROELMI HPC introduces Equibiotics®, a groundbreaking line of post-biotic ingredients. This novel approach aims to rebalance the skin microbiota, fostering skin health and thwarting potential alterations. Employing a gentle process, Equibiotics® deactivates bacteria while preserving their beneficial properties for our skin. The line encompasses Equibiotics® LRh, tailored for intimate care, and Equibiotics® LA, ideal for sensitive skin.

The skin's primary function as a physical barrier against external threats underscores the importance of a well-functioning microbiota. Serving as a dynamic interface with the environment, the skin harbors a diverse array of microorganisms, including bacteria, fungi, viruses, micro-eukaryotes (such as mites), archaea, and phages.

Viewing the skin as an ecosystem sheds light on the intricate interplay between host and microorganism. Disruptions in this delicate balance, whether originating internally through genetic variations or externally via environmental factors, can precipitate various skin disorders.

The activity of skin microorganisms is intertwined with mechanisms supporting the skin's immune system. Notably, these microorganisms colonize the skin surface, acting as a bulwark against pathogenic intrusion.

While a harmonious microbiota supports the body's immune defenses, disturbances leading to dysbiosis can trigger a cascade of dermatological issues. Dysbiosis, characterized by an imbalance in the structure and function of the skin's normal microbiota, can result from both internal and external stressors.

The cosmetic industry is witnessing a surge in the utilization of postbiotics for skin microbiota restoration on a global scale. Postbiotics, deactivated forms of bacteria, are gaining traction due to their suitability for cosmetic formulations. Unlike probiotics, postbiotics integrate a preservative system crucial for neutralizing harmful microorganisms, enhancing their appeal in skincare applications.

ROELMI HPC has developed postbiotic ingredients through a specialized soft process known as tyndalization. This method enables the deactivation of bacteria while preserving the integrity of the bacterial wall responsible for co-aggregation. Furthermore, this process facilitates the retention of specific bacterial structures essential for the formation of intact biofilms. These intact biofilms play a key role in restricting the proliferation and mobility of pathogens.

Lactobacillus rhamnosus LRH020 and *Lactobacillus acidophilus PBS066* are proprietary strains owned by Synbalance, a ROELMI HPC sister company. These strains have been primarly involved in the development and manufacturing of probiotics intended for use in food supplements. Consequently, the resulting line of postbiotics designated Equibiotics® LRh and Equibiotics® LA stand as a distinctive offering in the world of cosmetic applications.

The vaginal microbiota, both in its normal and abnormal states, comprises intricate ecosystems encompassing over 200 bacterial species, influenced by genetic factors, ethnic background, environmental elements, and behavioral factors. Within the healthy vaginal epithelium, various species of lactobacilli predominate, collaborating to establish a strong defense system alongside, antibacterical substances, cytokines, defensins, crucial for preventing dysbiosis, infections [6]. The lactobacilli, in particular, possess the ability to metabolize glycogen under the influence of estrogen, contributing to the production of lactic acid, which, in conjunction with other fermentative bacteria and vaginal epithelial cells, serves to acidify the vaginal ephitelium [7].

Although Equibiotics® LRh is rendered inactive, meaning its lack of viability and reproductive capacity, the deactivation process in conduced gently, with a "soft process", preserving the key proteins and transmembrane lipids responsible for its co-aggregative capability. Consequently, the essential properties of Equibiotics® LRh, the facilitating co-aggregation and the biofilm formation, remain unaltered despite deactivation. Scanning Electron Microscope images have revealed that Equibiotics® LRh has the ability to interact with various pathogens commonly found in the vaginal epithelium, highlighting its targeted focus on intimate care. Microscopic observations

demonstrate a distinct co-aggregation effect on *E. coli* and *Candida albicans*, effectively modulating their proliferation and mobility. Given the potential of these bacteria to induce discomfort in the intimate area, this observed modulation holds significant relevance. (**Figures 1** and **2**)

EquiBiotics® LRh has the capability to establish a protective biofilm, acting as a barrier that impedes the access of *Gardnerella Vaginalis* to the epithelium and its subsequent proliferation **(Figure 3)**.

Based on these results, *ex-vivo* tests were conducted on reconstructed vaginal epithelium to asses EquiBiotics® LRh's ability to ehnance cell vialability following treatment with SLS (Sodium Lauryl Sulfate), as well as its potential to mitigate the level of TNF-α, a key mediator of inflammatory response. The ingredient exhibited promising results, thus augmenting its value in terms of co-aggregation and biofilm formation abilities **(Figure 4)**.

Moreover, EquiBiotics® LRh enhances the skin barrier function, reducing Transepidermal Water Loss (TEWL), while simultaneously promoting hydration of the epithelium and mucosa **(Figure 5)**.

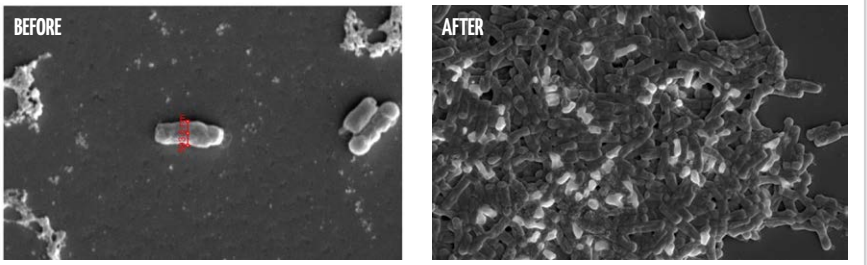

Fig. 1 EquiBiotics® LRh co-aggregates with *Escherichia coli*

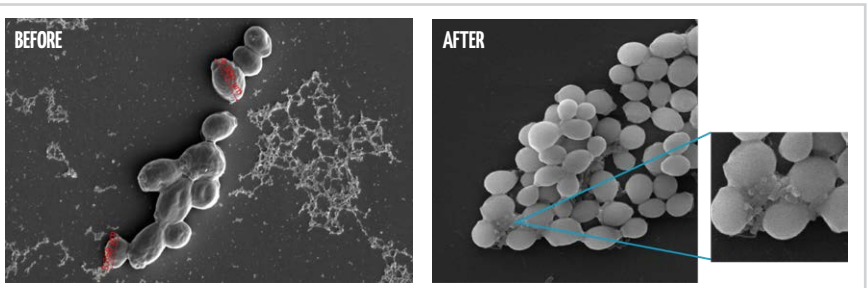

Fig. 2 EquiBiotics® LRh co-aggregates with *Candida Albicans*

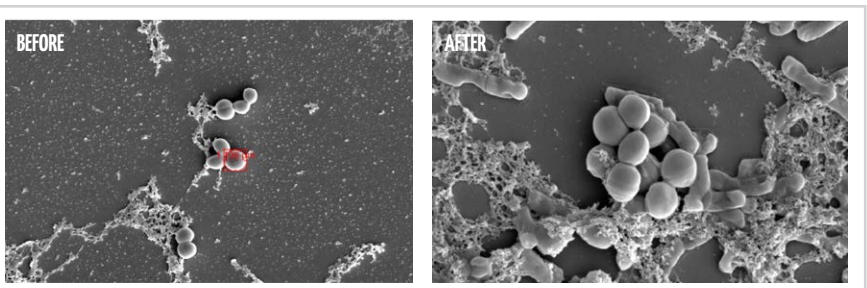

Fig. 3 EquiBiotics® LRh is able to form a biofilm around the *Gardnerella Vaginalis*

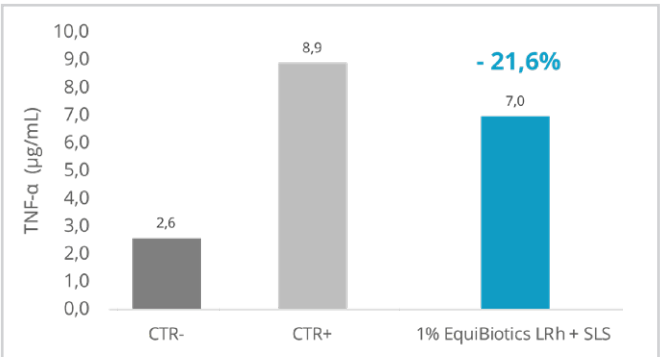

Fig. 4 Anti-inflammatory activity: TNF-α expression in *in-vitro* test

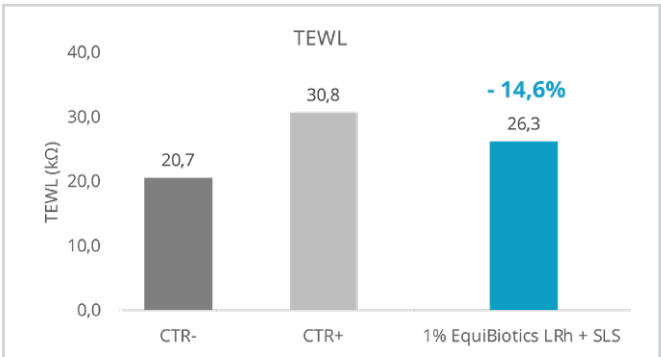

Fig. 5 Integrity of the epithelial barrier: TEWL in *in-vitro* test

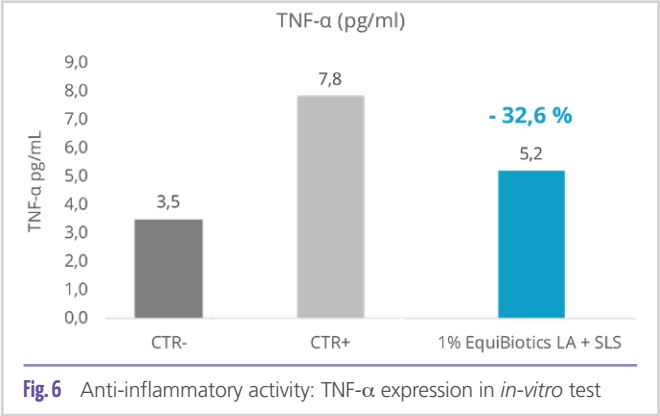

Fig. 6 Anti-inflammatory activity: TNF-α expression in *in-vitro* test

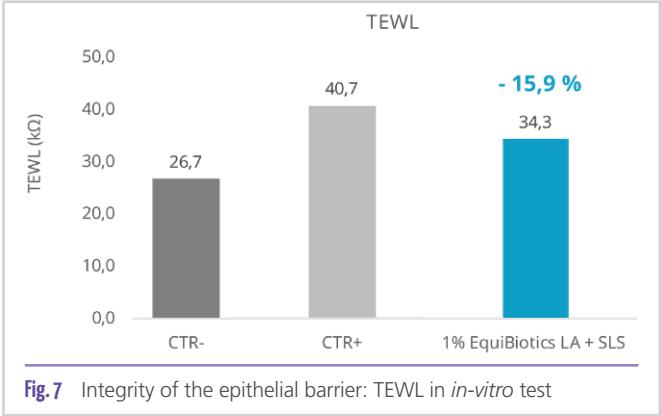

Fig. 7 Integrity of the epithelial barrier: TEWL in *in-vitro* test

Though these tests, it's possible to demonstrate the suitability of our ingredient for inclusion in all intimate care formulations. Additionally, it prevents potential skin alterations through its moisturizing and balancing properties.

The skin is constantly exposed to various endogenous, exogenous and life style factors that may affect the skin barrier function at the physical, mechanical and microbial levels. Consequently, such impacts can potentially lead to inflammatory skin conditions involving sensitive or irritated skin as well as chronic inflammatory skin diseases, infections, allergies or autoimmune diseases [8].

Sensitive skin is characterized by the occurrence of discomforting and unpleasant sensations, often accompanied by erythema, in response to stimuli that tipically do not provoke such reactions and that can not be linked to any skin discomfort [9].

The potential influence of cutaneous microbiota in skin sensitivity has been hypothesized [10].

Equibiotics® LA derived from *Lactobacillus acidophilus PBS066* via the tyndallization process, has undergone comprehensive testing, revealing its multifaceted mechanism of action. In-vitro studies on reconstructed human epidermis EpiDerm™ have demonstrated its efficacy in reducing inflammation, particularly crucial for reactive skin. Following inflammation induced by irritant agent SLS, there was a notable decrease of 32.6% in TNF-α levels compared to the CTRL+ **(Figure 6)**.

Equibiotics® LA is also capable to prevent water loss, thus reducing the risk of dryness, another very common fact in sensitive skin **(Figure 7)**.

Equibiotics® LA showed the ability to restore microbiota balance within just 48 hours at 1% concentration. Specifically, through Metagenomic analysis of the 16S rRNA gene, it was observed to effectively restore equilibrium after an oxidative stress induced by 30 µl H_2O_2. The results show a dicrease of *Staphylococcus Aureus* and an increase in *Lactobacillus* abundance **(Figure 8)**.

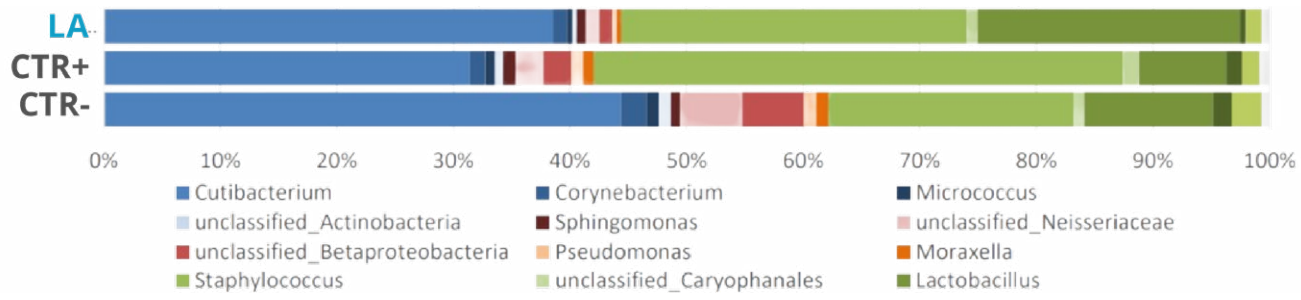

Fig. 8 Rebalance of skin microbiota: Microbiota composition at T48h C- vs. C+ vs. Equibiotics® LA

Given these outcomes, Equibiotics® LA emerges as an ideal solution for soothing and calming skin redness. Its efficacy extends beyond addressing typical signs of sensitive skin, as its influence on the skin microbiota enables the prevention of potential stressors that could aggravate sensitive and reactive skin conditions.

Equibiotics® Line represents a groundbreaking approach to prevent and rebalance various skin conditions by targeting the skin microbiota. Developed by ROELMI HPC, this innovative line of post-biotic ingredients offers multitalented benefits for skin health and integrity. The skin's microbiota plays a key role in maintaining its health and function, and disruptions to this delicate balance can lead to a range of skin disorders. Equibiotics® LRh and Equibiotics® LA have demonstrated their ability to restore microbiota balance, enhance skin barrier function, and mitigate inflammation, making them invaluable assets in skincare formulations targeting sensitive and reactive skin.

Overall, Equibiotics® represents a significant advancement in skincare formulations, offering a new interesting approach to address various skin concerns and promote skin health.

References:

[1] *Cogen AL et al.* Skin microbiota: a source of disease or defence? Br. J. Dermatol. 2008; 158:442–455.

[2] *Probst A.J. et al.* Moissl-Eichinger C. Archaea on human skin. PLoS ONE. 2013; doi: 10.1371

[3] *Fuchs E. et al.* Getting under the skin of epidermal morphogenesis. Nature Rev. Genet. 2002; 3:199–209.

[4] *Cundell A.M.* Microbial Ecology of the Human Skin. Microb. Ecol. 2018; 76:113–120. doi: 10.1007/s00248-016-0789-6.

[5] *Farahmand S.* Microbiome of Compromised Skin. In: Dayan N., editor. Skin Microbiome Handbook: From Basic Research to Product Development. 1st ed. Scrivener Publishing LLC; Beverly, MA, USA: 2020. pp. 145–170.

[6] Microbiota of the Human Body; Chapter Vaginal Microbiota; pp 83–93

[7] *Buchta V.* Vaginal microbiome. Ceska Gynekol. 2018 Winter; 83(5):371-379. PMID: 30848142

[8] *E. Baldwin et al.* Drugs Dermatol. 2017, 16, 12. CAS PubMed

[9] Experimental Dermatology; Volume 27, Issue 9 September 2018 Pages 1061-1064

[10] *L. Mijouin et al.* Effects of a Skin Neuropeptide (Substance P) on Cutaneous Microflora. PLoS ONE

author

Giuliana Graziadio | Product Manager

ROELMI HPC

Via Celeste Milani, 24/26 | 21040 Origgio (VA) | Italy

info@roelmihpc.com