

SCG78

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Speaker Abstracts

Session L: Biodiversity & Sustainable Ingredient Design





The Sweeter, The Better: Creating Novel Antioxidative Cosmetic Ingredients through Biotechnological Glycosylation

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ABSTRACT

Plant polyphenols are widely used in cosmetic formulations due to their potent antioxidant and anti-aging properties. However, their effectiveness is often limited by low water solubility and poor stability. This research focuses on discovering novel biocatalysts capable of structurally modifying polyphenols to improve their water solubility and bioactivity.

Several microbial strains were identified that efficiently convert polyphenols into various glycosides, such as glucosides, glucuronides, and rhamnosides. Among these, a versatile glycosyltransferase, BbGT, was isolated from *Beauveria bassiana* and successfully expressed in *Saccharomyces cerevisiae* and *Escherichia coli*. Additionally, a novel glucuronide biosynthetic pathway was characterized in *Streptomyces chromofuscus*. Utilizing both wild-type and engineered strains, we generated a library of novel glycosides from various polyphenols, including quercetin and resveratrol. These new glycosides demonstrated significantly enhanced water solubility, chemical stability, and antioxidant activity.

Our research introduces an innovative biotechnological approach for developing enhanced polyphenol derivatives, offering promising potential for cosmetic applications.



Advancing Sustainable Bioactive Production: Leveraging Plant-Based Systems as Biofactories for the Personal Care Industry

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ABSTRACT

The Personal Care industry faces a growing demand for innovative and sustainable production methods for bioactive compounds, including proteins. Traditional production strategies, including chemical synthesis, microbial fermentation, and human cell culture, have been extensively used; however, each method is associated with inherent limitations.

This presentation introduces a novel approach utilizing a whole plant system, which offers a sustainable platform for the biosynthesis of stable bioactive compounds within plant seeds. This system has been successfully leveraged to produce human Growth Factors — a class of endogenous proteins known for their longevity benefits when applied topically.

We will present placebo-controlled clinical data demonstrating the efficacy of human Growth Factors produced via this plant-based system. The results indicate significant improvements in key dermatological parameters.

This presentation highlights the transformative potential of plant biotechnology as a scalable and eco-friendly alternative for producing high-value bioactive compounds, addressing the industry's demand for sustainable, next-generation actives.



Novel Antioxidant Mechanism Discovered in Skin Probiotic Bacteria Protecting from Photo- and Chronological Aging

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ABSTRACT

Novel antioxidant mechanism discovered in skin probiotic bacteria protecting from photo- and chronological aging.

Skin microbiota plays a crucial role in protecting the skin against aging and photoaging by preventing oxidative stress. Their metabolic activity suggests a novel antioxidant mechanism to counteract such damage. Therefore, the objective of this work was to provide a new approach for promoting overall skin health protecting from photo- and chronological aging by boosting a novel ROS scavenging mechanism mediated by skin probiotic bacteria.

The effect of oxidative damage to skin probiotic bacteria on skin cells was assessed in a cell culture to which *S. epidermidis* was added as model organism for commensal human skin bacteria. Further, a model of stress-induced premature senescence was developed to evaluate extracellular matrix damage in histological sections.

The clinical studies scheduled aim to demonstrate the impact of modulating the crosstalk between the skin and its microbiota in not only reducing the signs of aging but also helping minimize solar radiation-induced damage.



New Molecular Architecture as a Path to Performance and Sustainability

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ABSTRACT

Sustainable materials are required for society to thrive into the 21st century and beyond. Challenges with current materials used in consumer products include bioaccumulation, fossil dependence, large carbon footprints, ecotoxicity, and a lack of biodegradability. By combining Green Chemistry and Process Intensification, next-generation sustainable materials can be designed for both performance and sustainability, simultaneously. This paper will discuss material design using biorenewable, nature-inspired chemistry used to generate new materials.

New techniques for assembling plant-based monomers into liquid polymers that could be used in cosmetics and personal care were desired at the outset of this project. In particular, methodologies that relied on low energy transformations that were nature-mimetic, high-yielding, and inherently safe were targeted. The goal was to design liquid polymers that delivered sensory and performance benefits over and above the liquid polymers used in cosmetics and personal care today.

A new class of liquid polymers was developed, stemming from a novel self-assembly mechanism using plant-based monomers. These liquid polymers have myriad performance benefits across both skin and hair applications and possess base sensory aesthetics that match silicones with remarkable fidelity. With regard to hair in particular, these polymers result in greater conditioning as evidenced by frizz reduction, heat protection, comb force reduction, and shine. In addition to desirable sensory with regard to feel, this new class of polymers was found to have fragrance retention properties, making it a multifunctional material that can extend and enhance the aroma of a product.



Future-Focused: Responsible Sourcing and Innovative Cosmetic Product Development

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ABSTRACT

The future of cosmetic product development relies on responsible sourcing strategies to mitigate risks and seize opportunities using natural ingredients, sustainable packaging and responsible supply chains. As our industry pivots towards increased sustainability expectations, priorities include biodiversity protection, water stewardship, human rights, environmental due diligence and formulating without harmful substances. Companies are adopting green chemistry, biotechnology, and upcycling practices more than ever. The EU's Green Claims Directive, Corporate Sustainability Due Diligence Directive and Deforestation Regulation compel brands to substantiate environmental claims, address human rights and environmental impacts and ensure deforestation-free supply chains. Prioritizing these aspects enhances the industry's social and environmental footprint, fosters consumer trust and drives innovation. This holistic approach aligns with global efforts to protect ecosystems and promote social equity, crucial for brands and suppliers aiming to lead in the cosmetic sector and attract consumers valuing transparency and sustainability.



Transforming Together Towards a Better Tomorrow – Bringing Consumer Products into a New Dimension

Anna Howe

Evonik

ABSTRACT

The demand for sustainable products is increasing among consumers worldwide, especially in the Personal Care industry. To develop the next generation sustainable solutions, alternative feedstocks are the biggest levers, focusing on ethical parameters such as sourcing, biodiversity, clean energy, emissions reduction, recycling waste, eliminating pollution, and consumer well-being. More new cosmetic ingredients are being developed with next-generation feedstocks with additional benefits and claims. This paper will explore the significance of lipophilic emollients in developing low CO₂ footprint emulsions. The study aims to compare conventional and enzymatic esterification synthesis utilizing first generation feedstocks. The second example that will be investigated is the use of discarded Baobab seeds as a second-generation feedstock. A natural botanical emollient with a clear focus on sustainability and has a strong sociological impact empowering women in Africa. This alternative feedstock supports Great Green Wall initiative from UNCCD and certified by FairWild.