

CONFLUENCE OF CHEMISTRY & BEAUTY

## Cosmetic chemists fusing global science with localised formulations to match consumer preferences

The science behind cosmetics is universal, but successful products must be crafted locally to reflect ingredient variability, regulatory differences, manufacturing realities and distinct consumer tastes. This was a key message emanating out of discussions at the biennial conference of the Indian Society of Cosmetic Chemists (ISCC) organised in Jaipur in February. The event, focussing on the theme – ‘Beauty & Wellness – Global Drivers, Local Considerations’ – brought together cosmetic scientists, industry leaders, and global experts for three days of discussions on the future of beauty and personal care.

In her inaugural address, ISCC’s President and Senior Perfumer at Robertet India, Ms. Monisha Mullick, described the cosmetics industry as a confluence of science and art, creating products that touch millions of lives.

She spoke about ISCC’s journey since its founding in 2002 into a nearly 400-member professional community spanning academia, R&D, manufacturing, consultancy, publishing, and raw material & packaging suppliers. Ms. Mullick also emphasised ISCC’s strong linkage with the International Federation of Societies of Cosmetic Chemists (IFSCC), a global network of 48 societies across 78 countries.

Citing rapid industry shifts – from AI-driven formulation tools and advanced biotechnology to sustainability and changing consumer expectations – she urged curiosity and collaboration, noting that modern



From L to R: Dr. Anjan Ray, Dr. Arunasiri Iddamalagoda, Ms. Monisha Mullick, Mr. Perry Romanowski, Mr. Sushoban Dutta (Honorary Secretary, ISCC)

cosmetic science can responsibly “validate, elevate and globalise” traditional ingredients such as turmeric, neem, amla and ashwagandha.

### Shifting demographics reshaping markets

Dr. Anjan Ray, Investment Partner, Navam Capital, highlighted how shifting demographics, income in-

equality, and regional market dynamics are reshaping the global personal care industry. He underlined stagnating population growth and aging in the US and EU, slowing demographic dividends in parts of Asia Pacific, and rising populations in the Middle East and Africa. He then linked these patterns to differing commercial strategies: premiumisation where volumes



ISCC 2026 managing committee officials

flatten and volume-led growth where basic aspirations drive purchases.

Dr. Ray also highlighted widening income inequality in some regions, the accelerating influence of AI and digital marketing, and the growing consumer demand for microbiome-friendly and green chemistries.

He stressed that modern product design must balance five equally critical factors: regulations, availability, affordability, sustainability, and functionality, alongside the challenge of differentiating brands in a world where AI threatens to rip-off “secret sauces” and where social media can blur the line between scientific fact and hype.

### The case for local cosmetic formulations

In his keynote address, Mr. Perry Romanowski, Vice President, Element 44 Inc., USA, told delegates that while the science of cosmetics is global, the craft of product creation must remain local. Drawing on his career in the industry, Mr. Romanowski traced a trajectory from secretive, on-the-job learning to a regulated, consolidated marketplace, and argued that despite standardisation and economies of scale, ingredient variability, regula-

tion, consumer taste, manufacturing realities and even emerging AI tools all reinforce the need for locally adapted formulas.

Mr. Romanowski said that in earlier years, the concept of surfactants and formulations were rarely taught in colleges, and knowledge was jealously guarded in company labs. Over time, he added, information sharing improved, aided by tools such as the INCI ingredient dictionary and by regulatory changes like mandatory ingredient labelling. These developments made it easier to standardise formulas and to distribute products globally, and they encouraged consolidation as larger firms acquired successful local brands to capture scale and reduce costs.

However, he noted the unviability of the idea of a single universal formula. He described how acquisitions often lead to reformulation for global consistency – citing the reworking of a well-known shampoo brand to match a mass-market formula – and explained that while universal recipes can lower costs through bulk purchasing and simplified production, they frequently fail when exported. He gave the example of fragrance

that resonated with American consumers but was disliked in Brazil, forcing local reformulation to suit regional scent preferences and sensory expectations.

### Practical variability of raw materials

A central theme of Mr. Romanowski’s talk was the practical variability of raw materials. He emphasised that ingredients commonly treated as single molecules are in fact blends whose composition depends on source and manufacturing plant. The same surfactant produced at different facilities can behave differently in a finished product, he said, and even identical specifications do not guarantee identical performance. Such supplier and plant-level differences, he argued, make local testing and adaptation essential.

Regulatory divergence and trade barriers further complicate global formulas. Different countries maintain distinct cosmetic regulations and preservative tolerances, and tariffs can make imported products uneconomical. Mr. Romanowski noted that acquiring a small brand can reveal compliance gaps – claims about exotic ingredients or sourcing that must be corrected – so larger companies often must rework products to meet local rules. He also highlighted environmental and biological differences among populations: climate extremes, local hair practices and region-specific consumer concerns create needs that universal products may not address.

### Perception & product success

Mr. Romanowski also spoke about the interesting phenomena of perception in product success. He described the “halo effect,” where fragrance, packaging or colour can dominate consumer judgments of performance, often outweighing measurable laboratory differences.



Mr. Perry Romanowski, Vice President, Element 44 Inc.

“Cultural scent preferences – lemony “clean” notes in some markets, florals or tropical fruits in others – can determine whether a product is embraced or rejected,” he said, stressing the need for local sensory design.

Manufacturing realities add another layer: equipment, cooling systems and batch times vary by plant, and a formula that runs efficiently in one facility may require adaptation elsewhere. Risk management also favours local approaches; when an ingredient like lauramide DEA (diethanolamine) raised safety concerns, the burden of reformulating many products was far greater because so many shared the same base recipes.

Turning to technology, Mr. Romanowski acknowledged that large language models and generative AI can produce plausible starting formulas from ingredient lists and accelerate tasks such as literature review, report writing and image generation. He demonstrated that AI could approximate known shampoo recipes but warned of non-trivial error rates and supplier-biased outputs. Crucially, he argued, AI systems trained on broad, universal data lack the niche, local knowledge that distinguishes

successful regional products, so local formulation expertise will remain a key differentiator.

**Global science, local beauty**

Later in a fireside conversation moderated by Dr. Ray, Dr. Tomonobu Ezure, Executive Fellow, Shiseido, Japan, and Mr. Romanosky sought to answer a central question for cosmetics: is beauty becoming global, remaining local, or evolving into a balanced hybrid that blends universal biology with regional preference?

Addressing marketplace realities, Dr. Ray highlighted the need for reliable information on beauty products and noted that cosmetic scientists have to make sure that the knowledge presented is real and is not just data and information that is recycled from the internet.

To reach non-specialist audiences, Dr. Ezure described a communication strategy: simplifying complex findings through videos, photography, illustrations and tailored lectures, so that cutting-edge skin biology becomes accessible and actionable for consumers and practitioners alike.

From the formulation and market

perspective, Mr. Romanosky stressed that consumer perception ultimately decides a product’s fate. He noted that marketing and sensory experience often override laboratory metrics because consumers respond to immediate, tangible effects.

**‘Growing interest in personalised diagnostics and bespoke products’**

Both panellists acknowledged the growing interest in personalised diagnostics and bespoke products.

Dr. Ezure described efforts to analyse skin genomics through minimally invasive sampling and to design products that account for genetic and environmental contributors. Mr. Romanosky noted that highly individualised products are technically possible but warned that the commercial and perceptual hurdles remain large: consumers must both notice and believe in the benefit, and formulators must convert genomic signals into reliable actives and delivery strategies.

The discussions also dwelt on the balance between genes and environment. Dr. Ezure emphasised that both matter: genetic makeup sets a baseline while lifestyle, facial muscle use, stress and environmental exposures shape appearance over time. He used the example of facial muscle activity and gravity to show how behaviour and condition can change morphology.

Regulation, climate, sensory preferences and entrenched habits were named as frequent breakers of global standardisation. Mr. Romanosky noted that if a product truly solved a universal problem, consumer demand could shift regulations, but in practice regulatory frameworks and local expectations often require adaptation. Dr. Ezure agreed that audience segmentation is essential: presentations, claims and product positioning must be tailored to age cohorts and cultural contexts to be effective.



From L to R: Dr. Tomonobu Ezure, Dr. Anjan Ray, and Mr. Perry Romanowski

## MARKET &amp; RESEARCH TRENDS

## Technical presentations highlight breakthrough innovations, renewed focus on traditional ingredients and differing consumer preferences across the globe

The technical sessions at the ISCC conference witnessed leading Indian and overseas subject-matter experts presenting the latest studies and data on technical innovations and market trends. A number of speakers put the spotlight on the African market – considered to be the next big beauty frontier, while Japanese and Korean experts revealed state-of-the-art beauty research findings, and some Indian speakers focussed on the huge potential of Indian traditional ingredients.

### Impact of water quality

Ms. Richa Mehta, Senior Scientist, L’Oreal, spoke on the impact of water quality on beauty consumer experience in Sub-Saharan Africa. “Due to water scarcity, beauty solutions linked to addressing this issue is vital for this market,” she said, adding that innovations in beauty solutions will have to address issues like ritual preservation, identity preservation and emotional resonance.

Hard water distorts generation and stability of foam, influencing the perceived efficacy and sensory experience of cleansing products like face cleansers and hair shampoos. Ms. Mehta gave details about a case study, which investigated the influence of water hardness on cosmetic foam characteristics through integrated macroscopic, microscopic, and rheological analyses. She noted the need for formulation chemists to mitigate water hardness effects with foam boosters, rheology modifiers, etc., to ensure consistent product performance and sensory attributes.

### Product design for African markets

Ms. Punita Kalra, CEO Research & Innovation, Corporate Quality Assurance, Emami, spoke on the various aspects of demographics-led product design for specific African markets. She noted that the beauty demand in Africa is outpacing global growth with the beauty & personal care market in the region set to reach \$103-bn by 2023 from around \$62-bn in 2022. The main challenges in the region facing formulators are mainly climate-driven – like high heat (sweat, shine and dehydration), high humidity (impact on curls), UV exposure, dust, pollution, hard water, etc.

As for the African hair structure, Ms. Kalra pointed out that natural protection is relatively weaker compared to other hair types. “Breakage is high and growth is slower, so formulators will have to work around these challenges,” she said, while suggesting options like sulphate-free foams with creamier texture and better moisture retention.

As for skin care, oily skin and dryness are the main pain points in the region, with moisturisation being the most demanded product characteristic. With acne leading to dark spots on African skin, Ms. Kalra noted the need for higher priced actives in skin brightening products.

### Holistic approach to treating acne

Ms. Shaila Bajoria, Scientist at L’Oreal, emphasised the need for a holistic approach to treating acne,

which is worsened by increasing pollution. She gave details of a serum developed by her company for treating acne lesions and post-inflammatory hyperpigmentation (PIH) correction. “Clinical findings suggest that this transparent aqueous formula made of a cocktail of different actives managed to reduce acne lesions & marks and PIH density decline,” she noted.

### Sustainability challenges

Mr. Sherluck John, GM-Advanced Research, Open Innovation and Operational Excellence-India at L’Oreal, described how the French beauty major is addressing sustainability challenges by focusing on science-based targets.

“We are committed to creating a more responsible beauty to limit our impact on climate, water and biodiversity,” he said. This is driven by its ‘Green Sciences’ initiative which is reshaping its entire innovation pipeline – from advanced research facilities and formulation laboratories to the sustainable cultivation and gentler extraction of raw materials – while accelerating the use of biotechnology and green-chemistry processes to transform those inputs.

L’Oreal is exploring a wide spectrum of novel molecules, active ingredients and finished formulations designed to deliver measurable performance while reducing environmental impact, aiming to combine rigorous science with more sustainable practices, he said.

**Skin microbiome data and its implication for cosmetics testing and certification**

In a video presentation, Dr. Kristin Neumann, co-founder of MyMicrobiome, dwelt on the availability of skin microbiome data and its implication for cosmetics testing and certification. Founded in 2018 as a consumer education platform, MyMicrobiome has evolved into a certification body and microbiome R&D consultancy firm.

Dr. Neumann focused on the diversity and geographical influences on the human microbiome, particularly in the context of cosmetics testing. She highlighted that microbiome data is heavily skewed towards industrialised countries, with only 4.5% of data from the US representing 50% of samples. In India, the microbiome profile shows higher prevalence of staphylococci and lactobacilli, with significant variations by city and family. Environmental factors, including climate, urban versus rural living, and contact with nature, significantly impact the microbiome, she informed.

**Skin longevity**

Dr. Bobby Cherian, Senior Manager, L’Oreal, discussed the concept of skin longevity, emphasising the need to extend health span and reduce comorbidities. He highlighted a study in China comparing polluted and less polluted cities, showing that pollutants lead to clinical manifestations like pigmentation and wrinkles. The study used hair shaft analysis and multi-omics approaches to understand the impact of pollutants. Mr. Cherian also addressed the role of UV radiation, particularly UVA, in causing skin damage, and the importance of maintaining skin microbiome diversity.

Dr. Hitoshi Masaki, CIEL Company Ltd., Japan, spoke on how oxidation caused by Reactive Oxygen

Species (ROS) can accelerate skin ageing.

**New broad spectrum UV filter**

The presentation by Dr. Gowri Jayamurugan, Founder & CEO, Gowriz The SkinRiz, focused on the development of a new broad spectrum UV filter, highlighting the challenges and advancements in the field. The speaker detailed the use of sporopollenin, a highly stable biopolymer, and its capacity to absorb UVB and UVA radiations.

**Role of evaluation methods**

Dr. Yuri Okano, Chief Scientist, Sola SAS, France, described the different evaluation methods – from *in-vivo* to *in-vitro* – and their properties in establishing scientific evidence for cosmetics. In order to address the challenge of linking results of *in-vitro* studies to real world conditions, Dr. Okano described the use of *ex-vivo* study as a translational evaluation model. *Ex vivo* cosmetic testing uses living human skin explants to evaluate product efficacy, safety, and absorption, offering a more physiologically relevant, animal-free alternative to *in-vitro* tests.

Dr. Sungho Lee, President, Sunjin Beauty Science, South Korea, focussed on the applications of colloidal science principles to a beauty mist formulation.

**Turmeric active ingredient**

Ms. Pranjali Dhawal, Proprietor, BioLys, benchmarked the turmeric active ingredient – tetra hydro curcumin (THC) – against leading cosmetic actives. The need for a smart, natural, and safe cosmetic ingredient that addresses oxidation, inflammation, and melanin pathways was underscored, with a focus on overcoming challenges like colour and bioavailability in using turmeric in its stable form, THC.

**Upcycling industry by-products into high-performance cosmetic actives**

Ms. Shraddha Kumbhar, Research Scientist, Keva Fragrances, described the company’s initiative to upcycle industry by-products into high-performance cosmetic actives. The discussion focused on a study utilising cocoa shell waste to create a sustainable cosmetic extract, named ‘Theo-Defense’. This extract addresses skin



From L to R: Dr. Sungho Lee, Dr. Arunasiri Iddamalagoda, Dr. Gowri Jayamurugan and Dr. Anjan Ray



aging, which is influenced by intrinsic (natural) and extrinsic (environmental) factors. The extract targets the mechanism of aging by inhibiting reactive oxygen species (ROS) production and enhancing collagen production.

Ms. Cathleen Anne Ysulat, Researcher at Nikko Chemicals, spoke on the efficacy of zinc glycinate in tackling dandruff fungi (*malassezia*) activity and recovery of compromised scalp.

Later, during a fireside chat moderated by Dr. Anjan Ray, Dr. Aruna-

siri Iddamalgoda, Managing Director, Ichimaru Pharcos, Japan, along with Dr. Sungho Lee and Dr. Gowri Jayamurugan discussed the possibilities and challenges involved in building a responsible, science-based beauty and wellness product brand.

**Mechanisms of facial aging**

The valedictory address of the conference was delivered by Dr. Tomonobu Ezure, Executive Fellow, Shiseido, Japan. Dr. Ezure's groundbreaking research on the mechanisms of facial aging, especially facial sagging, has provided a scientific basis

for developing new solutions, including many of Shiseido's flagship products.

He noted that earlier sagging skin was considered outside the scope of cosmetics. To see the inside of the skin, it was earlier possible to view it two dimensionally through a microscope. To understand the skin structure better, Dr. Ezure developed a method by which the skin can be viewed in three dimensions, and then even in four dimensions (4D). The 4D skin analysis technology revealed that young skin contains a high density of aligned hair muscles, which act as an anti-gravity system. Aging decreases these muscles, leading to skin deformation and sagging. His study found that directional stretching can regenerate hair muscles, offering a novel concept for facial rejuvenation. This approach aims to restore the dynamic belt of hair muscles, enhancing skin elasticity and reducing sagging.

**The Cosmetics-Climate Nexus**

The conference also witnessed poster presentation by representatives from various companies showcasing cutting-edge research and development work with a special focus on 'The Cosmetics-Climate Nexus'.

