

A Review on Emerging Role of Nutricosmetic in Development of Health, Nutrition and Cosmetics Sectors of India

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ABSTRACT:

Nutricosmetics, a burgeoning inter disciplinary field merging nutrition, dermatology, and cosmetic science, represents a transformative shift in the beauty industry. Often termed "beauty-from-within," these edible formulations and dietary supplements aim to enhance dermatological aesthetics by modulating internal physiological functions and cellular metabolism. Unlike traditional topical applications that act on the epidermal surface, nutricosmetics operate systemically. By delivering bioactive compounds—including collagen peptides, antioxidants (such as carotenoids and polyphenols), vitamins, minerals, and probiotics—through the bloodstream, they target skin, hair, and nail physiology at molecular level. Recent advancements in nutrigenomics and the exploration of the "gut-skin axis" have further validated their efficacy in promoting collagen synthesis, neutralizing oxidativestress, and maintaining cut a neoushomeostasis.[1],[2],[3],[21]

Key Words: Nutricosmetics, Bioactive compounds, Beauty-from-within, Skinhealth, Anti-oxidant, Nutritional supplements, Skin care, Nails, Hairs, Beauty supplements, Natural beauty, Vitamins.[4]

Definition: The nutricosmetics are products and ingredient that act as a nutritional supplement to care skin, nails& hairs natural beauty. Nutricosmetics are next generation beauty supplements that blend nutrition with cosmetics. They work from inside out, using powerful Vitamins, Antioxidants & Natural extracts.[5],[6],[7]

I. INTRODUCTION

The term nutricosmetic, derived from the combination of "nutrition" and "cosmetic", refers to edible products and dietary supplements that enhance skin health and beauty by influencing internal body functional body functions and metabolism. It is the newest trend in skin, hair & nails care. It involves the consumption of dietary and nutritional supplements to produce visual

appearance benefit and improve the health of skin, hair & nails. Nutricosmetics are nutritionally fortified products designed primarily to enhance dermatological aesthetics, where as health functional foods are formulated to support systemic disease prophylaxis and overall physiological homeostasis.[8],[9],[10]

This study aims to categories the lifestyle profiles of consumers who preferentially select nutricosmetics or health functional foods and to analyse the marketing communication variables influencing consumer attitudes towards these two categories. Nutricosmetics exert their effects systemically by delivering bioactive compounds through the bloodstream to target skin physiology, thereby enhancing dermatological aesthetics from within. In the post– pandemicera, with the rapid resurgence of offline activities, social interactions have exhibited an increasing trend. Individuals are placing greater emphasison their visual appearance, which enhances their adaptability to diverse interpersonal situations and social contexts. Moreover, in the era dominated by social media, physical appearance is increasingly perceived as a valuable social and economic asset, in trinsically linked to the concept of the "beauty economy" and competitive advantage, thereby reflecting the broader economic externalities associated with aesthetic attributes. [11],[12]

Nutrition pertains to dietary compounds or supplemental agents that confer physiological benefits to human health. The concept of nutricosmetics refers to the natural rocess occurring in animals and plants, where nutrients from consumed foods are absorbed and incorporated into human cells and tissues. The pursuit of beauty has always been deeply intertwined with health, culture & science. From ancient herbal rituals to modern bioactive formulations, humans have long recognized that true beauty reflects internal well-being. In recent decades, this ancient belief has found scientific validation throughtherise of nutricosmetics-a novel inter disciplinary field that merges nutrition, dermatology, & cosmetic science.

Unlike traditional topical cosmetics, which primarily act on the epidermal surface, nutricosmetics operate systemically, delivering bioactive compounds such as collagen peptides, carotenoids, vitamins, minerals, ceramides, antioxidants & plant extracts directly to target tissues via circulation. These compounds modulate cellular metabolism, promote collagen synthesis, counteract oxidative stress & regulate hydration & pigmentation path ways—biochemical processes fundamental to skin health & aging. The global expansive of nutricosmetic sector reflects both scientific progress & a sociocultural shift toward preventive and integrative wellness. Modern consumers increasingly seek products that are natural, multifunctional, & supported by clinical evidence. This has driven the convergence of the cosmetic, pharmaceutical & nutraceutical industries, resulting in hybrid formulations that bridge health & beauty. The growing prevalence of stress, pollution, poordiet & photo aging has further intensified interest approaches to skin protection & rejuvenation. Scientific research in nutricosmetics has accelerated in the past two decades, supported by advancements in nutrigenomics, bioavailability studies, & clinical dermatology. Investigations into antioxidants such as lycopene, astaxanthin & polyphenols, as well as structural components like collagen hydrolysates & hyaluronic acid, have provided mechanistic insights into their effects on dermal elasticity, hydration & wrinkle reduction.[13],[14],[15]

Additionally, the emerging understanding of the gut-skin axis has introduced new dimensions to nutricosmetic science, highlighting the role of probiotics and microbiome modulation in maintaining cutaneous homeostasis. From an industrial and commercial perspective, nutricosmetics represent one of the fastest-growing segments in the beauty and personal care market, driven by innovations in formulation technologies, delivery systems and consumer awareness. [16]

The concept of “beauty from within” aligns with the modern wellness narrative—promoting the idea that internal health optimization is integral to aesthetic longevity. Despite their growing popularity, nutricosmetics still face challenges related to standardization, regulatory classification & scientific validation. As many products occupy a grey area between food supplements and therapeutic agents, global regulations remain inconsistent, underscoring the need for harmonized safety and efficacy assessments. Ongoing research aims to bridge these gaps by elucidating molecular mechanisms,

optimizing bioavailability and establishing clinical benchmarks. Nutricosmetics represent a transformative evolution in beauty and health sciences. By uniting nutritional biochemistry with dermatological innovation, nutricosmetics redefine beauty not as a surface phenomenon but as an outcome of systemic wellness. [17]

Nutricosmetics are positioned as a holistic approach to beauty, working from the inside out by delivering targeted nutritional support. Their popularity is underpinned by scientific research on key ingredients like collagen, hyaluronic acid & MSM, which have proven benefits for skin aging and health. As the industry evolves, emphasis on validated formulations and innovative delivery systems continues to boost consumer confidence and product effectiveness. Research highlights key active ingredients such as collagen peptides for skin elasticity and joint health, biotin for hair & nail nutrition & methyl sulphonyl methane (MSM) for anti-inflammatory and skin rejuvenation properties. Nutricosmetics are positioned at the convergence of cosmeceuticals and nutraceuticals, utilizing pharmaceutical advances in sustained-release formulations to improve bioavailability and stability of active components. The industry faces challenges including ensuring ingredient stability post-formulation and the need for robust scientific validation to substantiate product claims, which are critical for consumer trust and regulatory compliance.[18]

Overall, nutricosmetics represent a promising, science-backed avenue to promote beauty and health synergistically, emphasizing prevention and internal nourishment as key strategies. Nutricosmetics products represent consumable formulations designed as meal resources that deliver multiple bioactive molecules with scientifically validated efficacy. Essentially, nutricosmetics consist of complex mixtures enriched with vitamins, minerals, antioxidants, peptides & other bioactive ingredients whose synergistic actions are backed by scientific research to improve the physiological health and appearance of the integumentary system. Thus, they serve as multifunctional nutritional supplements offering a scientifically substantiated approach to beauty and wellness.[19]

History of Nutricosmetics:

- According to the Dietary Supplement Health & Education Act(1994),The Food & Drug Administration oversees the nutricosmetic industry in America.

- Within Europe, regulations like the 1924/2006 directives of the European Food Safety Authority manage logical claims concerning health, recognizing benefits related to wellness for parts like skin, joints & bones. These rules define health-related rights, emphasizing maintaining the daily structure of skin and pores, as well as its hydration, versatility or appearance.[20]
- Example of nutricosmetic products include those that act on pores and skin, as well as drug-like items such as anti-aging agents, items for pore and skin brightening or whitening, breakout treatments, whitening toothpaste, anti-cellulite devices, antiperspirants and fragrances.
- The global cosmetics market is estimated to be valued at \$55 billion within one year.
- The scientific understanding of nutrition's influence on skin health began to evolve during the early to mid-20th century.
- The 1930s-1950s saw the discovery of vitamins A, C & E and their antioxidant roles in maintaining skin integrity.
- Biotin, zinc & selenium were identified as essential nutrients for hair and nail health.
- Early oral beauty supplements, such as cod-liver oil and brewer's yeast tablets, were introduced, through lacking modern scientific validation.
- The cosmetic industry began to recognize the potential synergy between topical and oral approaches for skin care, setting the stage for nutricosmetic research.
- The formal emergence of nutricosmetics as a distinct category began in Japan in Japan during the 1980s.
- Japan introduced the concept of "Food for Specified Health Uses (FOSHU)", enabling regulatory approval for foods with health claims.
- Japanese companies pioneered collagen-based drinks, hyaluronic acid beverages and coenzyme Q10- enriched formulations.
- The term "beauty from within" gained

popularity and nutricosmetics became integrated into daily self-care regimens. The period marked the transition from traditional beliefs to a science-backed, commercialized segment of the beauty industry.

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- The concept of nutricosmetics started in Japan & Europe in the 1980s.
- Japan first introduced collagen-based drinks, while Europe focused on Antioxidant-rich capsules.
- The first Recognised nutricosmetics product was a collagen-based beauty drink launched in Japan in 1989.
- Over the years, the trend spread worldwide as people began seeking natural and holistic beauty care.

Regulatory Guidelines for Nutricosmetic Products:

Nutricosmetics represent an emerging category at the intersection of nutrition and cosmetics, comprising oral supplements designed to enhance beauty from within by supporting skin, hair and nail health. The regulatory landscape for these products varies significantly across jurisdictions, as they are generally classified as dietary supplements or food supplements rather than cosmetics or drugs.[23],[27]

Indian Regulations:

FSSAI Nutricosmetics Regulations Overview Nutricosmetics in India fall under FSSAI's 2016 regulations for health supplements, nutraceuticals, and related categories, primarily under Food Product Category. Manufacturers, importers, and distributors require specific FSSAI licenses, with strict rules on labelling, claims, ingredients, and GMP. Key Regulatory Aspects This table structures the provided information for clarity in pharmaceutical compliance contexts.[25],[26]

| Aspect | Details |
|-----------------------------|---|
| Regulating Body & Framework | Food Safety and Standards Authority of India (FSSAI) under Food Safety and Standards (Health Supplements, Nutraceuticals, Food for special dietary use, Food for special medical purpose, functional foods and novel food) Regulations, 2016. |

| | |
|------------------------------|--|
| Product Categories | Health Supplements Nutraceuticals Food for special dietary use(FSDU) Food for special medical purpose (FSMP) |
| Licensing Requirements | Manufacturers, Importers and Distributors must obtain FSSAI licence under sub category before marketing |
| Labelling and Claims | Comply with FSSAI labelling, Health claims scientifically substantiated per food safety and standards (Advertising and claims) Regulations, include Nutritional information claims and warnings. |
| Ingredient Standards | FSSAI Standards ensure safety and efficacy, no disease treatment/cure claims without evidence And approval. |
| Good Manufacturing Practices | Manufacturers must adhere to GMP Standards With documentation of quality control and manufacturing processes. |

Global Regulatory Guidelines for Nutricosmetic Products:[23],[24]

| Region/Country | Classification | Regulatory Body | Key Requirements |
|----------------|---|--------------------------------|--|
| USA | Dietary supplements or cosmetics | FDA(MoCRA2022) | Facility registration, product listing, safety substantiation, no pre-market approval for supplements, adverse Event reporting |
| EU | Food supplements | EFSA/EC (Directive 2002/46/EC) | Pre-market notification, strict ingredient lists, no health claims without approval |
| Japan | Food for Specified Health Uses (FOSHU) or cosmetics | MHLW/PMDA | Government approval for FOSHU, licenses for manufacturing / marketing cosmetics, Ingredient standards |
| China | Health food supplements | NMPA(CSAR) | Pre-market registration, safety dossiers, often animal testing |
| India | Nutraceuticals/health supplements | FSSAI/CDSCO | License/registration, FSSAI labelling, ingredient safety data |
| Brazil | Nutraceuticals | ANVISA | Pre-market registration, quality/safety / efficacy rules. |

Formulations of Nutricosmetics:

- Capsules & Tablets:** Vitamins, collagens blend minerals, Convenient for daily use.
- Powders & Drinks:** Easy to mix, usually rich in collagen peptides, antioxidants for glowing skin.
- Gummies & Chewable:** Tasty & easy to consume, rich in biotin, vitamin C, zinc and herbal extracts.

- Functional Foods:** Chocolates, snake bars & yogurts enriched with Omega-3, Carotenoids or Collagens.[8]

Common Ingredients used in Nutricosmetics:

- Effective nutricosmetic products of ten include:
- Collagen peptides for improving dermal elasticity & wrinkle reduction.
- Vitamins and minerals such as C, E , zinc &

biotin for antioxidant protection and skin nourishment.

- Essential fatty acids like Omega-3 s to promote hydration and prevent inflammation.
- Herbal extracts including green tea, ginseng, grape seed and aloe vera for antioxidant and anti-aging effects.
- Protein and aminoacids that support cellular repair.[22]

Key Ingredients in Nutricosmetic Formulations:

1. Collagen peptides– Improve skin elasticity and hydration while reducing wrinkles. Marine collagen is highly favoured for its superior absorption rate.
2. Hyaluronic acid – Enhances skin moisture retention and smoothness, often paired with vitamin C for synergistic effects.
3. Vitamins (A,C,E,K) –Provide antioxidant protection and support collagen synthesis. Vitamin E (to copherols and to cotrienols) helps minimize UV-induced damage.
4. Minerals (Zinc, Selenium)–Aid in maintaining skin structure and protecting against oxidative stress.
5. Carotenoids (Lutein, Lycopene, Beta-carotene)–Offer photo protection and improve skin tone uniformity.
6. Polyphenols and Flavonoids–Found in grape seed, green tea, and other plant extracts; these compounds counteract oxidative stress and inflammation.
7. Omega-3 Fatty Acid–Maintain skin lipid barrier function and reduce inflammation, often derived from fish oils or algal sources.
8. Ceramides and Phytoceramides–Restore the skin barrier and improve hydration when taken orally.[25],[26]

Future Perspectives of Nutricosmetics:

The future of nutricosmetics lies in personalization, sustainability, and scientific validation:

- **Personalized Nutrition:** Advances in genomics and microbiome science are enabling individualized nutricosmetic regimens based on genetic and metabolic profiles.
- **Sustainable and Plant-Based Sources:** The demand for eco-friendly, vegan, and natural ingredients is reshaping formulation strategies.
- **Technological Integration:** Artificial intelligence (AI) and digital diagnostics are expected to support data-driven product recommendations.
- **Regulatory Evolution:** Clearer global

standards for efficacy and safety claims are anticipated as the field matures.

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