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Microbiome-Related Cosmetic Products in Selected Latin American Countries: Market Analysis, Claim–Ingredient Alignment, Terminological Inconsistencies and Regulatory Challenges

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Abstract

Rapid growth in microbiome-oriented cosmetics has resulted in the increased use of bioactive compounds with prebiotic, probiotic, postbiotic and microbiome-friendly marketing claims. However, inconsistencies in terminology, formulation practices and regulatory requirements result in some products being launched with claims that are not adequately aligned with the scientific and performance characteristics of the ingredients. Analysis was conducted on 264 products that were launched between December 2024 and December 2025 across selected Latin American countries which stated prebiotic, probiotic, postbiotic and skin microbiome claims on the label. A surprising finding was the substantial terminology mismatch between label claims and ingredients used; only 163 products were found to be consistent, i.e., a prebiotic claim and prebiotic ingredient. The remaining 101 products showed various inconsistencies, including 43 products making prebiotic or probiotic claims that contain no relevant ingredients. We also identified potentially microbiome-disruptive preservatives and surfactants in products that are marketed as microbiome-friendly. This study has shown that there is a growing market for cosmetic products with 'microbiome' claims but also highlights that there are discrepancies between marketing claims and the ingredients used. Future development of products in this area should focus on accurate marketing terminology and ingredient choice (e.g., if you are claiming a 'prebiotic', then you should use a prebiotic ingredient in the product). Establishing harmonised definitions and validated methodologies and applying clear regulatory guidance across Brazil and the rest of Latin America would help with scientific credibility and consumer protection.

Keywords: prebiotics; probiotics; postbiotics; skin microbiome; claim substantiation; formulation/stability

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1. Introduction

Healthy skin is important for its biological and protective function, whereas youthful-looking skin is associated with emotional well-being and represents an important target for cosmetic products and dermatological treatments [1]. In the latter, sensory attributes such as texture, softness, viscosity, stickiness, spreadability, absorption, appearance and fragrance are fundamental factors to consumers purchasing the product [2]. The 'Personal Hygiene, Perfumes and Cosmetics' (PHPC) segment in Brazil maintains its position as the third largest market in the world (behind only the United States and China) with an annual turnover of R$ 173.4 Bn in 2024 [3]. The larger segments currently include hair, skin, and hygiene products. These particular areas stand out due to their ability to anticipate trends and maintain a focus on quality and innovation regardless of the market positioning of the products [4,5]. Consumers are constantly seeking products that promote the achievement of healthy and radiant skin. With increasing access to information, they prioritise natural products with sustainable and/or recognised ingredient names that are advertised to 'protect' or 'repair' the skin or provide greater hydration or other perceived benefits [6]. As a result, the demand for cosmetic products aimed at supporting a healthy skin microbiome is increasing. The concept of a balanced microbiome is perceived to mean healthy and more resistant skin [7].

As the body's primary interface with the external environment, the skin performs essential protective, sensory, immunological, and homeostatic functions. Beyond its structural components, it harbours a diverse microbial (flora) ecosystem, which is known as the skin microbiome. This microbiome contributes to barrier integrity, immune regulation and helps to prevent pathogenic colonisations [8,9]. Growing evidence highlights the importance of maintaining the balance of the skin microbiota (eubiosis) and preventing imbalance (dysbiosis) to preserve skin health. However, some cosmetic products may negatively affect the skin microbiota due to the presence of certain surfactants and preservatives which themselves can disrupt microbial balance, induce skin irritation, and promote dysbiosis [10,11]. This has resulted in the cosmetic industry trying to develop formulations that do not compromise the skin microbiota. The development of in vitro tests that mimic the events that occur in the skin microbiome is essential to enable the development of cosmetic ingredients capable of protecting microbiota and restoring skin health [12].

Although the term 'Probiotic Cosmetics' has become widespread in commercial marketing communication, the incorporation of viable microorganisms (i.e., a probiotic) into cosmetic formulations remains a major technological and regulatory challenge. The presence of live microorganisms in a formulation is generally incompatible with the microbiological quality requirements established for cosmetic products and is the main reason that preservatives are added to products [13]. Due to effective marketing campaigns, consumers increasingly associate microbiome-related cosmetic products with concepts such as naturalness, sustainability, skin health, and scientific innovation. Consequently, so-called 'microbiome-friendly' claims have become an important marketing strategy, influencing purchasing decisions even when consumers have a limited or no understanding of the scientific differences between probiotics, prebiotics and postbiotics [14,15]. To standardise their use, the International Scientific Association of Probiotics and Prebiotics (ISAPP) has established clear scientific definitions for these categories [16–18]:

- Probiotics: live microorganisms that, when administered in adequate amounts, confer a health benefit on the host.
- Prebiotics: substrate that is selectively utilised by host microorganisms to confer a health benefit on the host.

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- Postbiotics: preparation of inanimate microorganisms and/or their components that confer a health benefit on the host.

Inconsistent terminology has been reported in the cosmetic sector, motivating the need for further market evaluation, and this lack of consistency poses challenges for regulatory authorities and cosmetic manufacturers alike [15]. The European Union Cosmetics Regulation EC 1223/2009 does not explicitly mention a category for probiotic, prebiotic or postbiotic cosmetics; however, products that contain these ingredients remain regulated under the general legislation that governs the safety of all cosmetic products and requires that all claims are substantiated [19].

In the United Kingdom, the marketing of cosmetic products containing probiotics is governed by the General Cosmetic Products Regulation, which states that such products are subject to the same regulatory criteria as other cosmetic products [20]. Regulatory compliance fundamentally requires the designation of a 'Responsible Person' who must be based in the United Kingdom and assumes legal responsibility for product safety and compliance. Marketing claims in the UK must be substantiated, cannot be misleading and must strictly follow the guidelines set by the Advertising Standards Authority (ASA) [21]. Depending on the claim, the ASA may consider terms such as 'probiotics' or 'gut health' to be health-related, which require specific health data. If a product makes a claim that could be considered to be medicinal (i.e., to specify action against a specific microorganism), then it will be regulated as a medical product and be subject to stricter rules. Thus, claims and communication strategies with consumers for cosmetics containing probiotics in the United Kingdom present regulatory complexity and require careful analysis to avoid reclassification of the product [20].

In Brazil, the National Health Surveillance Agency (ANVISA) has consolidated regulations on the use of probiotics in food and food supplements (according to RDCs 241/2018 and 243/2018), but the regulation on the use of these probiotics in cosmetic products is a topic that is not yet well defined and is a challenge for manufacturers [22,23]. The legislation for cosmetic products is based on Good Manufacturing Practices under RDC 48/2013 [24], general safety standards RDC 907/2024 [25] and RDC 949/2024 [26], which are extremely strict regarding microbial contamination in cosmetic products. The addition of viable microorganisms, i.e., a probiotic, into a formulation is incompatible with these standards, as it would be in many parts of the world.

Analysis of the active ingredients marketed throughout the cosmetic industry highlights that they are mostly prebiotics or postbiotics, i.e., they do not contain live microbial cells [15,27]. Postbiotics are metabolic by-products such as fermentation extracts, filtrates, or metabolites of live microorganisms [28]. These bioactive molecules offer proven benefits for topical use in cosmetic formulations [17,29]. These ingredients are the ones of choice for cosmetic industries in all regions, including Brazil. However, advertising and marketing messaging to consumers can be ambiguous or potentially misleading due to incorrect use of terminology; for example, the frequent use of the term 'probiotic' for formulations that contain prebiotics or postbiotics. These ingredients, as they do not have live microorganisms, fit better into the safety and microbiological stability standards established in Brazil by ANVISA, and products can be registered in a simplified way through the Solicit System as Grade 1 and 2 cosmetics. Eligibility for this exempt status is subject to benefit-specific criteria and full compliance with safety and quality requirements.

Despite the rapid expansion of microbiome-related cosmetic products, limited information is available regarding (i) the composition of these products, (ii) the terminology adopted in marketing communication, and (iii) the regulatory implications associated with microbiome-related claims in Latin America. Most published studies have

focussed on microbiome biology or ingredient efficacy, whereas market characterisation and regulatory analyses remain scarce.

This study comprised two complementary analyses: (i) a market analysis of cosmetic products incorporating microbiome-related ingredients (prebiotics, probiotics and postbiotics) that are marketed across selected Latin American countries and (ii) a regulatory analysis of the Brazilian framework supplemented by comparison with selected international regulatory systems. A specific objective was to assess the consistency between microbiome-related on-label claims and the microbiome-related ingredients identified in the corresponding INCI ingredients lists.

2. Methods

2.1. Market Analysis and Mapping of Cosmetic Products

The aim of this study was to analyse cosmetic products with claims related to the skin microbiome currently marketed in Latin American countries and to evaluate the accuracy of the terminology used. To ensure a comprehensive mapping of the Latin American market, data collection was across both professional and consumer-facing databases including the Global New Products Database (GNPD) from Mintel [30], supplemented by an analysis of digital platforms: INCI Decoder [31], SkinSkool [32] and Instagram social media [33] as a complementary market-observation source to capture market visibility and consumer perception trends. The analysis focussed on products featuring skin microbiome-related claims that were launched within the previous year (i.e., December 2024 to December 2025). The Mintel search was carried out on Friday 4th April 2026, and the INCI decoder (now renamed to Inkeedecoder) and SkinSkool searches were carried out in the following 2 weeks.

The search included the words 'prebiotic', 'probiotic', 'postbiotic', 'skin microbiome' and 'microbiota' (as defined by ISAPP), which were searched in both Portuguese and Spanish. Inclusion criteria were restricted to cosmetic products that were legally marketed (officially registered) and sold within Latin America. While all 20 Latin America countries were part of the initial search criteria, reliable data was found for only 12 of the 20 countries; therefore, the remaining countries were excluded. Exclusion criteria included handmade products (artisanal) and those lacking registration with national regulatory agencies. All results and conclusions in this study refer to 'Latin America' as the following selected countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Panama, Peru, Puerto Rico, and Venezuela.

To ensure an unbiased sample selection, a new Instagram account was created to avoid potential bias or data contamination that could be caused by previous search algorithms, and the results were screened manually.

Mintel was used as the primary database to identify products that had been launched using the above search criteria, using the other databases to supplement the search. This may be considered to be limiting; however, >99% of all of the identified products were initially found by using the commercial database and were subsequently confirmed by supplementary searches, thereby giving confidence in the search results. Ingredients lists were obtained for each of the products, and all product information was transposed into a Microsoft Excel table, which is filterable to allow easier analysis. All four researchers added to the Excel file, and any duplicate entries were removed. The assignment of the relevant ISAPP category and determination of claim– ingredient consistency was done by the four researchers, who used their knowledge and experience of the skin microbiome and cosmetic ingredients to identify the relevant ingredients for each product. Under the ISAPP classification framework, trehalose and maltodextrin do not qualify as prebiotics or postbiotics; however, the cosmetic industry uses the word prebiotic much more loosely; carbohydrates, sugars and starches are often referred to as prebiotics in regard to the

microbiome concept in cosmetics. Trehalose and maltodextrin are widely marketed within the cosmetic industry as prebiotics (however, topical microbiome evidence remains limited), and they are classified as such in this article. Product variants (i.e., the same product launched in different countries) were included individually, as they are justifiably different products and are specifically highlighted in Section 3.1.

Detailed analysis was then undertaken to identify the specific microbiome-related ingredient used within a product, which was then compared with the on-label claims and used to highlight discrepancies and identify the most popular ingredient within each geography. There were no disagreements among the team in terms of product and ingredient classification or conclusions.

2.2. Brazilian Regulations on the Use of Microbiome-Related Terms in Cosmetic Products

We evaluated current Brazilian legislation applicable to cosmetic products with skin microbiome-related claims involving prebiotics, probiotics and postbiotics, which are enforced by ANVISA. In addition, ANVISA's participation in international forums on the subject was investigated. Data was collected by searching through various official databases (effective until the end of 2025), including

- The Brazilian Agência Nacional de Vigilância Sanitária (ANVISA) web portal [34].
- International databases: US Food and Drug Administration [35], European Commission [19], Mercosur Official Portal [36] and the Andean Community database [37].

Analysis of the databases and documentation included (i) specific requirements for the regularisation of products with microbiome claims, including ingredient list, efficacy protocols and specific labelling standards; (ii) ANVISA's official position and contribution within international forums; and (iii) possible regulatory gaps—highlighting inconsistencies within Brazilian legislation. The key search words (legislation, cosmetics, skin microbiome, prebiotic, probiotic, postbiotic and microbiota) were translated into both Portuguese (legislação, cosméticos, microbioma da pele, prebióticos, probióticos, pós-bióticos e microbiota) and Spanish (legislación, cosméticos, microbioma de la piel, prebióticos, probióticos, postbióticos e microbiota), with both languages being used during the search. Inclusion criteria included all legal documents that are in force or have been revoked in Brazil (laws, decrees, resolutions, normative instructions) alongside official documentation from international regulatory agencies. Exclusion criteria included non-normative documents such as educational booklets, practical manuals and technical infographics.

3. Results and Discussion

Following the systematic search methodology previously described, we identified 264 products commercialised in the Latin American market featuring 'prebiotic', 'probiotic', 'postbiotic' or 'microbiome' efficacy claims on the label. The results of the search were compiled into a Microsoft Excel 'master table', which is filterable to assist analysis. The complete dataset is provided in the accompanying Supplementary Information File (SIF).

Table 1 provides an overview of the variables captured for each product identified in the market analysis search. Each product was numbered for easy identification, i.e., P095, P097 etc. (see the master table in the Supplementary Information File (SIF) for full details), and the following information was recorded for each: product name, company, country, subcategory, microbiome ingredient, ISAPP classification, label claims, INCI ingredients list and on-label claims. This spreadsheet enabled us to use the filter function to do an analysis of geographical distribution, ingredient frequency, product category, and terminology and to assess the consistency between the claimed microbiome benefit and the identified ingredients.

Table 1. Summarised version of the full data search results table showing the claim–ingredient alignment categories.

#	Product Name	Company Name	Country	Subcategory	Microbiome Ingredient(s)	ISAPP Class	Label Claims	INCI Ingredients	On-Label Claim	Claim–Ingredient Alignment
P095	Nosotras Diarios Pro-Defense V Intimate Soap	Productos Familia	Puerto Rico	Intimate hygiene	Hydrolyzed yogurt protein; inulin	Prebiotic	Female, hypoallergenic, pH. balanced, dermatologically tested, ethical-environmentally friendly package, for sensitive skin, prebiotic, social media, ethical-recycling	Aqua, cocamidopropyl betaine, polyquaternium-7, decyl glucoside, ammonium acryloyldimethyltaurate/vp copolymer, peg/ppg-120/10 trimethylolpropane trioleate laureth-2, styrene/acrylates copolymer, glycerin, phenoxyethanol, parfum, sodium benzoate, lactic acid, hydrolyzed yogurt protein, inulin, tetrasodium EDTA	Prebiotic	**Aligned** Prebiotic claim and ingredient
P097	Derman Firming Intensive Dermatological Serum	Compañia Internacinal de Comercio	Mexico	Body care	Alpha-glucan oligosaccharide; saccharide isomerate; polymnia sonchifolia root juice; maltodextrin; *Lactobacillus*	Postbiotic + Prebiotic	Vitamin/mineral fortified, fragrance free, hypoallergenic, dermatologically tested, ethical-animal, brightening/illuminating, firming, moisturising/hydrating, toning, time/speed, prebiotic, for balanced skin	Aqua, propylene glycol, glycerin, phenoxyethanol, carbomer, triethanolamine, methylparaben, PEG-40 hydrogenated castor oil, niacinamide, allantoin, panthenol, polyacrylate crosspolymer-6, ethyl hexyl glycerin, sodium hyaluronate, hydrolyzed collagen, retinyl palmitate, alpha-glucan oligosaccharide, saccharide isomerate, polymnia sonchifolia root juice, maltodextrin, disodium EDTA, CI 14700, glycolic acid, lactic acid, lactobacillus, tocopherol, citric acid, sodium citrate	Prebiotic	**Partially aligned** Prebiotic claim—actives are prebiotic and postbiotic
P101	Revox B77 Skintreats Biotic Resurfacing Activator	Revuele	Mexico	Face/neck care	Saccharomyces/xylinum/black tea ferment	Postbiotic	Dermatologically tested, exfoliating, ethical-animal, brightening/illuminating, moisturising/hydrating, for sensitive skin, vegan/no animal ingredients, probiotic	Aqua, hydroxyethyl urea, gluconolactone, propylene glycol, panthenol, potassium hydroxide, phenoxyethanol, sodium hyaluronate, saccharomyces/xylinum/black tea ferment, glycerin, hydroxyethylpiperazine ethane sulfonic acid, ppg-1-PEG-9 lauryl glycol ether,	Probiotic	**Misaligned** Probiotic claim—actives are postbiotic

								triacetin, hydroxyethylcellulose, disodium EDTA		
P119	Medimart Fresh Daily Use Intimate Soap	Walmart	Mexico	Intimate hygiene	None identified	n/a	Female, botanical/herbal, hypoallergenic, pH balanced, dermatologically tested, paraben free, prebiotic	Aqua, disodium lauryl sulfosuccinate, glycerin, PEG-150, glycol distearate, lactic acid, DMDM hydantoin, aloe barbadensis leaf juice, parfum, citric acid	Prebiotic	**Unsupported by listed composition** Prebiotic claim—no listed microbiome ingredient

Note: The unique product ID number in column 1 was generated for each product to allow easy identification throughout our analyses- the full table can be found as Table S1 in the Supplementary Information File (SIF).

3.1. Geographical Distribution

The data collated into this master table was then analysed in various different ways. With regard to the geographical spread of new product launches, Table 2 shows that the majority of product launches were in Brazil (with 90 products), followed by Chile (36 products) and then Mexico, Argentina and Peru being relatively equal (29–31 products).

Table 2. Geographical distribution of launched products.

Country	Number of Products Launched	% of Total Products
Brazil	90	34.1%
Chile	36	13.6%
Mexico	31	11.7%
Peru	30	11.4%
Argentina	29	11.0%
Colombia	20	7.6%
Ecuador	10	3.8%
Puerto Rico	6	2.3%
Costa Rica	6	2.3%
Venezuela	3	1.1%
Panama	2	0.8%
Guatemala	1	0.4%
Total	264	

It is worth highlighting that out of the 264 products launched, there were only 3 products (all manufactured by Natura) that had variants launched in multiple countries, and these have been included individually as they are justifiably different products:

- Natura Todo dia Flor de Cereza y Aguacate Repairing Shampoo: launched in Peru (P039) and Argentina (P067).
- Natura Todo dia Mango Rosa y Agua de Coco Sun, Sea and Swimming Pool Shampoo: launched in Chile (P033), Brazil (P050) and Peru (P077).
- Natura Todo dia Mora y Aceite de Coco Shampoo: launched in Mexico (P044), Peru (P057) and Argentina (P058).

3.2. Efficacy/Marketing Claims

Of the 264 products launched throughout the 12 countries shown in Table 2, most had multiple claims on the label, and there were 93 distinct claims overall that were made by those 264 products. Table 3 summarises some of the most prevalent and expected claims identified across the products (with the complete list available in the Supplementary Information File).

Table 3. Selected efficacy and marketing claims identified on label (the full list can be found in Table S2 in the Supplementary Information File).

Efficacy and Marketing Claim	Number of Products with the Claim	% of Products with the Claim	Rank
Prebiotic	218	82.6	1
Moisturising/hydrating	145	54.9	2
Botanical/herbal	127	48.1	3
Vegan/no animal ingredients	121	45.8	4
Dermatologically tested	89	33.7	7
Brightening/illuminating	54	20.5	12

Probiotic	41	15.5	18
For sensitive skin	38	14.4	19
pH balanced	33	12.5	20
No additives/preservatives	27	10.2	24
Antioxidant	26	9.8	26
Fragrance free	26	9.8	27
Postbiotic	18	6.8	34
Microbiome/skin flora	18	6.8	35
Sulfate/sulfate free	17	6.4	36
Probiotic fractions	1	0.4	86

The most prevalent on-label claims associated with skin microbiome-related ingredients were prebiotic (82.6%), moisturising/hydrating (54.9%), probiotic (15.5%), postbiotic/microbiome/skin flora (6.8%), and probiotic fractions (0.4%). Secondary attributes, e.g., botanical/herbal (48.1%), vegan (45.8%), dermatologically tested (33.7%) and aesthetic benefits such as skin illumination (20.5%) were also observed. Most of the analysed products featured multifunctional claims, suggesting a strategic response to consumer demands. Beyond microbiome benefits, sustainability-oriented and clean beauty claims are also factors in product selection within the specified Latin American market.

3.3. Ingredient Frequency

It is important to note that ingredient lists on cosmetic products follow the International Nomenclature of Cosmetic Ingredients (INCI) naming protocols, which is a global mandate by regulatory authorities [38]. This results in ingredient lists containing unusual and/or specific spellings for certain ingredients, e.g., 'hydrolyzed' protein instead of 'hydrolysed' protein. Also, the names of microorganisms and plant species, e.g., *Lactobacillus*, *Avena sativa* kernel flour, *Polymnia sonchifolia* root juice, etc. all appear without being italicised on the ingredient's labels.

The results of our search identified 42 distinct ingredients marketed or described as having microbiome-related activity that are present within the 264 products and are shown in Table 4. It should be noted that some of the 264 products contained multiple ingredients on this list (as would be expected), which explains the total number of 327 occurrences.

Table 4. Microbiome-related INCI ingredients found 'on label' across the 264 different products.

INCI Name of Ingredient	Number of Occurrences	ISAPP Classification
Alpha-glucan oligosaccharide	47	Prebiotic
Trehalose	47	Prebiotic
Maltodextrin	35	Prebiotic
Lactobacillus ferment	25	Postbiotic
Xylitol	24	Prebiotic
Inulin	22	Prebiotic
Avena sativa kernel flour	11	Prebiotic
Saccharide isomerate	9	Prebiotic
Lactobacillus	8	Postbiotic
Polymnia sonchifolia root juice	8	Prebiotic
Avena sativa kernel extract	7	Prebiotic
Hydrolyzed yogurt protein	7	Prebiotic
Vitreoscilla ferment	7	Postbiotic

Faex extract	6	Prebiotic
Lactitol	6	Prebiotic
Beta-glucan	5	Prebiotic
Fructooligosaccharides	5	Prebiotic
Bacillus ferment extract filtrate	4	Postbiotic
Bifida ferment lysate	4	Postbiotic
Bacillus ferment	3	Postbiotic
Hydrolyzed milk protein	3	Prebiotic
Lactobacillus ferment lysate	3	Postbiotic
Lactococcus ferment lysate	3	Postbiotic
Aspergillus ferment	2	Postbiotic
Aureobasidium pullulans ferment	2	Postbiotic
Fructan	2	Prebiotic
Lactobionic acid	2	Prebiotic
Lactococcus ferment	2	Postbiotic
Saccharomyces ferment filtrate	2	Postbiotic
Sphingomonas ferment extract	2	Postbiotic
Yogurt powder	2	Prebiotic
Bifida ferment filtrate	1	Postbiotic
Colloidal oatmeal	1	Prebiotic
Epilobium fleischeri flower/leaf/stem extract	1	Prebiotic
Hibiscus sabdariffa flower ferment filtrate	1	Postbiotic
Lactobacillus/hibiscus sabdariffa flower ferment filtrate	1	Postbiotic
Leuconostoc/radish root ferment filtrate	1	Postbiotic
Saccharomyces/xylinum/black tea ferment	1	Postbiotic
Saccharomyces ferment	1	Postbiotic
Saccharomyces lysate	1	Postbiotic
Saccharomyces/copper ferment (and) *Saccharomyces*/iron ferment (and) *Saccharomyces*/magnesium ferment (and) *Saccharomyces*/silicon ferment (and) *Saccharomyces*/zinc ferment	1	Postbiotic
Undaria pinnatifida extract	1	Prebiotic
Hydrolyzed *Candida saitoana* extract	1	Postbiotic
Total number of occurrences:	327	

Prebiotic oligosaccharides have attracted significant interest in cosmetology and skin health due to their ability to modulate the skin microbiome. A review conducted by Zeng et al. showed the multiple roles of prebiotic oligosaccharides in promoting some benefits of interest for consumer demands, and consequently, for cosmetic companies [39]. Some of these benefits included the promotion of skin commensals (helpful bacteria); the inhibition of pathogenic bacteria; anti-melanogenesis, antioxidant and anti-inflammatory activities; prevention of atopic dermatitis; enhanced skin hydration; anti-aging; and photo protection properties. In our findings, alpha-glucan oligosaccharide was present in 47 products while fructooligosaccharides (FOSs) were in 5 products, mainly in the face/neck care subcategory. This is inconsistent with the benefits demonstrated for the prebiotic ingredients. Alpha-glucan oligosaccharide is present in some formulations together with other microbiome-related ingredients. Some suppliers sell the isolated compound, but it is becoming more common to sell in a proprietary blend, both to potentially give a synergistic benefit and to distinguish the product in the market from competitive products. One example is Ecoskin® (Solabia, France) which is a combination of the prebiotic oligosaccharide with probiotic *Lactobacillus* strains and has the INCI name of 'Alpha-glucan oligosaccharide (and) *Polymnia sonchifolia* root juice (and) maltodextrin (and)

Lactobacillus'; this blended ingredient was found to be present in 3 face care and 3 body care products [39].

The prebiotic compound inulin (n = 22) is also widely used, as it supports the growth of beneficial bacterial and provides moisturising properties. It is sourced from vegetables, mainly from Jerusalem artichokes and chicory (more popular) [40]. Inulin is present as an isolated prebiotic ingredient and also in blended products such as Yogurtene® Balance (Givaudan Active Beauty), which has the INCI name of 'inulin (and) hydrolysed yogurt protein'.

Xylitol is a five-carbon sugar alcohol commonly used as a sweetener in the food industry. For skin, it was demonstrated to reduce transepidermal water loss (TEWL), probably by increasing tight junction and barrier formation, and it has been reported to help suppress the growth of potential skin pathogens. Furthermore, many of the skin benefits have been obtained in vitro or as a dietary supplement, which need further substantiation in this use [41]. Despite that, xylitol is used as a cosmetic ingredient either isolated or blended with synergic components. An example is the combination with lactitol, as used in Ecodermine™ and Hairspa™ (Croda Beauty) for the preservation and restoration of the cutaneous and scalp microflora, respectively. This synergistic combination of xylitol and lactitol was present in three of the evaluated products. The isolated xylitol was present in 21 formulations, 13 of which were from the same company in hair care products, and the other 8 used by different companies that combine xylitol with another microbiome-related ingredient.

Other very popular oligosaccharides include trehalose and maltodextrin. Trehalose was present in 47 products overall, and it was the only microbiome-related ingredient in 43 of those, with one particular company launching 38 of those 43 products, mainly for body care (n = 24). After analysing the INCI formulation and the marketing material for these products, the company claims the use of 'prebiotic technology' but then state that they are actually using a mixture of trehalose and vegetable oils such as '*Theobroma cacao* (cocoa) seed butter and *Linum usitatissimum* (linseed) seed oil' to form a 'complex' that maintains the skin microbiota's natural balance via skin barrier reinforcement, rather than using a traditional microbiome-related ingredient. Verspecht et al. identified D-(+)-trehalose as a novel prebiotic substrate capable of shifting multiple species of oral biofilms toward a host-compatible state [42]. These findings established the ability of trehalose to modulate microflora. However, further studies are required to translate these oral biofilms findings into real benefits for cosmetic applications.

Maltodextrin is well known as a prebiotic dietary fibre with extensive gastrointestinal and nutritional science data; its inclusion in topical formulations would have a very different purpose. In cosmetic formulations, maltodextrin is used as a stabiliser, a rheology modifier or as an encapsulating agent for botanical extracts [43]. The terminological inconsistency between commercial marketing and known chemical functionality creates significant ambiguity. It remains unclear whether the ingredient is included to optimise the structural stability of the formulation or to justify the use of a microbiome-related claim.

This ambiguity highlights the lack of regulation regarding microbiome-related claims in Latin America. Manufacturers can use this ambiguity to influence (or mislead) consumers regarding cosmetic labelling, efficacy claims and product benefits. When a consumer purchases a cosmetic product that is advertised with a 'prebiotic technology' claim, there is a reasonable expectation that the product contains active ingredients which have been validated to benefit the skin and scalp microbiomes.

3.4. Lactobacillus-Derived Ingredients and Commercial Claims

Within the postbiotic category, *Lactobacillus* ferment was the most prevalent ingredient, being present in 25 cosmetic products: face care (n = 8), intimate care (n = 6), hair care (n = 5), deodorants (n = 3), toiletries, body care and bar soap (n = 1 each). Within the nomenclature '*Lactobacillus*', we identified several different INCI names: *Lactobacillus*, *Lactobacillus* ferment lysate and *Lactobacillus*/*Hibiscus sabdariffa* flower ferment filtrate. According to the Cosmetic Ingredient Review (CIR) safety assessment of *Lactobacillus* ferment ingredients as used in cosmetics, four distinct materials were evaluated: *Lactobacillus* ferment, *Lactobacillus* ferment filtrate, *Lactobacillus* ferment lysate, and *Lactobacillus* ferment lysate filtrate [44]. All of these ingredients are reported to function as miscellaneous skin-conditioning agents. However, *Lactobacillus* ferment is reported to possess numerous additional cosmetic functions, as detailed in Table 5. These four ingredients are grouped together because they are all products of bacterial fermentation, derived predominantly from the genus *Lactobacillus*.

Table 5. Various *Lactobacillus* species and their functional claims.

INCI Ingredient	Definition	Functions	Examples of Trade Names (Supplier)
Lactobacillus ferment	Obtained via fermentation by the *Lactobacillus* microorganism	• antiacne agents • antidandruff agents • antioxidants • emulsion stabilisers • film formers • humectants • skin-conditioning agents • viscosity-increasing agents	• ProBioBalance™ CLR NP (CLR Berlin)
Lactobacillus ferment lysate	Lysate of the product obtained via fermentation by the *Lactobacillus* microorganism	• skin-conditioning agents	• ProRenew Complex CLR™ (CLR Berlin) • *Lactobacillus* Ferment Lysate (Suzhou Greenway Biotech Co., Ltd.)
Lactobacillus ferment lysate filtrate	Filtrate of the lysate of the product obtained via fermentation by the *Lactobacillus* microorganism	• skin-conditioning agents	• *Lactobacillus* Ferment Lysate Filtrate (Aogubio Co.)
Lactobacillus ferment filtrate	Filtrate of the product obtained by the fermentation of the growth media by the *Lactobacillus* microorganism	• antioxidants • skin-conditioning agents	• Biolin P (Evonik/Dr. Straetmans) • *Lactobacillus* Ferment Filtrate (Curerex-Lacto)

The various *Lactobacillus*-derived ingredients identified in the dataset were analysed, and the 'on-label' claims made on the corresponding products were compared with the functional information available from CIR and supplier documentation. Table 6 illustrates the extent to which commercial claims correspond to the documented functions of the specific ingredient and highlights cases where relatively general ingredient functions are being used to claim broader 'on-label' microbiome claims.

Table 6. Comparison of *Lactobacillus*-derived postbiotic INCI ingredients against the documented 'on-label' claims and correlation with published Cosmetic Ingredient Review (CIR) of the supplier's data.

INCI Name and Product Reference	Documented 'On-Label' Claims	Published Cosmetic Ingredient Review (CIR) of the Supplier Data
Lactobacillus Product #: 97, 107, 108, 139, 164, 183, 197, 199	• Antiacne • Helps maintain a balanced skin microbiome • Pre- and probiotic complex • For fresh breath smell/probiotics/lasting • Evens skin tone and reduces blemishes • Pre- and probiotics/cleanse and nourish/soap-free • Microbiome technology: pre- and postbiotics repair biome • Breath-freshening, probiotic • Microbiome science/accelerates and helps repair skin barrier	• CIR classifies this biomass as a 'skin-conditioning' agent and 'emulsion stabiliser'. • This translates into general tissue-coating and barrier-reinforcing parameters for dermatological claims, e.g., active barrier repair and microbiome protection. • These film properties are used in oral care to coat and protect oral mucosa against odour compounds.
Lactobacillus Ferment Product #: 120, 121, 122, 127, 131, 141, 148, 152, 160, 161, 177, 179, 188, 190, 193, 205, 214, 217, 232, 238	• Cleans and balances excessive root oiliness • Detangling, reconstruction and structural strength • Myrica fruit wax and bio cysteine and prebiotic • With probiotic: dual-action/repairs the skin barrier • Quickly and permanently relieves irritation and itching • Infused with microbiome-friendly oatmeal • Transforms shower with instant hydration • Kefir: cellular renewal and natural glow • Probiotics: maintain a balanced microbiota • Lactoprebiotic: maintains healthy pH • Natural peach probiotics/microbiota balanced/glow • With collagen and probiotics/helps repair skin barrier • Odour control/sensitive skin/pH 5 • Formulated with salicylic acid, citric acid and probiotics/mattifying • With proteins from probiotic yogurt/gentle formula • Contains cotton and probiotics that promote natural skin conditions • Facial moisturising gel with probiotics and squalane/soft and radiant • Night-time facial serum with probiotics/strengthens the barrier and regulates pH	• CIR classifies this pure ferment as an 'antiacne agent', 'antidandruff agent' and 'humectant'. • Commercial brands use these definitions and utilise them in various ways, e.g., • Océane and Pixi use the antiacne designation for pore-refining and clarifying formulations. • Truss uses the antidandruff property for functional sebum control on oily scalps. • Benzal, Viive and Intylact use the humectant designation for hydration and physiological pH maintenance.
Lactobacillus ferment lysate (filtrate)	• Salicylic acid and probiotics balance and preserve	• CIR classifies this as a targeted 'skin-conditioning' agent.

Product #: 123	• Clear complexion cleanser that hydrates while gently and effectively purifying pores, visibly minimising breakouts	• Commercial brands such as Pixi Skintreats uses this as an 'automated biological cushion inside an aggressive chemical exfoliation base', validating the claim that the postbiotic component actively preserves and balances skin parameters during deep pore cleansing.
Avena Sativa kernel extract/*Lactobacillus* Product #: 137	• Protector with oat prebiotic/relieve dryness • Balances the skin's microbiome/pH for atopic skin	• CIR classifies this as a 'humectant'. • Advanced Botanical Synergy is a co-fermented ingredient blending the 'humectant' profile of *Lactobacillus* with the natural beta-glucans of oats and targeting dry and hyper-sensitive skin.
Lactobacillus/Hibiscus flower ferment filtrate Product #: 171	• Prebiotic *hibiscus* and bacuri butter/deeply nourishing • Sulfate free/oil-to-milk body wash/soothes	• CIR classifies this as an 'antioxidant'. • Sol de Janeiro uses this ingredient to bio-convert organic alpha-hydroxy acids (AHAs) to provide enzymatic cell turnover. Fulfils requirement for antioxidant free radical scavenging.

3.5. Inconsistencies Between Microbiome-Related Claims and INCI Composition

A critical finding in this analysis is that terminology is not always aligned between the microbiome claims made on the labelling and the actual INCI ingredients list. Our search results identified a number of products where there were inconsistencies between the on-label claims and the ingredients found on label.

Of the 264 products identified in our search, 163 were found to be consistent; the label claim aligned with the ingredients list, i.e., a postbiotic claim and postbiotic ingredient (n = 14) or a prebiotic claim and prebiotic ingredient (n = 149). The remaining 101 products (i.e., 38% of all products) showed different levels of inconsistencies, as shown in Table 7. The framework and classification that we have used falls into four different categories: (i) aligned, (ii) partially aligned, (iii) misaligned and (iv) unsupported by listed composition. For clarity, a product that has a prebiotic label claim but contains a postbiotic ingredient has been classified as being 'misaligned'. In comparison, a product with a prebiotic label claim that contains a prebiotic and postbiotic ingredient has been classified as 'partially aligned'. In such cases, we are not commenting on the efficacy of the product, only that there are inconsistencies between label claims and ingredients used.

Table 7. Inconsistencies found between on-label claims and the ingredients list.

Label Claim	Ingredient	Claim–Ingredient Alignment	Number of Occurrences	Product ID
Prebiotic	Prebiotic + postbiotic	Partially aligned	8	P097, P148, P154, P171, P186, P199, P219, P240
Prebiotic + probiotic	Prebiotic + postbiotic	Partially aligned	7	P096, P107, P164, P183, P188, P193, P223
Postbiotic	Prebiotic + postbiotic	Partially aligned	2	P163, P179
Prebiotic + probiotic + postbiotic	Postbiotic	Partially aligned	1	P263
Prebiotic	Postbiotic	Misaligned	6	P120, P121, P122, P131, P144, P178
Prebiotic + probiotic	Postbiotic	Misaligned	2	P136, P246

Probiotic	Postbiotic	Misaligned	11	P089, P101, P126, P152, P161, P162, P196, P228, P252, P253, P258
Probiotic	Prebiotic	Misaligned	4	P207, P209, P210, P220
Probiotic	Prebiotic + postbiotic	Misaligned	14	P108, P123, P127, P141, P160, P190, P197, P205, P214, P215, P221, P222, P232, P238
Probiotic + postbiotic	Prebiotic	Misaligned	1	P081
Prebiotic	No microbiome ingredient	Unsupported by listed composition	42	P003, P004, P005, P006, P033, P034, P035, P039, P040, P045, P046, P047, P049, P050, P051, P059, P060, P061, P067, P069, P070, P071, P077, P079, P092, P094, P110, P113, P119, P128, P130, P138, P158, P185, P187, P192, P211, P213, P217, P230, P234, P237
Probiotic	No microbiome ingredient	Unsupported by listed composition	1	P247
'Microbiome Friendly Certification'	No microbiome ingredient	Unsupported by listed composition	2	P260, P261
		Total =	101	

Table 7 shows the various discrepancies, which include claiming a prebiotic, whereas the ingredient is postbiotic (n = 6); or a probiotic claim where the ingredient is postbiotic (n = 11); or even a probiotic claim where the ingredients are prebiotic and postbiotic (n = 14). These discrepancies are most likely to be simple mistakes, misunderstanding or misinterpretation of the ingredients. However, the most concerning are those products that list prebiotic or postbiotic claims but do not actually contain any relevant ingredient (n = 43). A similar situation was found by Puebla-Barragan et al., who analysed 50 North American cosmetic products and demonstrated a significant labelling deficiency, where 78% of the probiotic products characterised utilised ferments such as *Bifida* ferment lysate, which is a postbiotic, not a probiotic [45].

This discrepancy corroborates the communication gap and emphasises the failure of cosmetic companies to distinguish between viable microorganisms (probiotics) and inanimate microbial ingredients (postbiotics). Vinderola et al. confirmed that the term 'probiotic' is strictly reserved for live, active cultures, which are practically impossible to maintain alive in a traditional cosmetic formulation due to various other ingredients, such as preservative systems and surfactants [46]. Consequently, the misuse of this nomenclature not only creates misinformation but may also undermine consumer trust, as 'skintellectual' consumers increasingly demand technical accuracy in efficacy claims.

3.6. Distribution Across Personal Care Product Categories

When analysing the subcategories, skincare represents the largest number of launched products (n = 113, 42.8%), divided into 67 products for facial care, 41 for body care and 5 for hand care (Table 8). Hair care products represent 28.4% (n = 75) of all launched products, where the main ingredients are being classified as prebiotics to support a microbiome-friendly claim. This reflects the 'skinification' trend within hair care, where active ingredients which have been used mainly for facial-care products are now being incorporated into hair-care products [47].

Table 8. Personal care categories and subcategories and the number of products within each category that feature microbiome-related claims.

Subcategory	Subcategory	Number of Products
Hair Care	Hair treatment	26
	Conditioner	25
	Shampoo	23
	Hair styling	1
Facial Care	Face/neck care	42
	Face cleansers	21
	Eye care	2
	Foundation	1
	Multi-use	1
Body Care		41
Intimate Care	Cosmetic	31
	Pads	1
Toiletries	Bar soap	6
	Shower products	7
	Liquid soap	3
Deodorant		12
Sun Care		11
Hand Care and Nail		5
Oral Care	Mouthwash	1
	Toothpaste	2
	Dental ancillaries	1
Shaving		1
	Total=	264

Table 9 summarises the frequency with which the microbiome-related ingredients were identified across the various personal care categories, not just facial skincare (as is a common misconception). Because individual products can often contain more than one microbiome-related ingredient, the numbers in the table refer to the number of occurrences of the ingredients in products, rather than individual products. This analysis provides an indication of where microbiome-related positioning is most commonly incorporated within the wider personal care market and highlights differences in ingredient selection between leave-on and rinse-off applications.

As previously mentioned, trehalose and maltodextrin do not qualify as prebiotics or postbiotics under the ISAPP classification framework. The cosmetic industry uses less stringent rules, where carbohydrates, sugars and starches are often referred to and marketed as prebiotics in regard to the microbiome concept; e.g., trehalose and maltodextrin are marketed as prebiotics (even though topical microbiome evidence remains limited). For this reason, we have included and recognised trehalose and maltodextrin to be prebiotics within this article.

Table 9. Microbiome ingredients used in different personal care categories and the number of products in which they feature (note: multiple ingredients can be used in a single product).

Microbiome Ingredient / Category	Hair Care				Skincare							Toiletries						Oral Care				
	Hair Treatment	Conditioner	Shampoo	Styling	Face/Neck Care	Face Cleansers	Eye Care	Foundation	Multi-Use	Body Care	Intimate Hygiene	Bar Soap	Shower Products	Liquid Soap	Deodorant	Sun Care	Hand and Nail	Mouthwash	Toothpaste	Dental Auxiliaries	Styling	Total
Alpha-glucan oligosaccharide		1	1		12	9				6	13					4					1	47
Trehalose					6				1	24	1		1		5	4	5					47
Maltodextrin	6	4	4		5	4				3	4		2		3							35
Lactobacillus ferment	5	2	1		6	1	1			1	6	1	1		3							28
Xylitol	4	5	4	1	4	1			1		1							1	1	1		24
Inulin	1				3	1		1			7	5		2		1						21
Avena sativa kernel flour										8		3										11
Saccharide isomerate		1			1	3				1	1		1		1							9
Lactobacillus					2	1				2								1		1		7
Polymnia sonchifolia root juice					3	1				3												7
Hydrolysed yogurt protein	1										5	1										7
Vitreoscilla ferment	1	2	1			1				1						1						7
Faex extract	1	2	1		1						2											7
Lactitol					2						4											6
Beta-glucan					2	1	1			2												6
Fructooligosaccharides		1	1		2						1											5
Lactobacillus ferment lysate	2	1				1																4
Bacillus ferment extract filtrate					2	2																4
Bifida ferment lysate					3	1																4
Bacillus ferment					2	1																3
Hydrolysed milk protein					1						2											3
Lactococcus ferment lysate						2					1											3

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Aspergillus ferment					2																	2
Aureobasidium pullulans ferment					2																	2
Fructan					2																	2
Lactobionic acid					2																	2
Lactococcus ferment					2																	2
Saccharomyces ferment filtrate					2																	2
Sphingomonas ferment extract																2						2
Yogurt powder					1	1																2
Bifida ferment filtrate					1																	1
Colloidal oatmeal					1																	1
Epilobium fleischeri flower/leaf/stem extract					1																	1
Hibiscus sabdariffa flower ferment filtrate													1									1
Lactobacillus/hibiscus sabdariffa flower ferment filtrate													1									1
Leuconostoc/radish root ferment filtrate						1																1
Saccharomyces/xylinum/black tea ferment					1																	1
Saccharomyces ferment											1											1
Saccharomyces lysate					1																	1
Saccharomyces/copper ferment (and) *Saccharomyces*/iron ferment (and) *Saccharomyces*/magnesium ferment (and) *Saccharomyces*/silicon ferment (and) *Saccharomyces*/zinc ferment					1																	1
Undaria pinnatifida extract					1																	1
Yeast extract											1											1
Total	21	19	13	1	77	32	2	1	2	51	50	10	7	2	12	12	5	2	1	2	1	

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In cases where ingredients are blended, e.g., maltodextrin and *Lactobacillus* ferment, marketing teams often refer to this as a prebiotic/probiotic complex (mainly with evidence from the ferment). There are also examples where either trehalose or maltodextrin are used on their own and are claimed to be prebiotic, therefore (as previously stated) they are recognised within this article as being prebiotics. For clarity, Table 10 shows the actual number of products where trehalose and maltodextrin have been used (with prebiotic claims) either individually or in combination with other ingredients. Trehalose (present in 47 products) is used as the only prebiotic ingredient in 43 of those, whereas maltodextrin (present in 35 products) is more evenly split, with 15 products where it is the only prebiotic ingredient and 20 products where it is used as part of a mixture.

Table 10. Use of trehalose and maltodextrin as microbiome-related ingredients.

Ingredient	Products Where the Ingredient Is Used on Its Own	Number of Products	Products Where the Ingredient Is Used in Conjunction with Others	Number of Products	Total Number of Products
Trehalose	P001, P002, P007, P008, P010, P011, P012, P013, P014, P015, P016, P018, P021, P022, P024, P025, P026, P027, P028, P030, P031, P032, P037, P043, P048, P052, P053, P054, P055, P064, P065, P073, P074, P075, P076, P083, P100, P103, P114, P153, P174, P198, P206	=43	P017, P141, P189, P190	=4	=47
Maltodextrin	P023, P029, P038, P041, P042, P056, P068, P078, P090, P091, P175, P194, P195, P216, P229	=15	P097, P107, P112, P123, P127, P139, P141, P160, P164, P171, P179, P183, P188, P190, P199, P205, P214, P218, P232, P248	=20	=35

3.7. Hair Care

The hair care category (shampoo, conditioner, hair treatment and hair styling) had a total of 75 products, as shown in Table 8. Shampoo formulations represent 30.7% (n = 23), and are characterised as rinse-off products. Shampoos have only a brief contact time with the scalp epidermis that allows active ingredients (as prebiotics) and surfactants to interact with the resident scalp microbiome. The incorporation of prebiotics into conditioners or hair fibre treatments is more typically marketing strategy to communicate 'microbiome-friendly' positioning into a hair care line more than a physiological efficacy. Given that the hair fibre is an extracellular, dead structure composed of highly keratinised cells, any microbiome-related ingredient presents no biological or metabolic activities on non-living fibres [48]. Despite this, conditioners (n = 25), hair treatments (n = 26) and hair styling (n = 1) represent 69.33% (n = 52) of all hair care products. Out of these 52 products, only 3 products explicitly instruct the consumer to apply the formulation from the scalp to the ends of the hair. The other 49 products state that application should be restricted to hair fibres only (and to avoid the scalp).

Out of the 75 identified hair care products, 46.7% (n = 35) were manufactured by the same regional cosmetic company, marketed in five of the evaluated countries (Brazil, Peru, Chile, Argentina and Colombia). Regarding ingredient composition, these formulations are being communicated not based on scientific evidence, but on marketing concepts that appeal to consumers, featuring the word 'prebiotic' on the labels and in digital advertisements through such phrases as: 'exclusive prebiotic technology that cares from root to tip' and 'prebiotics that protect and balance the scalp'.

It is common with certain product lines to have a number of variants whereby fragrances/oils/extracts etc are changed to reflect the product name i.e., 'Cherry Blossom and Avocado shampoo' and 'Pink Mango and Coconut Water shampoo'; however, the products will share a common chassis. Analysing the ingredient composition, maltodextrin and xylitol, both prebiotics, constitute the microbiome-related components identified in this particular line of hair care products. However, these ingredients are listed at the bottom of the ingredient list, often appearing after the preservatives, intimating that the concentration used is relatively low and is likely to be lower than typically required to present a significant prebiotic effect.

Furthermore, shampoos are rinse-off products with short contact times, meaning that these low concentrations would not have enough time to exert beneficial effects on the scalp. In addition to the issues regarding microbiome-related ingredients, the formulation itself presents a paradox by combining a known irritant anionic surfactant (sodium lauryl sulfate) and a mild surfactant (decyl glucoside).

This contradiction also extends to conditioners and hair treatments; some products contain relatively low concentrations of microbiome-related ingredients, which can be intuited from the relative positioning on the INCI ingredient list, with others not containing any at all. It is worth noting that while we do not know the exact % formulation of any of the products, international protocol is to list INCI ingredients in descending order (hence, aqua usually being the first ingredient). There are upper limits for certain ingredients such as preservatives, which are usually included towards the maximum allowable level e.g., 1%; therefore, any ingredients listed on the label below the preservative level can reasonably be expected to be at relatively low levels (provided people are following the correct labelling rules). In addition, there are examples where the usage instructions for prebiotic claim products direct consumers to apply the product exclusively to the hair fibre and ends, while avoiding the roots and the scalp (which is where the microflora can actually be found).

3.8. Intimate Care

From the 31 intimate care products (Table 8) commercialised in the selected Latin American countries, 15 different ingredients were found to be used in those products (as shown in Table 11). Obviously, some of the products contained multiple microbiome ingredients (as we have mentioned previously).

Table 11. Frequency of microbiome-related ingredient occurrences in intimate care products.

Microbiome Ingredient	Number of Times the Ingredient is Used	% Share	Classification
Alpha-glucan oligosaccharide	13	26.0%	Prebiotic
Inulin	7	14.0%	Prebiotic
Lactobacillus ferment	6	12.0%	Postbiotic
Hydrolysed yogurt protein	5	10.0%	Prebiotic
Lactitol	4	8.0%	Prebiotic
Maltodextrin	4	8.0%	Prebiotic
Faex extract	2	4.0%	Prebiotic
Hydrolysed milk protein	2	4.0%	Prebiotic
Fructooligosaccharides	1	2.0%	Prebiotic
Lactococcus ferment lysate	1	2.0%	Postbiotic
Saccharide isomerate	1	2.0%	Prebiotic
Saccharomyces ferment	1	2.0%	Postbiotic
Trehalose	1	2.0%	Prebiotic
Xylitol	1	2.0%	Prebiotic
Yeast extract	1	2.0%	Postbiotic

Total =	50

Brazil and Mexico together account for 17 products (55%) in this category. Just one product mentioned unisex use; all the others are focussed on female care. Microbiome-related ingredients were identified in the majority of products: prebiotics were present in 87.10% ($n = 27$) of the products, while postbiotics were present in 29% ($n = 9$). Furthermore, 48.38% ($n = 15$) of the formulations featured a combination of more than one microbiome-related ingredient. As demonstrated in Table 9, alpha-glucan oligosaccharide (41.9%, 13/31 products), was the dominant prebiotic, followed by inulin (22.58%, 7/31 products). Among the postbiotics, *Lactobacillus* ferment (19.35%, 6/31 products) and hydrolysed yogurt protein (16.12% 5/31 products) were the predominant ingredients.

Lactic acid represents the core component of the products, appearing in 96.77% (30/31 products). This alpha-hydroxy acid is widely used for supposed benefits in vulvovaginal formulations, contributing to pH regulation, and thus, supporting the local microbiome. A systematic review conducted by Plummer et al. on lactic acid-containing products demonstrated that high-quality evidence remains insufficient to connect lactic acid with clinical treatment of bacterial vaginosis, but it supports the vaginal microenvironment by regulating local pH [49]. Despite having benefits for the vaginal microbiome (due to its acidity), this ingredient was not considered a prebiotic in our analysis.

The surfactant chassis is a critical determinant of product mildness. Kalinowska-Lis et al. conducted a market analysis in Poland evaluating 195 intimate hygiene products available in the country [50]. The study demonstrated that the intimate care category is migrating to mild surfactants, such as amphoteric surfactant (cocamidopropyl betaine) and non-ionic glucosides, whereas anionic surfactants known to be irritants, such as sodium laureth sulfate, were less used. Within the intimate care segment, 5 of the 31 products analysed contained ammonium lauryl sulfate ($n = 1$) and sodium lauryl sulfate ($n = 4$), which are known to be disruptive to the microbiome.

These findings are aligned with the special dermatological compatibility and preservation of the delicate microbial balance in sensitive areas. However, the analysed facial cleansers, shower gels and shampoos utilised a hybrid combination between disruptive and mild surfactants. Although market trends show a significant shift toward sulfate-free formulations, many companies continue to maintain these associations. By reducing the concentration of sulfates and buffering them with gentler agents (mainly alkyl polyglucosides), the industry seeks to balance cost-effectiveness, performance and claims aligned with trends.

In our findings, one product stands out due to its mild composition: a sulfate-free amphoteric and non-ionic surfactant complex (sodium methyl cocoyl taurate, cocamidopropyl betaine and lauryl glucoside), an eco-friendly chelant agent (trisodium dicarboxymethyl alaninate) and non-irritant preservative (benzyl alcohol). The microbiome-friendly ingredients used were inulin (prebiotic) and hydrolysed yogurt protein (postbiotic).

Puebla-Barragan analysed 50 intimate care products, mainly commercialised in the United States and Canada, and the importance of balance to the microbiome, concluding that most of these products marketed for vaginal health presented a lack of scientific evidence and validated bacterial strains for restoring homeostasis [27]. The authors highlighted that the promotion and marketing strategies of these products are driven by pseudo-experts exploiting regulatory gaps to promote these formulations without well-documented trials.

While still evaluating the identified products, it is interesting to note that an Argentinian company was the only company certified by MyMicrobiome® [51], a German institute that evaluates formulation compositions and certifies them in accordance with

the rules. When analysing the list of ingredients, the two certified products do not present any prebiotic or postbiotic ingredients; instead, the formulation is composed of gentle ingredients known to preserve or protect the cutaneous microbiome. This company approach establishes an alternative of using 'microbiome-friendly' in their communication. This corroborates Santos et al., who reported that protecting the skin microbiota depends on the entire list of ingredients instead of the presence of a particular prebiotic or postbiotic ingredient [52].

3.9. Microbiome-Friendly Formulations for Hand Care

Before the COVID-19 pandemic, Edmonds-Wilson et al. presented data on the hand microbiome and highlighted that the skin microbiota is constantly changing and is influenced by environmental factors and the frequency of hand hygiene practices [53]. The COVID-19 pandemic transformed hand sanitisation from a public health protocol into the widespread consumer use of hand sanitisers. While the market is dominated by alcohol and benzalkonium chloride, recent research is redefining our understanding of their biological impact. A study by Two et al. demonstrated that the skin microbiome is remarkably resilient to short-term cleansing, being able to maintain the bacterial diversity despite a short-term reduction in natural antimicrobial peptides [54]. Fierer et al. demonstrated a highly diverse and variable bacterial community, influenced by sex, hand dominance and time since hand washing [55].

Our data analysis identified two subcategories featuring skin microbiome claims in hand care labelling: hand creams and liquid soaps. The hand cream products were represented by one regional player with a presence in Brazil, Chile, Argentina and Mexico, while the liquid soap category featured one global company with large distribution across Latin America. Both products presented prebiotics as the core ingredient in their formulation, mainly for the communication message to customers 'to preserve the natural balance of skin flora'. Other claims are botanical/herbal, antioxidant, ethical environmentally friendly package, moisturising/hydrating, for dry skin.

Just as hand creams focus on supporting the skin's microbiome balance, the recent literature highlights the critical importance of the scalp microbiome in maintaining dermatological health. Scalp dysbiosis is strongly correlated with excessive sebum production, irritation and sensitivity. Consequently, formulation strategies prioritise gentle ingredients to rebalance hydration and sebum without disrupting physiological pH and local microbiota [52].

Among the products presenting a scalp care claim, only 8 were identified, representing 3.0% of the 264 products evaluated. Within this subset, 4 products did not contain ingredients that supported the microbiome-related claim. Of the remaining 4, 3 were marketed by the same company and comprised shampoos and hair treatment products bearing a probiotic claim with *Lactobacillus* ferment lysate listed. The final product carried a prebiotic claim, supported by the inclusion of alpha-glucan oligosaccharides.

3.10. Formulation Factors Relevant to Microbiome Compatibility

Any personal care cosmetic formulation represents a complex matrix of ingredients, including surfactants, humectants, rheological modifiers, pH stabilisers, active ingredients and preservatives that interact dynamically with the skin's surface [52]. The commercial viability and safety of these products are strictly governed by rigorous stability and safety assessments to guarantee consumer safety and product integrity through the shelf life. Recent cosmetic formulations are characterised by this high level of complexity, typically between 15 and 50 individual ingredients per product. These

components are categorised based on their technical function to ensure product stability, performance, consumer safety and sensorial appeal [56].

The non-volatile ingredients in a formulation, particularly in leave-on formats, may alter the composition of the skin microbiota, potentially compromising or supporting homeostatic balance (dependent on the compound and concentration, etc.). The skin microbiome acts as a vital ecosystem essential for maintaining barrier function and homeostasis, having its composition determined by various factors such as moisture levels, sebaceous gland activity and topography [57]. Skincare formulations are designed to maintain, protect or restore certain skin functions; however, they also contain a complex mixture of ingredients that are needed to maintain product stability. This complexity presents a paradox: some ingredients, i.e., preservatives and surfactants, may counteract the intended aesthetic benefits, potentially disrupting skin homeostasis and the delicate microbial balance. Evidence supports this paradox: Bouslimani et al. [58] reported that ingredient residues can persist on the skin for several weeks, fundamentally altering the skin's chemical environment. These findings reveal that while topical applications may increase overall microbial diversity, they often cause a significant shift in the relative abundance of specific microbiota. Also, the chemical complexity of cosmetic formulations (which are intended for stability and sensory appeal) induces a prolonged modification of the skin's molecular topography.

3.11. Preservatives

The paradox is further exacerbated by the rise of 'microbiome-friendly' claims in products that still use conventional chemical compounds known to disrupt microbial eubiosis. While these formulations are marketed as being beneficial for skin health, their chemical composition often includes preservatives such as phenoxyethanol that are present in a formulation to inhibit microbial growth in the product.

The widespread use of phenoxyethanol as a preservative in current commercialised products is evidenced by its inclusion in 53.4% (n = 141) of the 264 cosmetic products evaluated in this study. Intriguingly, phenoxyethanol frequently precedes microbiome-related ingredients on the ingredients list, meaning (if labelling is done correctly) that it is present at a higher concentration. This presents a conflict between the expected benefits of the microbiome-related ingredient in the skin and its real stability in the skin microbiome. Tandon et al. demonstrated that such preservatives inhibit microorganisms in general without presenting taxonomic selectivity, thereby suppressing the proliferation of beneficial species including *Staphylococcus epidermidis* and leading to a state of induced dysbiosis that remains invisible to the consumer despite the aesthetic improvements [57].

Alternatives to conventional preservatives are already available in the marketplace and include multifunctional preservation systems based on organic acids, multifunctional glycols, glyceryl caprylate, capryl hydroxamic acid, etc., which can provide broad-spectrum antimicrobial protection when appropriately formulated. Evidence suggests that certain preservative combinations may preserve the balance of the resident skin microbiota while maintaining antimicrobial efficacy against undesirable microorganisms, although these effects are formulation-specific and require experimental validation. Likewise, clinical studies indicate that appropriately formulated cosmetic products do not necessarily induce significant alterations in skin microbial diversity following regular use [59]. The transition to these non-conventional preservative systems can often meet resistance, as they are typically more expensive and not economically viable.

The impact of cosmetic products on the skin microbiome is also influenced by their application and contact time. Rinse-off formulations, such as cleansers and shampoos, have a limited contact time with the skin and can be less risky for the skin microbiome than regular leave-on cosmetic formulations such as emulsions and lotions. Callejon et al.

described experiments with three types of leave-on face skincare products—a hydrophilic formulation, a micellar formulation, and an oil-in-water emulsion—on skin microbiome after four days, demonstrating that all formulations maintained the natural microbiome balance of the skin without causing dysbiosis [12].

3.12. Surfactants

The balance of the skin microbiome, stratum corneum integrity and water retention/transepidermal water loss (TEWL) in the skin can be influenced by the properties of some surfactants when a cosmetic product is applied [52]. These properties result in surfactants being classified as ultra-mild, mild, moderately disruptive and highly disruptive to the skin microbiome and skin barrier function, and they are generally defined as shown below and accepted as being so by the cosmetics industry [60–63].

- Ultra-mild: Non-ionic, usually based on sugar or carboxylic amino acids. They do not bind to or denature skin proteins, remove the skin's natural moisturising factors (NMF) or alter the pH. They do not affect the microbiome.
- Mild: Amphoteric or slightly anionic, usually isethionates- or taurate-based. Slightly larger micellar structures which prevent deep penetration into the stratum corneum, preserving the lipid matrix, which results in a minimal effect on the microbiome.
- Moderately disruptive: Anionic, ethoxylated or alkanolamide-based. They lower surface tension, remove some of the natural lipids and mildly swell the stratum corneum proteins. Can cause a temporary/mild change in the microbiome.
- Highly disruptive: Anionic, short-chain alkyl sulfate-based. Readily penetrates into the stratum corneum, dissolving the intercellular lipid bilayer; denatures structural proteins; raises the local skin pH and removes flora from the skin microbiome.

Considering this, 86 rinse-off products were analysed to understand the surfactant system used in these microbiome-friendly cosmetic products. The products fall into four categories, liquid soaps, intimate soaps, shampoos and facial cleansers, and were analysed considering their surfactant profiles and their potential impact on the skin and scalp microbiome, as shown in Table 12. These surfactants are well known, as is their potential effect on the skin microbiome. We are not implying any demonstrated effects from these products, merely highlighting that some surfactants which are known to affect the microbiome are being used in products with microbiome claims, which itself is somewhat of a conundrum.

Table 12. Summary of the surfactants identified across four rinse-off categories and their respective potential impacts on the skin/scalp microbiome by surfactant definition.

Surfactant	Type	Potential Impact on Skin/Scalp Microbiome	Liquid Soap	Intimate Hygiene	Face Cleansers	Shampoo	Total
Cocamidopropyl betaine	amphoteric	Mild	3	18	12	22	55
Coco-glucoside	non-ionic	Ultra-mild	0	6	4	14	24
Decyl glucoside	non-ionic	Ultra-mild	0	4	3	14	21
Sodium laureth sulfate	anionic	Moderate	2	12	3	4	21
Sodium lauryl sulfate	anionic	Highly disruptive	0	4	1	13	18
Lauryl glucoside	non-ionic	Ultra-mild	0	10	3	0	13
Sodium cocoyl isethionate	anionic	Mild	0	1	1	5	7
Sodium methyl cocoyl taurate	anionic	Mild	0	2	1	4	7
Cocamide DEA	non-ionic	Moderately disruptive	0	7	0	0	7

Cocamide MEA	non-ionic	Moderately disruptive	3	1	0	2	6
Sodium lauroyl methyl isethionate	anionic	Mild	0	2	4	0	6
Coco-betaine	amphoteric	Mild	0	1	2	2	5
Sodium cocoamphoacetate	amphoteric	Mild	0	3	2	0	5
Sodium lauroyl sarcosinate	anionic	Mild	0	1	0	2	3
Disodium laureth sulfosuccinate	anionic	Ultra-mild	0	2	0	0	2
Sodium cocoyl glycinate	anionic	Mild	0	0	2	0	2
Sodium cocoyl glutamate	anionic	Ultra-mild	0	0	2	0	2
Ammonium lauryl sulfate	anionic	Highly disruptive	0	1	1	0	2
Disodium cocoyl glutamate	anionic	Ultra-mild	0	1	1	0	2
Sodium C12–C13 alketh sulfate	anionic	Moderately disruptive	1	0	0	0	1
Sodium lauryl sulfoacetate	anionic	Mild	0	0	1	0	1

Froebe et al. demonstrated that the irritancy of sodium lauryl sulfate is primarily associated with its interaction with the stratum corneum proteins and disruption of skin barrier function [64]. Despite the well-documented fact that traditional anionic sulfates, such as sodium lauryl sulfate and ammonium lauryl sulfate, are considered to be disruptive to the microbiome and irritating to the skin, a total of 20 evaluated cosmetic products (23.3%) present these ingredients as part of their composition, which does somewhat contradict the commercial position as microbiome-friendly formulations.

The structural integrity of the stratum corneum is strongly influenced by the physicochemical properties of cleansing surfactants. Bárány et al. [65] compared the irritancy potential of commonly used surfactants in a clinical test using biophysical measurements, including transepidermal water loss, cutaneous blood flow and patch testing, demonstrating marked differences in skin irritation among surfactant classes, with anionic surfactants producing greater barrier disruption than milder amphoteric and non-ionic surfactants. These findings provided early evidence that surfactant selection is a determinant of skin compatibility and supported the development of milder cleansing formulations. Sodium cocoyl isethionate is an anionic surfactant widely used in cosmetics and recognised for its mildness and skin compatibility. Compared with conventional anionic surfactants and soaps, sodium cocoyl isethionate causes less disruption to the skin barrier due to the larger micelles that cannot penetrate into the stratum corneum, and therefore, do not cause damage to the skin barrier (irritation) [66]. The isethionate surfactants (sodium cocoyl isethionate and sodium lauroyl methyl isethionate) were studied by Ananthapadmanabhan et al., who showed that these surfactants preserve the microenvironments required for a symbiotic microbial colonisation and keep the intercellular lipid matrices intact [60].

Focussing on structural modifications, Seweryn demonstrated how changing surfactant chemistry can modify its interactions with the stratum corneum [67]. It was demonstrated that the ethoxylation process (as in sodium laureth sulfate and ammonium laureth sulfate) can increase micellar size, thus restricting the surfactant transport into the deeper layers of the stratum corneum. In contrast, C_{14}-C_{16} olefin sulfonate was also studied, demonstrating a high denaturation capacity, and so, being classified as highly disruptive to the cutaneous barrier.

Mijalijca et al. compiled a comprehensive review on skin-surface conditions when exposed to traditional soaps versus modern syndets [68]. This study analysed the physiological compatibility of non-ionic systems, such as coco glucoside and decyl

glucoside, as well as amino acid-derived surfactants such as sodium methyl cocoyl taurate, sodium lauryl sarcosinate, sodium cocoyl glycinate, methyl lauroyl taurate and sodium methyl oleoyl taurate, concluding that these surfactants were reported to minimise the harsh alkaline pH shifts typically associated with saponified fatty acid soaps. On the other hand, Zhao et al. demonstrated that the use of sodium lauroyl sarcosinate (considered a mild surfactant), can be aggressive to the skin microbiota by altering the skin barrier lipid composition, thus facilitating colonisation by pathogens more resistant to changes in the skin ecosystem [69]. These findings suggest that dedicated studies on the skin microbiome are needed to confirm their ability to preserve skin microbiome homeostasis.

It was observed that 69.8% (n = 60) of the rinse-off formulations within the face cleanser, shampoo, liquid soap and intimate care subcategories utilised a synergistic combination of at least three different surfactants. This multi-surfactant approach is used to optimise cleansing efficacy, enhance foam quality and adjust formulation viscosity while mitigating potential skin irritation, as reported by Townsend et al. [70].

3.13. Regulatory Landscape for Microbiome-Related Cosmetic Products

The increasing popularity of microbiome-related cosmetic products has created new regulatory challenges regarding the scientific substantiation of efficacy claims. Although no jurisdiction has established legislation specifically addressing microbiome-related cosmetics, existing cosmetic regulations provide the legal framework for the evaluation of such claims. Concurrently, the scientific literature has highlighted the need for standardised, reproducible methodologies capable of generating clinically relevant evidence to support microbiome-related cosmetic claims.

Within the European Union, cosmetic products are regulated under Regulation (EC) No. 1223/2009 [19], while the substantiation of cosmetic claims is governed by Commission Regulation (EU) No. 655/2013 [71]. These regulations require that all cosmetic claims, including those relating to the skin microbiome, are supported by appropriate scientific evidence demonstrating that the finished cosmetic product delivers the claimed cosmetic benefit. The importance of rigorous claim substantiation was highlighted by the ruling issued by the UK Advertising Standards Authority (ASA) on 13 January 2021, which upheld a complaint against microbiome-related cosmetic claims because the available evidence was considered insufficient to support the advertised benefits [21]. The ASA concluded that the concern was not the use of microbiome-related terminology itself, but rather the lack of adequate scientific substantiation. The ruling further emphasised that supporting evidence should be generated using the finished cosmetic product, preferably under conditions representative of normal use (in vivo), in the target consumer population and should directly support the specific cosmetic claims being made.

In Brazil, microbiome-related cosmetic claims are regulated within the general framework established by ANVISA Resolution RDC No. 907/2024 [25]. This regulation defines the requirements for cosmetic products, including quality, safety, efficacy and labelling, but does not currently contain specific provisions addressing microbiome modulation or microbiome-related cosmetic claims. Unlike the food sector, where prebiotics and probiotics are subject to specific regulatory evaluation for functional claims, the Brazilian cosmetic regulatory framework does not establish harmonised criteria for the use of terms such as ‘microbiome-friendly’, ‘prebiotic’, ‘probiotic’ or ‘postbiotic’ in cosmetic labelling. Consequently, microbiome-related cosmetic products are currently introduced to the Brazilian market through the existing regulatory pathways dictated by ANVISA. Although ANVISA classifies cosmetics as Grade 1 or Grade 2 products, most conventional cosmetics, including shampoos, conditioners, facial cleansers, moisturisers and body lotions, are exempt from pre-market registration because they are considered to

represent a lower health risk. Instead, these products are 'notified' to ANVISA via their electronic prior notification system (Sistema de Automação de Cosméticos, SGAS). Under this system, the cosmetic manufacturer electronically submits the product information required and, once the notification is completed, the product is then allowed to be sold on the market. However, at this point, there has been no pre-market technical review of the complete product dossier or scientific substantiation of marketing label claims. Responsibility for product composition, safety, efficacy, labelling and regulatory compliance rests entirely with the manufacturer, who must maintain supporting documentation for possible inspection (RDC nº 907/2024) [25].

ANVISA regulates cosmetic ingredients through a periodically updated list of prohibited ingredients for cosmetics comprising more than 1400 active ingredients (RDC No 1030/2026) [71], including pharmaceutical active substances, specific botanic ingredients and other compounds unsuitable for cosmetic use. No reference is made to the use of live microorganisms, including probiotics. This absence does not mean that it is allowed, but rather, highlights a regulatory gap, as the current negative list does not specifically address the use of viable microorganisms in cosmetic products.

As no microbiome-specific guidance or validated testing protocols have yet been established by ANVISA, the scientific substantiation of these claims follows the general requirements applicable to cosmetic products. However, the absence of harmonised methodologies for evaluating the effects of cosmetic formulations on the skin microbiome has resulted in considerable variability in the nature and quality of the evidence used to support microbiome-related claims. The evaluation of the 90 microbiome-related cosmetic products included in the present study illustrates this regulatory scenario: 13.3% (n = 12) of the evaluated products have a probiotic claim on the label; however, most products were marketed using terminology referring to the skin microbiota or microbiome despite the absence of harmonised regulatory definitions or specific substantiation criteria. In some cases, microbiome-related claims were associated with ingredients traditionally used as moisturising, humectant or conditioning agents, such as trehalose, or presented ingredients known to disrupt the skin or scalp homeostasis.

4. Conclusions

This study provides a market and regulatory assessment of microbiome-oriented cosmetics in Latin America, addressing an area in which commercial development has progressed faster than scientific standardisation and regulatory guidance. Analysis of 264 products launched and marketed during 2025 across 12 Latin American countries indicates that microbiome positioning is now well established across skin, hair, intimate care and other personal care categories. Brazil accounted for the largest proportion of identified products, highlighting its importance as a market for microbiome-related innovation.

Our findings revealed substantial inconsistencies between consumer-facing claims, INCI composition and the plausibility of some claimed benefits. The most notable finding was the widespread use of microbiome-related terminology that did not consistently correspond to the ingredients present in the products. The dominant claim was for prebiotics, which occurred in 82.6% of products, while probiotic claims were made in 15.5%. A particularly important and surprising finding was that products marketed with 'probiotic' claims (i.e., containing a viable microorganism) actually contained inactivated microbial derivatives, typically *Lactobacillus* ferment lysates, which are more appropriately classified as postbiotics. This distinction is scientifically important because probiotics and postbiotics are not interchangeable and have different biological characteristics.

Critically, the search results identified that only 163 of the 264 products were found to be consistent, where the label claim matched the ingredients. The remaining 101 products (i.e., 38% of all products) showed various inconsistencies, as shown previously in Table 7. Worryingly, 43 of those products did not contain any relevant microbiome-related ingredient, while at the same time making prebiotic or probiotic claims on the label.

The widespread use of probiotic terminology is difficult to justify, considering that including viable probiotic microorganisms throughout a product's shelf life is almost impossible in the presence of preservatives and other formulation components. The preference for non-viable microbial derivatives in the products that have been analysed is understandable from a formulation perspective, but it does not justify claiming that these products contain probiotics.

It is important to note that microbiome compatibility or physiological effects on the skin from a product cannot be inferred simply from the presence of a prebiotic, postbiotic or another microbiome-associated ingredient. The effect of a cosmetic depends on the complete formulation, including ingredient concentration, pH, chassis, preservatives, surfactants, application site and contact time. The presence of phenoxyethanol in 53.4% of the products analysed, along with a number of anionic surfactants (which are well known to disrupt the microbiome) in 23.3% of rinse-off formulations, raises an intriguing question: in a product which claims to improve the microbiome of the skin, why are ingredients that are known to cause issues with the microbiome added to the formulation?

The analysis of hair care products provided an additional example of scientific plausibility. Hair care accounted for 28.4% of the identified products, with many of the products making microbiome-related claims for a product that is intended primarily for the hair fibre rather than the scalp, which is where the microbiome actually is. In some cases, products promoted prebiotic benefits while the application instructions specifically advised consumers to avoid putting the product onto the scalp. Similarly, microbiome-related ingredients were sometimes positioned low down in the INCI ingredients list (which suggests relatively low concentrations, as previously mentioned) and incorporated into rinse-off products with limited contact time. These findings raise important questions regarding whether the ingredient concentration, exposure and site of application are sufficient to support the claimed microbiome benefit. They also illustrate the need for claims to reflect the actual conditions under which a product is used.

The findings in the intimate care category further reinforce the importance of formulation-level assessment. Many products contained prebiotic or postbiotic ingredients along with lactic acid, which is typically used to maintain an appropriate local pH to support the microbiome environment. Some products contained surfactants that are known to be disruptive to the microbiome, but many had mild surfactant systems and included a specific microbiome ingredient, supporting the concept that a microbiome-friendly formulation should be considered a characteristic of the finished product, and not a property attributable to one ingredient.

The regulatory findings are similarly important; no specific regulatory category for microbiome-related cosmetics was identified within any framework examined. Instead, such products remain subject to existing cosmetic legislation, including the general requirements for safety, appropriate labelling and scientific substantiation of claims. In Brazil, the situation is particularly relevant because many cosmetic products do not require registration with ANVISA (which would require comprehensive pre-market technical assessment); instead, ANVISA only requires a notification that the product is being introduced to the market. While current legislation does not prohibit microbiome-related claims, the absence of specific definitions or harmonised substantiation requirements creates uncertainty regarding how claims such as 'probiotic', 'prebiotic' and 'microbiome-friendly' should be evaluated. This regulatory gap is significant because the

microbiome-related claims on the label may exceed the evidence available for the finished product, and as there is no ANVISA assessment, these discrepancies are not noticed. The presence of an ingredient with proven in vitro microbiome activity does not automatically mean that the same effect will be observed following topical application; this would require test data. The same applies to evidence that has been generated in nutritional, oral or other biological systems in that the data does not necessarily translate to the skin. Claim substantiation assessments should consider the finished cosmetic, the concentration and formulation of the active ingredient, the intended site of application, exposure conditions and the relevant consumer population.

Future product development by cosmetics companies would be improved if these claim substantiation gaps could be addressed through the standardised testing of finished formulations. Harmonised in vitro, ex vivo and clinical methodologies are needed to determine whether microbiome-related products produce reproducible benefits under realistic conditions of use. Studies should consider microbial composition and function alongside skin barrier parameters, formulation characteristics, concentration, exposure time and the distinction between rinse-off and leave-on products, providing evidence for manufacturers to make the correct claims and for regulators to establish consistent assessment criteria.

This study has demonstrated that many microbiome-oriented cosmetic products have been launched throughout the selected Latin American countries, but there are significant discrepancies between the marketing/on-label claims and the actual ingredients used. Future products in this microbiome area should focus on using the correct terminology in their marketing and choice of claims along with the appropriate choice of ingredient, e.g., if a product is claimed to be 'prebiotic', then a prebiotic ingredient must be included in the product formulation. Establishing clear regulatory guidance with the use of harmonised definitions and validated methodologies across Brazil and the rest of Latin America would provide clear guidance for responsibility, improve the scientific credibility of products, and improve consumer confidence.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/cosmetics13060311/s1, Table S1: Full data "Master" table of the 264 products identified by the search; Table S2: Efficacy and marketing claims identified.

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References

1. Dou, X.; Zhang, Y.; Wang, X.; Zhang, Y.; Hou, R. The way aesthetic needs affects the relationship between aesthetic responsiveness and creativity. *PLoS ONE* **2025**, *20*, e0331067. https://doi.org/10.1371/journal.pone.0331067.
2. Andrei, F. Sensory Science in Cosmetics. In *Cosmetic Industry—Trends, Products and Quality Control*; Kartal, S.P., Ed.; IntechOpen: London, UK, 2025; p. 2. https://doi.org/10.5772/intechopen.1009804.
3. ABIHPEC—Brazilian Association of the Personal Hygiene, Perfumery and Cosmetics Industry 2025. Overview of the Personal Hygiene, Perfumery and Cosmetics Sector. Available online: https://abihpec.org.br/publicacao/panorama-do-setor-25/ (accessed on 9 October 2026).
4. Mintel. Brazil Beauty & Personal Care Product Analysis Search Report (in-depth confidential report). 2025.
5. Mintel. Brazil Beauty & Personal Care Market Analysis Search Report (in-depth confidential report). 2025.
6. da Motta Ramos Mendonça, B.; Alves, P.E.; dos Santos, E.P. Revisão bibliográfica acerca da tendência sustentável no desenvolvimento de cosméticos. *Res. Soc. Dev.* **2023**, *12*, e4212239888. https://doi.org/10.33448/rsd-v12i2.39888.
7. Gonçalves, S.; Gaivão, I. Natural Ingredients in Skincare: A Scoping Review of Efficacy and Benefits. *BioMed. Biopharm. Res.* **2023**, *20*, 143–160. https://doi.org/10.19277/bbr.20.2.328.
8. MacGibeny, M.A.; Adjei, S.; Pyle, H.; Bunick, C.G.; Ghannoum, M.; Grada, A.; Harris-Tryon, T.; Tyring, S.K.; Kong, H.H. The human skin microbiome in health. *J. Am. Acad. Dermatol.* **2025**, *93*, 329–336. https://doi.org/10.1016/j.jaad.2024.07.1498.
9. Byrd, A.L.; Belkaid, Y.; Segre, J.A. The human skin microbiome. *Nat. Rev. Microbiol.* **2018**, *16*, 143–155. https://doi.org/10.1038/nrmicro.2017.157.
10. Guet-Revillet, H.; Dompmartin, A.; Join-Lambert, O. Microbiote cutané: Rôle physiologique et pathologique [Translated from French: Skin microbiome: Role in human health and skin inflammatory diseases]. *Rev. Prat.* **2020**, *70*, 653–656. PMID: 33058612.
11. Lee, H.-J.; Kim, M. Skin Barrier Function and the Microbiome. *Int. J. Mol. Sci.* **2022**, *23*, 13071. https://doi.org/10.3390/ijms232113071.
12. Callejon, S.; Giraud, F.; Larue, F.; Buisson, A.; Mateos, L.; Grare, L.; Guyoux, A.; Perrier, E.; Ardiet, N.; Trompezinski, S. Impact of Leave-on Skin Care Products on the Preservation of Skin Microbiome: An Exploration of Ecobiological Approach. *Clin. Cosmet. Investig. Dermatol.* **2023**, *16*, 2727–2735. https://doi.org/10.2147/CCID.S409583.
13. Moreira, N.; Machado, I.; Ribeiro, J.; Prazeres, M.; Lopez, R.; Pinto, C.A.; Saraiva, J.A. Probiotic and Postbiotic Approaches in Modern Dermocosmetics. *Appl. Microbiol.* **2026**, *6*, 69. https://doi.org/10.3390/applmicrobiol6060069.
14. Mintel. The future of Ingredient Transparency in Beauty and Personal Care (in-depth confidential report). 2023.
15. Arora, R.; Kaur, R.; Babbar, R.; Dhingra, S.; Dhingra, A.K.; Grewal, A.S. Evolving Advances in the Cosmetic use of Probiotics and Postbiotics: Health, Regulatory and Marketing Aspects. *Curr Pharm. Biotechnol*. **2024**, *25*, 1349–1361. https://doi.org/10.2174/1389201024666230703115732.
16. Gibson, G.R.; Hutkins, R.; Sanders, M.E.; Prescott, S.L.; Reimer, R.A.; Salminen, S.J.; Scott, K.; Stanton, C.; Swanson, K.S.; Cani, P.D.; et al. Expert consensus document: Expert consensus document: The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics. *Nat. Rev. Gastroenterol. Hepatol.* **2017**, *14*, 491–502. https://doi.org/10.1038/nrgastro.2017.75.
17. . Salminen, S.; Collado, M.C.; Endo, A.; Hill, C.; Lebeer, S.; Quigley, E.M.M.; Sanders, M.E.; Shamir, R.; Swann, J.R.; Szajewska, H.; et al. The International Scientific Association of Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of postbiotics. *Nat. Rev. Gastroenterol. Hepatol.* **2021**, *18*, 649–667. https://doi.org/10.1038/s41575-021-00440-6. Correction in *Nat. Rev. Gastroenterol. Hepatol.* **2022**, *19*, 551. https://doi.org/10.1038/s41575-022-00628-4

18. ISAPP—International Scientific Association for Probiotics and Prebiotics. Available online: https://isappscience.org/a-roundup-of-the-isapp-consensus-definitions-probiotics-prebiotics-synbiotics-postbiotics-and-fermented-foods/ (accessed on 9 October 2026).
19. European Commission. European Commission Regulation (EC) No. 1223/2009. 2009. Available online: http://data.europa.eu/eli/reg/2009/1223/oj/eng (accessed on 9 October 2026).
20. UK Government. UK Government. Regulation (EC) No. 1223/2009 and the Cosmetic Products Enforcement Regulations 2013. Available online: https://www.gov.uk/government/publications/cosmetic-products-enforcement-regulations-2013/regulation-20091223-and-the-cosmetic-products-enforcement-regulations-2013-great-britain (accessed on 9 October 2026).
21. Advertising Standards Authority (UK). Available online: https://www.asa.org.uk (accessed on 9 October 2026).
22. BRAZIL. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução Da Diretoria Colegiada—RDC Nº 241/2018, de 26 de Julho de 2018. Dispõe Sobre Os Requisitos Para Comprovação da Segurança e Dos Benefícios à Saúde Dos Probióticos Para Uso Em Alimentos. Diário Oficial da União; 27 July 2018; 2018. Available online: https://bvsms.saude.gov.br/bvs/saudelegis/ANVISA/2018/rdc0241_26_07_2018.pdf (accessed on 9 October 2026).
23. BRAZIL. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução Da Diretoria Colegiada—RDC Nº 243/2018. Dispõe Sobre Os Requisitos Sanitários Dos Suplementos Alimentares. Diário Oficial da União: 27 July 2018; 2018. Available online: https://www.gov.br/anvisa/en/rules-and-regulations/arquivos/rdc-243_2018.pdf (accessed on 9 October 2026).
24. BRAZIL. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução Da Diretoria Colegiada—RDC Nº 48/2013, de 26 de Julho de 2018. Dispõe Sobre Os Requisitos Para Comprovação Da Segurança e Dos Benefícios à Saúde Dos Probióticos Para Uso Em Alimentos. Diário Oficial da União; 27 July 2018; 2018. Available online: https://www.gov.br/anvisa/en/rules-and-regulations/arquivos/rdc-241_2018.pdf (accessed on 9 October 2026).
25. BRAZIL. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução Da Diretoria Colegiada—RDC Nº 907/2024. Dispõe Sobre a Definição, a Classificação, Os Requisitos Técnicos Para Rotulagem e Embalagem, Os Parâmetros Para Controle Microbiológico, Bem Como Os Requisitos Técnicos e Procedimentos Para a Regularização de Produtos de Higiene Pessoal, Cosméticos e Perfumes. Diário Oficial da União: 19 set 2024; 2024. Available online: https://anvisalegis.datalegis.net/action/UrlPublicasAction.php?acao=abrirAtoPublico&num_ato=00000907&sgl_tipo=RDC&sgl_orgao=RDC/DC/ANVISA/MS&vlr_ano=2024&seq_ato=000&cod_modulo=310&cod_menu=9434 (accessed on 9 October 2026).
26. BRAZIL. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução Da Diretoria Colegiada—RDC Nº 949/2024. 12 Dez 2024. Altera a Resolução Da Diretoria Colegiada—RDC Nº 907, de 19 de Setembro de 2024, e Internaliza a Resolução GMC MERCOSUL Nº 18/2023. Diário Oficial da União: 16 Dec. 2024.; 2024. Available online: https://anvisalegis.datalegis.net/action/ActionDatalegis.php?acao=abrirTextoAto&link=S&tipo=RDC&numeroAto=00000949&seqAto=000&valorAno=2024&orgao=RDC/DC/ANVISA/MS&cod_modulo=310&cod_menu=9431 (accessed on 9 October 2026).
27. Duarte, M.; Oliveira, A.L.; Oliveira, C.; Pintado, M.; Amaro, A.; Madureira, A.R. Current postbiotics in the cosmetic market-an update and development opportunities. *Appl. Microbiol. Biotechnol*. **2022**, *106*, 5879–5891. https://doi.org/10.1007/s00253-022-12116-5
28. da Silva Vale, A.; de Melo Pereira, G.V.; de Oliveira, A.C.; de Carvalho Neto, D.P.; Herrmann, L.W.; Karp, S.G.; Soccol, V.T.; Soccol, C.R. Production, Formulation, and Application of Postbiotics in the Treatment of Skin Conditions. *Fermentation* **2023**, *9*, 264. https://doi.org/10.3390/fermentation9030264.
29. Alipour, M.; Bonyad, R.; Ghasemi, S.; Khoshdooz, P.; Shafiee, F.; Hasannejad-Bibalan, M. Probiotics and Postbiotics for Skin Care Cosmetics. *J. Trop. Med*. **2026**, 3125037, https://doi.org/10.1155/jotm/3125037
30. Mintel. Mintel's Global New Products Database (GNPD). Available online: https://www.mintel.com/products/gnpd/ (accessed on 9 October 2026).
31. INKEEDecoder Search Engine. Available online: https://inkeedecoder.com/ (accessed on 9 October 2026).
32. SkinSkool. SkinSkool—Skincare Comparison Website. Available online: https://skinskoolbeauty.com (accessed on 9 October 2026).
33. Instagram—Meta. Instagram Social Media. Available online: https://www.instagram.com (accessed on 9 October 2026).
34. ANVISA—Agência Nacional de Vigilância Sanitária (National Health Surveillance Agency) Web Portal. 2026. Available online: https://www.gov.br/anvisa/pt-br (accessed on 9 October 2026).
35. U.S. Food and Drug Administration. Cosmetics Laws and Regulations. 2026. Available online: https://www.fda.gov/cosmetics (accessed on 9 October 2026).
36. MERCOSUR. Official Internet Portal Website. 2026. Available online: https://www.mercosur.int/en (accessed on 9 October 2026).

37. Community, A. Decision No. 944: Amendment to Decision No. 833 "Harmonisation of Legislation on Cosmetic Products". Official Gazette of the Cartagena Agreement No. 5663. Official Gazette of the Cartagena Agreement No. 5663. 2025. Available online: https://www.comunidadandina.org/DocOficialesFiles/Gacetas/GACETA%205663.pdf (accessed on 9 October 2026).
38. Personal Care Products Council. International Nomenclature of Cosmetic Ingredients (INCI) Naming Protocols. 2026. Available online: https://www.personalcarecouncil.org/resources/inci/ (accessed on 9 October 2026).
39. Zeng, M.; Li, Y.; Cheng, J.; Wang, J.; Liu, Q. Prebiotic Oligosaccharides in Skin Health: Benefits, Mechanisms, and Cosmetic Applications. *Antioxidants* **2025**, *14*, 754. https://doi.org/10.3390/antiox14060754.
40. Abed, S.M.; Ali, A.H.; Noman, A.; Niazi, S.; Al-Farga, A.; Bakry, A.M. *Inulin as Prebiotics and its Applications in Food Industry and Human Health*; A Review. *Int. J. Agric. Innov. Res.* **2016**, *5*, 3772705.
41. Salli, K.; Lehtinen, M.J.; Tiihonen, K.; Ouwehand, A.C. Xylitol's Health Benefits beyond Dental Health: A Comprehensive Review. *Nutrients* **2019**, *11*, 1813. https://doi.org/10.3390/nu11081813.
42. Verspecht, T.; Van Holm, W.; Boon, N.; Bernaerts, K.; Daep, C.A.; Masters, J.G.; Zayed, N.; Quirynen, M.; Teughels, W. Potential prebiotic substrates modulate composition, metabolism, virulence and inflammatory potential of an in vitro multi-species oral biofilm. *J. Oral Microbiol.* **2021**, *13*, 1910462. https://doi.org/10.1080/20002297.2021.1910462.
43. Sansone, F.; Mencherini, T.; Picerno, P.; d'Amore, M.; Aquino, R.P.; Lauro, M.R. Maltodextrin/pectin microparticles by spray drying as carrier for nutraceutical extracts. *J. Food Eng.* **2011**, *105*, 468–476. https://doi.org/10.1016/j.jfoodeng.2011.03.004.
44. Cosmetic Ingredient Review Expert Panel. Safety Assessment of Lactobacillus Ferment Ingredients as Used in Cosmetics. 2024. Available online: https://www.cir-safety.org/sites/default/files/PostMeetingAnnouncement_062025.pdf (accessed on 9 October 2026).
45. Puebla-Barragan, S.; Reid, G. Probiotics in Cosmetic and Personal Care Products: Trends and Challenges. *Molecules* **2021**, *26*, 1249. https://doi.org/10.3390/molecules26051249.
46. Vinderola, G.; Sanders, M.E.; Salminen, S. The Concept of Postbiotics. *Foods* **2022**, *11*, 1077. https://doi.org/10.3390/foods11081077.
47. HPC Today. *Hair Skinification: An Innovative Perspective in Scalp Care*; HPC Today: Milano, Italy, 2024; Volume 19. Available online: https://www.hpc-today.com/articles/hair-skinification-an-innovative-perspective-in-scalp-care/ (accessed on 9 October 2026).
48. Buffoli, B.; Rinaldi, F.; Labanca, M.; Sorbellini, E.; Trink, A.; Guanziroli, E.; Rezzani, R.; Rodella, L.F. The human hair: From anatomy to physiology. *Int. J. Dermatol.* **2014**, *53*, 331–341. https://doi.org/10.1111/ijd.12362.
49. Plummer, E.L.; Bradshaw, C.S.; Doyle, M.; Fairley, C.K.; Murray, G.L.; Bateson, D.; Masson, L.; Slifirski, J.; Tachedjian, G.; Vodstrcil, L.A. Lactic acid-containing products for bacterial vaginosis and their impact on the vaginal microbiota: A systematic review. *PLoS ONE* **2021**, *16*, e0246953. https://doi.org/10.1371/journal.pone.0246953.
50. Kalinowska-Lis, U.; Mucha, P. Overview of the Composition of Cosmetic Preparations for Intimate Hygiene. *Appl. Sci.* **2026**, *16*, 2293. https://doi.org/10.3390/app16052293.
51. MyMicrobiome. MyMicrobiome Certification—Microbiome-Friendly Certified Products 2026. Available online: https://microbiome-friendly.com/en/ (accessed on 9 October 2026).
52. Santos, Y.R.; Andréo-Filho, N.; Lopes, P.S.; Leite-Silva, V.R. A review of skin microbiome and new challenges to cosmetic microbiome-friendly formulations. *Int. J. Cosmet. Sci.* **2026**, *48*, 780–797. https://doi.org/10.1111/ics.70073.
53. Edmonds-Wilson, S.L.; Nurinova, N.I.; Zapka, C.A.; Fierer, N.; Wilson, M. R Review of human hand microbiome research. *J. Dermatol. Sci.* **2015**, *80*, 3–12. https://doi.org/10.1016/j.jdermsci.2015.07.006.
54. Two, A.M.; Nakatsuji, T.; Kotol, P.F.; Arvanitidou, E.; Du-Thumm, L.; Hata, T.R.; Gallo, R.L. The Cutaneous Microbiome and Aspects of Skin Antimicrobial Defense System Resist Acute Treatment with Topical Skin Cleansers. *J. Investig. Dermatol.* **2016**, *136*, 1950–1954. https://doi.org/10.1016/j.jid.2016.06.612.
55. Fierer, N.; Hamady, M.; Lauber, C.L.; Knight, R. The influence of sex, handedness, and washing on the diversity of hand surface bacteria. *Proc. Natl. Acad. Sci. USA* **2008**, *105*, 17994–17999. https://doi.org/10.1073/pnas.0807920105.
56. Sharma, S.; Ahmad, U.; Akhtar, J.; Islam, A.; Muazzam Khan, M.; Rizvi, N. The Art and Science of Cosmetics: Understanding the Ingredients. In *Cosmetic Products and Industry—New Advances and Applications*; IntechOpen: London, UK, 2023. https://doi.org/10.5772/intechopen.112925.
57. Tandon, A. Impact of cosmetic products on the skin microbiome: Implications for acne-prone skin. *J. Appl. Bioanal.* **2025**, *11*, 36–45. https://doi.org/10.53555/jab.v11i4.313.

58. Bouslimani, A.; da Silva, R.; Kosciolek, T.; Janssen, S.; Callewaert, C.; Amir, A.; Dorrestein, K.; Melnik, A.V.; Zaramela, L.S.; Kim, J.-N.; et al. The impact of skin care products on skin chemistry and microbiome dynamics. *BMC Biol.* **2019**, *17*, 47. https://doi.org/10.1186/s12915-019-0660-6.
59. Pinto, D.; Ciardiello, T.; Franzoni, M.; Pasini, F.; Giuliani, G.; Rinaldi, F. Effect of commonly used cosmetic preservatives on skin resident microflora dynamics. *Sci. Rep.* **2021**, *11*, 8695. https://doi.org/10.1038/s41598-021-88072-3.
60. Ananthapadmanabhan, K.P.; Leyden, J.J.; Hawkins, S.S. Recent Advances in Mild and Moisturizing Cleansers. *J. Drugs Dermatol.* **2019**, *18*, s80–s88. PMID: 30681816.
61. Walters, R.M.; Mao, G.; Gunn, E.T.; Hornby, S. Cleansing Formulations That Respect Skin Barrier Integrity. *Dermatol. Res. Pract.* **2012**, *2012*, 495917. https://doi.org/10.1155/2012/495917.
62. Mijaljica, D.; Spada, F.; Harrison, I.P. Skin Cleansing without or with Compromise: Soaps and Syndets. *Molecules* **2022**, *27*, 2010. https://doi.org/10.3390/molecules27062010.
63. Wojciechowska, K.; Dos Santos Szewczyk, K. The Skin Microbiome and Bioactive Compounds: Mechanisms of Modulation, Dysbiosis, and Dermatological Implications. *Molecules* **2025**, *30*, 4363. https://doi.org/10.3390/molecules30224363.
64. Froebe, C.L.; Simion, F.A.; Rhein, L.D.; Cagan, R.H.; Kligman, A. Stratum corneum Lipid Removal by Surfactants: Relation to in vivo Irritation. *Dermatologica* **1990**, *181*, 277–283. https://doi.org/10.1159/000247822.
65. Bárány, E.; Lindberg, M.; Lodén, M. Biophysical characterization of skin damage and recovery after exposure to different surfactants. *Contact Dermat.* **1999**, *40*, 98–103. https://doi.org/10.1111/j.1600-0536.1999.tb05999.x.
66. Ghosh, S.; Blankschtein, D. Why is sodium cocoyl isethionate (SCI) mild to the skin barrier?–An in vitro investigation based on the relative sizes of the SCI micelles and the skin aqueous pores. *Int. J. Cosmet. Sci.* **2008**, *30*, 310. https://doi.org/10.1111/j.1468-2494.2007.00405_3.x.
67. Seweryn, A. Interactions between surfactants and the skin—Theory and practice. *Adv. Colloid Interface Sci.* **2018**, *256*, 242–255. https://doi.org/10.1016/j.cis.2018.04.002.
68. Zhao, H.; Yu, F.; Wang, C.; Han, Z.; Liu, S.; Chen, D.; Liu, D.; Meng, X.; He, X.; Huang, Z. The impacts of sodium lauroyl sarcosinate in facial cleanser on facial skin microbiome and lipidome. *J. Cosmet. Dermatol.* **2024**, *23*, 1351–1359. https://doi.org/10.1111/jocd.16092.
69. Townsend, N.; Hazan, A.; Dell'Acqua, G. New Topicals to Support a Healthy Scalp While Preserving the Microbiome: A Report of Clinical and in Vitro Studies. *J. Clin. Aesthet. Dermatol.* **2023**, *16*, S4–S11. PMID: 38495927.
70. The European Commission. Commission Regulation (EU) No 655/2013 of 10 July 2013. Laying down Common Criteria for the Justification of Claims Used in Relation to Cosmetic Products. 2013. Available online: https://eur-lex.europa.eu/eli/reg/2013/655/oj/eng (accessed on 9 October 2026).
71. Brazil. Agência Nacional de Vigilância Sanitária (ANVISA). Resolução Da Diretoria Colegiada—RDC Nº 1030/2026 Altera a Resolução Da Diretoria Colegiada—RDC Nº 907, de 19 de Setembro de 2024, e Internaliza a Resolução GMC MERCOSUL Nº 18/2023. Diário Oficial da União; 11 June 2026. Available online: https://anvisalegis.datalegis.net/action/ActionDatalegis.php?acao=detalharAto&tipo=RDC&numeroAto=00001030&seqAto=000&valorAno=2026&orgao=RDC/DC/ANVISA/MS&nomeTitulo=codigos&desItem=&desItemFim=&cod_modulo=134&cod_menu=1696 (accessed on 9 October 2026).

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