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Impact and Outlook of the "*Ecological and Environmental Code of the People's Republic of China: Part Four Green and Low carbon Development*" on the Cosmetics Industry

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In March 2026, the Fourth Session of the 14th National People's Congress adopted the "*Ecological and Environmental Code of the People's Republic of China*" (hereinafter referred to as "*Ecological and Environmental Code*"), which will come into force on August 15, 2026. As the second basic law named "Code" following the "*Civil Code*", this "*Ecological and Environmental Code*" establishes an independent part for Green and Low-Carbon Development for the first time. It systematically builds a top-level institutional framework for green and low-carbon development in the form of basic national law, clarifying the action directions and legal guarantees for green and low-carbon development in all industries. The cosmetics industry is closely linked to people's livelihood consumption, ecological environment and public health. A comprehensive and accurate understanding of the its requirements is essential for the high-quality development of the industry.

This article systematically sorts out the contents of the "*Ecological and Environmental Code of the People's Republic of China: Part Four Green and Low carbon Development*" (hereinafter referred to as "*Green and Low carbon Development Part*"), analyzes its far-reaching impact on the cosmetics industry, and puts forward prospects based on industry practices and the work of our association.

1. Overview of the "*Green and Low carbon Development Part*"

Part Four of the "*Ecological and Environmental Code*", Green and Low-Carbon Development, for the first time incorporates green and low-carbon development, circular economy, energy conservation and carbon reduction, climate change response, as well as the carbon peaking and carbon neutrality goals into a basic legal

framework in a codified and systematic manner. It forms an institutional system that is guiding, fundamental, binding and incentive-based, leading the green transformation of all industries.

(1) General Provisions

As the General Provisions of the entire "*Green and Low carbon Development Part*", this chapter clarifies that the "*Green and Low carbon Development Part*" applies to activities related to the development of circular economy, energy conservation, green and low-carbon transformation, and response to climate change. It systematically establishes the overall goals and basic principles for China to promote the comprehensive green transformation of economic and social development, build a green, low-carbon and circular economic system, advance energy conservation, carbon reduction and efficiency enhancement, steadily achieve carbon peaking and carbon neutrality, and strengthen climate change adaptation capacity.

The "*Ecological and Environmental Code*" puts forward guiding requirements for the green and low-carbon transformation of key areas such as industry, transportation, construction, agriculture and rural areas, improves the supporting and guarantee systems for green and low-carbon standards, statistics, investment, technology and international cooperation, and specifies the responsibilities and obligations of public institutions, enterprises and citizens in green and low-carbon development respectively. It provides a top-level legal basis and comprehensive rules for the implementation of subsequent specific systems such as circular economy, energy transformation and climate change response.

(2) Development of Circular Economy

Centered on the core principles of reduction, reuse and recycling, this chapter defines the overall requirement of "government promotion, market guidance, enterprise implementation and public participation". It systematically builds a full-chain institutional system covering clean production, waste recycling and green consumption.

By promoting green design, strengthening clean production audits, strictly restricting excessive packaging and single-use plastic products, implementing the Extended Producer Responsibility (EPR) system, advancing waste resource utilization and application of recycled materials, as well as guiding green consumption and green supply chain building, the "*Ecological and Environmental Code*" comprehensively regulates resource utilization and waste management in all links of production, circulation and consumption. It provides direct and specific legal basis and codes of conduct for realizing green ingredients, clean production, circular packaging and low-carbon consumption.

(3) Energy Conservation and Green Low-Carbon Transformation

Based on the basic principles of conservation priority, intensive and efficient use, innovation-driven, security guarantee and orderly transformation, this chapter systematically regulates energy conservation management and green low-carbon transformation of the energy structure. It clarifies energy-saving systems such as energy-saving review for fixed-asset investment projects, supervision of key energy-consuming entities, and management of energy efficiency labeling.

The "*Ecological and Environmental Code*" vigorously promotes the clean and efficient utilization and safe replacement of fossil energy, prioritizes the development of non-fossil energy such as wind, solar and biomass energy, accelerates the building of a new clean, low-carbon, safe and efficient energy system and a new power system, and improves supporting mechanisms such as renewable energy consumption guarantee, green power certificates, energy storage and hydrogen energy development. It provides clear institutional guidelines and implementation paths for energy conservation and carbon reduction, green power application and low-carbon transformation at the production end.

(4) Response to Climate Change

Adhering to the principle of equal emphasis on mitigation and adaptation, this chapter brings the goals of carbon peaking and carbon neutrality into the track of the rule of

law in an all-round way. It systematically establishes core systems such as total carbon emission and intensity control, carbon emission statistics and accounting, product carbon footprint management, national carbon emission trading and voluntary greenhouse gas emission reduction trading.

The "*Ecological and Environmental Code*" strives to consolidate and enhance the carbon sink capacity of ecosystems, strengthens climate risk assessment, extreme weather monitoring and early warning, and climate adaptation capacity building in key areas. Based on international norms such as "common but differentiated responsibilities", it deepens international cooperation in green economy and trade, technology and standards, and actively participates in and leads global climate governance. It provides a solid legal guarantee and action guidance for carbon management, carbon disclosure, carbon emission reduction and compliance with international green trade rules.

2. Impact of the Implementation of the Code on the Cosmetics Industry

(1) Industrial Level

The "*Ecological and Environmental Code*" covers green and low-carbon requirements across the entire chain: ingredient procurement, manufacturing, packaging design, circulation and sales, use and recycling. Enterprises must fulfill obligations of clean production audit, compliance discharge, energy conservation and carbon reduction, prohibit excessive packaging, restrict non-degradable single-use plastic products, and perform the main responsibility of packaging recycling. The "*Ecological and Environmental Code*" encourages green ingredients, low-carbon formulations and clean production; packaging is transforming to recyclable, easy-to-recycle and degradable forms, with an increasing proportion of recycled materials; carbon footprint accounting and green certification become key factors for product market access and brand competition, and green supply chains become important thresholds for cooperation among enterprises. Cosmetics enterprises need to accelerate the building of green industrial chains and improve the full-life-cycle green governance capacity.

(2) Market Level

Guided by the "*Ecological and Environmental Code*", China advocates green consumption, restricts single-use products, and guides consumers to prioritize green and low-carbon products; government green procurement and green labeling on e-commerce platforms further strengthen market orientation, driving enterprises to shift from "passive compliance" to "active green innovation" to seize market share with green products. Green and low-carbon development will change from "added value" to basic competitiveness, and the green transformation of consumer market will be accelerated.

(3) Industry Level

The "*Ecological and Environmental Code*" strengthens diversified co-governance and provides a legal basis for industry associations to participate in standard formulation, policy publicity, self-regulation guidance and enterprise services. In the future, the cosmetics industry will accelerate the formation of a new green and low-carbon governance pattern featuring government supervision, association guidance, enterprise implementation and public supervision, and the overall standardization and greening level of the industry will continue to be improved.

3. Conclusion and Outlook

The promulgation and implementation of the "*Ecological and Environmental Code*" mark that China's green and low-carbon development has officially entered a new stage of legalization, standardization and systematization, and also provides key support for the green transformation and high-quality development of the cosmetics industry. The "*Green and Low carbon Development Part*" focuses on key areas such as circular economy development, clean and low-carbon manufacturing, green packaging recycling and green standard building, which are not only the core directions of industrial transformation but also the key starting points for our association to fulfill its functional value.

Based on industry development needs and the functional positioning of our Association, future priorities will focus on three aspects:

Firstly, improve the building of the green standard system. our association will continue to act as a bridge between the government and enterprises, take the lead in building a green and low-carbon standard system suitable for the cosmetics industry, and promote the in-depth integration of standards with key areas such as ingredient selection, clean production, packaging recycling and green consumption, providing unified and standardized guidance for industry development.

Secondly, promote the effective implementation of green practices. Based on industry realities, our association will guide enterprises to implement the relevant requirements of the "*Ecological and Environmental Code*", promote advanced technologies and experience in green development, standardize enterprise production and operation behaviors, help enterprises reduce costs, improve efficiency and enhance market competitiveness; meanwhile, strengthen the dissemination of green consumption concepts, cultivate green consumption habits, and promote the transformation of consumption patterns to green and low-carbon.

Thirdly, deepen international exchanges and cooperation. Our association will actively build an international exchange platform, promote the industry's in-depth participation in global green governance, help enterprises connect with international resources and expand international markets, promote the internationalization of China's cosmetics industry's green and low-carbon standards, technologies and products, and enhance the industry's international influence and brand competitiveness.

In the future, CACHCA will take the "*Green and Low carbon Development Part*" of the "*Ecological and Environmental Code*" as the fundamental guideline, base on industry realities, fulfill service functions and strengthen the leading role: continuously improve the green standard system, promote the implementation of government green development support policies, guide the industry to practice the concept of green development, foster green consumption trends, build an international exchange and cooperation platform, help build a green, low-carbon and circular economic system for the cosmetics industry, and contribute to China's ecological civilization construction and high-quality economic and social development.

Laws and Regulations

- Establishment of Chapter 1109 Test for Burkholderia cepacia Complex in the Chinese Pharmacopoeia 2025 Edition
- China Domestic and International Regulatory Status of the Burkholderia cepacia Complex (Bcc)
- Digital Compliance · One Code for Global Access:
  Huake CloudLetter Empowers a New Era of Cosmetics Electronic Labeling
- Interpretation of the Pilot Policy for Electronic Labeling of Cosmetics

Establishment of Chapter 1109 Test for Burkholderia cepacia Complex in the Chinese Pharmacopoeia 2025 Edition

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Abstract Objective: To develop a standardized Burkholderia cepacia complex (referred to as "Bcc") testing method for the "*Pharmacopoeia of the People's Republic of China*" (referred to as the "*Chinese Pharmacopoeia*") 2025 Edition, thereby enhancing the national standards for China's pharmaceutical microbial contamination control and improving regulatory oversight. **Methods:** A systematic methodological evaluation of Bcc detection protocols was conducted by referring to the international standards for pharmaceuticals, cosmetics, and related products. By collaborating with 11 drug control laboratories under a national pharmaceutical standards enhancement initiative, critical parameters were optimized, including enrichment conditions, selective media, and confirmatory assays. Method validation was performed using both spiked and real-world samples, followed by iterative revisions based on interlaboratory verification. **Results:** The reference strains for quality control, an optimized enrichment and isolation system, and selective culture media with improved specificity were specified in the finalized "*Chinese Pharmacopoeia*" 2025 Edition Bcc test method. Additionally, a definitive species-level taxonomic list of Bcc members was incorporated to facilitate accurate strain identification. **Conclusion:** On the basis of aligning with global regulatory standards, the establishment and inclusion of the Bcc test method addresses critical gaps in China's pharmaceutical microbiological quality control. Its adoption in the "*Chinese Pharmacopoeia*" 2025 Edition represents a pivotal advancement in the compendium's microbial standards, ensuring enhanced detection of opportunistic pathogens in pharmaceutical products.

Keywords: Chinese Pharmacopoeia; Burkholderia cepacia complex; control of microbial contamination; compilation of pharmacopoeia standards; test method

The "*Pharmacopoeia of the People's Republic of China*" (referred to as the "*Chinese Pharmacopoeia*") is the statutory technical requirement that must be followed in all links of pharmaceutical production, circulation, application and supervision. In recent years, the concept of pharmaceutical quality control has gradually shifted from "finished product testing" to "production process control", which is embodied in the formulation of the "*Chinese Pharmacopoeia*" 2025 Edition. To further improve the microbial standard system of the "*Chinese Pharmacopoeia*", the "*Chinese Pharmacopoeia*" 2025 Edition includes for the first time the Burkholderia cepacia Complex (Bcc) testing method (hereinafter referred to as General Chapter 1109), establishing a standardized culture-based detection method for Bcc. The inclusion of this standard not only aligns with international standards but also is based on the reality of China's pharmaceutical industry, fully considering the current situation and demands of China domestic pharmaceutical production, quality control and supervision.

This paper introduces the formulation background, structure, main framework and key content analysis of the Bcc testing method, aiming to help users and implementers better understand and apply the standard, promote its scientific implementation, and boost the improvement of China's pharmaceutical microbial control level and the high-quality development of the industry.

1. Formulation Background of the Testing Method

In the "*Chinese Pharmacopoeia*" 2020 Edition, Microbiological Examination of Non-sterile Products: Microbial Enumeration Test (General Chapter 1105)[1] and Microbiological Examination of Non-sterile Products: Test for Specified Microorganisms (General Chapter 1106)[1] specify quantitative or qualitative methods for the examination of microbial counts and specified microorganisms in non-sterile products. Microbiological Examination of Non-sterile Products: Acceptance Criteria for Pharmaceutical Preparations and Substances for Pharmaceutical Use (General Chapter 1107)[1] lays down the control requirements for the quantity and specified species of contaminating microorganisms in products of different dosage forms. This

overall control strategy is basically consistent with the harmonized texts formulated by the "*United States Pharmacopoeia*" (USP), European Pharmacopoeia and Japanese Pharmacopoeia under the framework of the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH). In addition, General Chapter 1107 mentions that in addition to the seven categories of specified microorganisms currently specified in the Pharmacopoeia (bile-tolerant Gram-negative bacteria, Escherichia coli, Pseudomonas aeruginosa, Salmonella, Staphylococcus aureus, Clostridia, Candida albicans), other potentially harmful microorganisms may need to be tested according to the characteristics and uses of raw materials, excipients and their preparations, as well as the production technique of preparations. The <1111> Microbiological Examination of Nonsterile Products: Acceptance Criteria for Pharmaceutical Preparations and Substances for Pharmaceutical Use in the "*United States Pharmacopoeia*" (USP <1111>) has similar suggestions to General Chapter 1107. Bioburden Control of Nonsterile Drug Substances and Products in the "*United States Pharmacopoeia*" (USP <1115>) further explains potentially harmful microorganisms: it is impractical to list targeted objectionable microorganisms for each product, because such "objectionability" needs to be comprehensively evaluated by manufacturers based on the attributes of the product or raw materials (including route of administration and target population). Objectionable microorganisms refer to those known to be pathogenic to patients under the corresponding route of administration. The Parenteral Drug Association (PDA) elaborates on the concept, characteristics, evaluation, risk analysis in production process and inspection control strategies of objectionable microorganisms in pharmaceuticals, medical devices and cosmetics in its Technical Report No. 67[2].

Bcc is a collective term for a group of Gram-negative bacteria that are phenotypically similar, genotypically different and widely present in the environment, belonging to the genus Burkholderia[3]. It is a typical objectionable microorganism. Due to its clinical harm, growth characteristics and inherent multidrug resistance, Bcc has attracted extensive attention from administration departments and the pharmaceutical industry[4]. In recent years, Chinese and US drug regulators have successively put

forward control requirements for Bcc, reminding enterprises to pay attention to the risk of Bcc contamination in high-risk water-based products[5-6].

According to the U.S. Food and Drug Administration (FDA) recall data statistics, Bcc contamination accounted for 34% of non-sterile drug recall cases caused by objectionable microorganisms from 2012 to 2023[7]. In 2018, Bcc contamination was also found in some gels in China[8]. Accurate and efficient detection of Bcc is one of the necessary conditions for its risk control. The "*United States Pharmacopoeia*" first included the testing method for Bcc in non-sterile products in Supplement 2 of USP 42 on December 1, 2019 (USP <60> Microbiological Examination of Nonsterile Products: Tests for Burkholderia cepacia Complex)[9], while there was no targeted Bcc detection method for pharmaceuticals in China at that time. To promote the improvement of pharmacopoeial microbial test standards and enhance the quality control level of non-sterile pharmaceuticals, the Microbiology Committee of the National Pharmacopoeia Commission decided to formulate the Bcc testing method. For scientific and orderly development of the formulation, the National Pharmacopoeia Commission approved the standard improvement project in April 2019, which was undertaken by the National Institutes for Food and Drug Control (NIFDC), jointly with 11 provincial and municipal drug control institutes to carry out systematic research on the Bcc testing method. The research contents included investigation and comparison of China domestic and foreign standards, collection of Bcc reference strains and pharmaceutical environmental strains, growth of Bcc in liquid enrichment systems, optimization of Bcc selective and isolation media, polyphasic classification and identification of Bcc, drafting and review of the standard, etc. After nearly two years of research, the project was accepted by the National Pharmacopoeia Commission in April 2021. After repeated reviews and revisions by the Microbiology Committee, the draft testing method was released to the public for two rounds of publicity to extensively solicit opinions and suggestions from standard users and implementing entities, and was further revised and improved. Finally, the Bcc testing method included in the "*Chinese Pharmacopoeia*" 2025 Edition was formed.

2. Structure and Framework of the Testing Method

The Bcc testing method is a qualitative detection method for non-sterile products, designed to check whether the test sample is contaminated with Bcc. At present, only the "*United States Pharmacopeia*" includes the Bcc testing method internationally, and this standard has not been included in the ICH scope. The structure of the Bcc testing method in the "*Chinese Pharmacopoeia*" refers to General Chapter 1106. In view of the fact that the existing Bcc testing methods for pharmaceuticals and cosmetics are all based on classical culture methods, the testing steps of this method follow the procedures of specified microorganism tests, including preparation of test solution, enrichment culture, selective and isolation culture, and result judgment. In the process of standard formulation, in addition to referring to existing standard methods, sufficient experimental research data were relied on to ensure that the testing method is scientific, reliable and easy to operate.

3. Analysis of Key Contents

3.1 Scope of Application

The Bcc testing method is a qualitative test for contamination of non-sterile products with Bcc, and does not involve acceptance criteria requirements. At present, General Chapter 1107 does not specify clear control requirements for Bcc. Although in the industry, the water-based products are generally regarded as high-risk product types for Bcc contamination, enterprises still need to independently clarify which specific varieties require Bcc testing and control based on risk assessment. Standard users and implementers can conduct assessment with reference to the monographs of the Pharmacopoeia, Guideline for Risk Assessment and Control of Objectionable Microorganisms in Non-sterile Pharmaceuticals (General Chapter 9212) of the "*Chinese Pharmacopoeia*" 2025 Edition, PDA Technical Report No. 67, as well as "*Common Pharmaceutical Issues and Relevant Technical Requirements for Pre NDA Meetings of Innovative Chemical Drugs*" and "*Guideline for the Study of Microbiological Limits of Non Sterile Chemical Drugs and Raw Materials*" issued by the Center for Drug Evaluation (CDE) of the National Medical Products Administration, so as to determine the Bcc testing and control strategy for products. With the implementation and

promotion of the Bcc testing method, the requirements on its scope of application will be improved in due course according to industry feedback and regulatory demands.

3.2 Selection of Reference Strains

Bcc is a collective term for more than 20 closely related species. When determining the test reference strains for the testing method, on the one hand, reference was made to the test strain selection in USP <60>, and on the other hand, the representativeness of strains in the inspection and detection process was considered. USP <60> selects three species with the highest clinical isolation frequency as representatives to indicate their clinical harmfulness. In the project research, the contamination of pharmaceuticals and production water systems in China was investigated, and the growth characteristics of isolated strains were studied. In the formulation of the Bcc testing method in the "*Chinese Pharmacopoeia*", comprehensively considering strain representativeness, actual contamination status, project research data and strain resource availability, Burkholderia cepacia, Burkholderia cenocepacia and Burkholderia aenigmatica were finally determined as the test reference strains. The corresponding reference strains are preserved, prepared and supplied to the public by the National Center for Medical Culture Collections (CMCC), with the strain numbers CMCC(B)23005, CMCC(B)23006 and CMCC(B)23010 respectively. The test strains for verifying the inhibitory ability of media applicability are determined as Staphylococcus aureus [CMCC(B)26003] and Pseudomonas aeruginosa [CMCC(B)10104].

3.3 Selective and Isolation Media

Selective and isolation culture is one of the key factors for effective detection of target strains. Its growth-promoting ability, inhibitory ability and indicating characteristics are closely related to the formula composition of the medium. Literature research shows that the formula of Bcc selective medium basically consists of three parts: nutrients, pH indicator and bacteriostatic substances. To screen more suitable selective and isolation media for Bcc testing, the research team carried out carbon source utilization tests on 60 Bcc reference strains and wild strains isolated from the environment or samples. The results showed that Bcc strains cannot use lactose as a carbon source, and some

species can use sucrose, which is consistent with the report in Bergey's Manual of Systematic Bacteriology[12]. This finding provides data support for the selection of carbon sources in the medium[13]. To achieve better indicating characteristics of the selective medium and facilitate observation and judgment by experimenters, the content of phenol red and initial pH value in the medium were determined in combination with the pH indication range of phenol red. In the project research, two mainstream selective media were compared: Burkholderia cepacia Selective Agar (BCSA) included in USP <60> and Burkholderia cepacia Agar (BCA) used in import and export inspection and quarantine standards. Combined with the above optimization considerations, the medium formula was adjusted to form the selective and isolation medium in the Bcc testing method of the "*Chinese Pharmacopoeia*", namely Burkholderia cepacia Complex Selective Agar (BCCSA). The medium applicability study results showed that BCCSA has better growth-promoting ability and indicating characteristics than BCSA and BCA, and can achieve equivalent inhibitory ability[11].

3.4 Classification and Result Judgment of Bcc

According to the requirements of General Chapter 1109 and Guideline for Identification of Microorganisms in the "*Chinese Pharmacopoeia*" 2020 Edition (General Chapter 9204)[1], the identification level required for Bcc testing result judgment is at the complex level. Up to now, more than 27 named species belong to Bcc. In a study on Bcc classification, researchers constructed a maximum likelihood phylogenetic tree based on the concatenated amino acid alignment of 1005 single-copy homologous genes of 116 Bcc genomes. These Bcc strains clustered into 36 clades, indicating that the number of species-level members of Bcc will further increase in the future[14]. Existing identification methods usually give results of genus, species or strain when identifying unknown strains. As a special taxon, Bcc does not belong to the above conventional result presentation units. Therefore, considering the above problems that users and implementers will face in actual operation, the Bcc testing method of the "*Chinese Pharmacopoeia*" adds a list of existing species-level members of Bcc, aiming to help experimenters compare and distinguish whether the identification result of the test strain belongs to the Bcc taxon during result judgment. Different identification methods

can achieve different identification levels for Bcc. Experimenters can select appropriate methods according to the detection purpose and laboratory identification technology reserves. In addition, for suspected bacteria growing on the selective medium, from the perspective of risk control, they can cross the high-concentration antibiotic barrier, and regardless of whether they are Bcc, assessment should be carried out to judge their safety risk to the product.

4. Summary and Prospect

On the one hand, the newly added Bcc testing method in the "*Chinese Pharmacopoeia*" 2025 Edition adopts the same detection process as the specified microorganism testing method and USP <60> Bcc testing method, namely enrichment culture →selective culture →identification, so that the specificity, detection limit and other parameters of the method can meet the inspection requirements, and it is convenient for acceptance and implementation by various laboratories. On the other hand, the Bcc testing method of the "*Chinese Pharmacopoeia*" also has a number of innovations and developments, such as adopting further optimized selective media, selecting reference strains more suitable for pharmaceutical testing, and innovatively putting forward a clear Bcc member list to support result judgment. These innovations and developments are based on sufficient research data of the project, and at the same time take into account the characteristics of China's pharmaceutical industry and the core position of China's national pharmaceutical standards, reflecting the scientificity, advancement, practicability and standardization upheld by the "*Chinese Pharmacopoeia*".

In conclusion, the inclusion of the Bcc testing method implements the microbial standard building concept of the "*Chinese Pharmacopoeia*" 2025 Edition, aligns with international standards, and responds to the requirements of full life cycle quality control of pharmaceuticals. The formulation of the Bcc testing method is based on the reality of China's pharmaceutical production, with the original intention of improving the applicability of standards and serving the high-quality development of the industry, and the goal of ensuring the smooth implementation of standards. It will effectively promote the improvement of China's pharmaceutical standard system

and play an important role in the high-quality development of China's pharmaceutical industry.

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China Domestic and International Regulatory Status of the Burkholderia cepacia Complex (Bcc)

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On February 6, 2026, the National Institutes for Food and Drug Control (NIFDC) publicly collected comments on six cosmetic standards, including the *General Rules for Microbiological Examination of Cosmetics (Draft for Comments)*, among which the detection method for Burkholderia cepacia complex (Bcc) is a newly added method.

The current *Safety and Technical Standards for Cosmetics (2015 Edition)* only specifies five microbiological indicators: total aerobic microbial count, total combined yeasts and molds count, thermotolerant coliform bacteria, Staphylococcus aureus, and Pseudomonas aeruginosa. Among these, the latter three pathogenic organisms are stipulated as "not detected," while no restrictions have yet been established for Bcc. To explore the background and significance of this newly added detection method, this article reviews and analyzes the current regulatory status of this bacterial complex at home and abroad for industry reference.

Characteristics and Hazards of Bcc

The Burkholderia cepacia complex (Bcc) is a group of Gram-negative opportunistic pathogens comprising more than 20 closely related species within the genus Burkholderia. Widely distributed in the environment, Bcc exhibits strong drug resistance and significant pathogenicity to immunocompromised individuals, capable of causing severe infectious diseases such as pulmonary infections, sepsis and urinary tract infections.

This bacterial complex possesses strong concealment; contamination of products

generally does not result in obvious problems such as off-odors or discoloration, making it prone to missed detection in routine total aerobic microbial count testing. Meanwhile, its survival capability is extremely robust—it readily colonizes purified water systems and pipeline interiors during production, forming biofilms that enable it to evade routine cleaning, disinfection procedures, and the effects of preservatives, thereby causing continuous contamination of products. Furthermore, Bcc demonstrates prominent drug resistance, showing natural tolerance to commonly used cosmetic preservatives such as phenoxyethanol and sodium benzoate, which increases the difficulty of preventing and controlling subsequent contamination. Due to these characteristics, Bcc has become a significant contaminant in pharmaceutical products, cosmetics and hygiene products.

Current Regulatory Status of Burkholderia cepacia Complex in China

In the pharmaceutical sector, the Bcc has been listed as an objectionable microorganism in the 2025 edition of the *Chinese Pharmacopoeia*, with the Burkholderia cepacia Complex Test Method incorporated in the General Chapters of Part IV. In the Common General Technical Q&A released by the Center for Drug Evaluation (CDE) of the National Medical Products Administration (NMPA) on February 4 this year, it was clarified that for non-sterile preparations for inhalation use, as well as non-sterile aqueous preparations for oral, mucosal, dermal, and nasal administration, enterprises should conduct studies with reference to the pharmacopoeial test methods and incorporate the testing for this bacterial complex into drug registration standards—that is, pharmaceutical enterprises are required to establish comprehensive control and detection systems with zero tolerance for detection.

In the cosmetics sector, the existing test methods for Burkholderia cepacia in China are the industry standards SN/T 4684-2016 Method for the Detection of Burkholderia cepacia in Import and Export Cosmetics and SN/T 4485-2016 Method for the Detection of Burkholderia cepacia in Import and Export Oral Cleaning Products, administered by the General Administration of Quality Supervision, Inspection and Quarantine and under the jurisdiction of the Certification and Accreditation Administration. These

standards officially came into effect on February 1, 2017, and were developed against the background of quality disputes arising from microbial contamination in cosmetics during international trade. The current public consultation by NIFDC on the newly added detection method for this bacterial complex marks the gradual advancement of regulatory efforts regarding Bcc in China's cosmetics sector.

Regulatory Status of Burkholderia cepacia Complex Abroad

Across major global cosmetics consumption and production regions, regulatory requirements for this bacterial complex vary. The United States has proposed relevant testing recommendations, while the European Union, Japan, and South Korea have not yet established restrictions. The specific regulatory situations are as follows:

1. United States

The U.S. Food and Drug Administration (FDA) began paying attention to Burkholderia cepacia complex in 1980, when several patient deaths were suspected to be linked to contamination of an inhalation product by this bacterial complex. Since then, the FDA has gradually strengthened risk assessment and regulation of Bcc. Currently, the FDA has listed Burkholderia cepacia complex as an objectionable microorganism in pharmaceuticals, requiring enterprises to strictly control product quality with zero tolerance for detection. Regarding the cosmetics sector, although no specific regulatory provisions have been issued, the FDA explicitly recommends that testing be conducted with reference to the United States Pharmacopeia (USP) General Chapter <60> Microbiological Examination of Nonsterile Products for Burkholderia cepacia Complex, particularly applicable to water-based cosmetics and cosmetic categories that may contact mucous membranes or wounds.

2. European Union

The European Union adopts EN ISO 17516:2014 Cosmetics–Microbiology–Microbiological Limits as the authoritative reference standard for microbiological limits in cosmetics. This standard explicitly stipulates that four pathogenic organisms–Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli, and Candida albicans–must not be detected. To date, no restrictions have been established for Burkholderia cepacia complex.

3. Japan and South Korea

Japan manages microbiological limits for cosmetics and quasi-drugs with reference to EU standards, with enterprises voluntarily adopting EN ISO 17516:2014 for relevant work. No restrictions have been established for Burkholderia cepacia complex.

South Korea conducts microbiological management of cosmetics in accordance with the Cosmetics Safety Standards issued by the Ministry of Food and Drug Safety (MFDS). The pathogenic organisms required for testing include Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa. Similarly, no restrictions have been proposed for Burkholderia cepacia complex.

Conclusion

As an opportunistic pathogen characterized by concealment, pathogenicity, and drug resistance, Burkholderia cepacia complex has increasingly attracted attention in cosmetics, pharmaceutical products, and other sectors, with related regulatory efforts being progressively advanced. From the current global regulatory trends, the regulation of this bacterial complex is developing from the pharmaceutical sector toward the cosmetics sector, and from voluntary testing toward mandatory requirements. Enterprises are advised to pay attention to detection technologies for this microorganism and cosmetic safety requirements to effectively ensure product quality and safety.

Digital Compliance · One Code for Global Access: Huake CloudLetter Empowers a New Era of Cosmetics Electronic Labeling

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Abstract: Amid the global shift toward digitalization, green development and compliance in the cosmetics industry, China has fully launched its cosmetics electronic labeling pilot program, marking a new digital and international stage for industry labeling management. As a wholly-owned subsidiary of the Information Center of the National Medical Products Administration (NMPA), Huake Pharmaceutical Technology Co., Ltd. has deeply participated in policy formulation, technology R&D and pilot implementation. It independently developed the Huake CloudLetter Cosmetics Electronic Labeling Management Platform, building an end-to-end solution backed by authoritative policies, secure data and cutting-edge technology to deliver multi-stakeholder value for regulators, enterprises, consumers and the global market. This article systematically interprets the cosmetics electronic labeling pilot policy, introduces Huake's strengths and the platform's core capabilities, and provides authoritative answers to frequently asked questions from enterprises. It offers professional guidance and practical pathways for cosmetics enterprises to pursue digital transformation, compliance implementation and global development, helping China's beauty industry achieve compliance upgrades, cost reduction, efficiency gains and one-code global access.

Keywords: cosmetics electronic labeling; digital supervision; fFull lifecycle management; anti-counterfeiting & traceability; international compliance; Huake CloudLetter

1. Policy Leadership: Cosmetics Electronic Labeling Launches a New Journey for High-Quality Industry Development

1.1 Background and Core Significance of the Policy

With the full implementation of the *Cosmetic Supervision and Administration Regulation* (CSAR) and the *Administrative Measures on Cosmetic Labeling*, China's cosmetics labeling supervision has entered a new stage of legalization, refinement and digitalization. Traditional paper labeling suffer from common pain points: insufficient space for small-pack labeling, high costs for information updates, weak traceability and anti-counterfeiting, poor accessibility for the elderly, and mounting pressure for green transformation. These shortcomings no longer meet the needs of high-quality industrial development and global competition.

On October 20, 2025, the NMPA officially issued the *Notice on Launching the Pilot Program for Cosmetics Electronic Labeling* [1] (NMPA Cosmetics [2025] No. 16), launching a three-year pilot in six provinces and municipalities: Beijing, Shanghai, Zhejiang, Shandong, Guangdong and Chongqing. Hainan's offshore duty-free cosmetics are implemented by reference. As a statutory component of cosmetics labeling, electronic labeling has the same legal effect as paper labeling. It is a key enabler of digital supervision, industrial greening, consumer transparency and global trade, representing a milestone in improving regulatory efficiency, protecting consumer safety, reducing corporate costs and enhancing international competitiveness.

1.2 Authoritative Interpretation of Key Pilot Policy Points

(1) Legal Status

Electronic labeling is a statutory part of cosmetics labeling and must be fully consistent with paper labeling information. They must strictly comply with the CSAR [2], the *Administrative Measures on Cosmetic Labeling* [3] and relevant pilot specifications to ensure authenticity, completeness, traceability and immutability.

(2) Main Regulatory Requirements

① Complete Labeling: Electronic labeling must display all statutorily required content with no omissions.

② Content Consistency: Must fully match registration/notification information and labeling drafts, with no over-range display.

③ Notification for Any Change: All changes to electronic labeling information require a notification procedure.

④ Secondary Page Rules: Traceability, anti-counterfeiting, official website and other jumpable secondary pages are not part of electronic labeling and do not require notification, but must be clearly indicated.

⑤ Code Assignment Rules: Each smallest sales unit must be coded with a clearly scannable QR code, labeled "Cosmetics Electronic Labeling" or "Toothpaste Electronic Labeling" underneath.

(3) Pilot Scope and Value

The pilot covers the entire chain of cosmetics production, operation, import and application, balancing four goals: stronger regulation, lower corporate costs, safer consumption and global compatibility. It lays a solid foundation for nationwide rollout and international mutual recognition.

(4) International Orientation

The policy aligns with international regulatory systems such as the EU CPNP, US FDA MoCRA and Japan's Pharmaceutical Affairs Law. It supports the GS1 international standard and global traceability, helping Chinese beauty products achieve compliance for export, one-code access and global trust.

2. State-Owned Enterprise Commitment: Huake – A Leader in Digital Compliance for Cosmetics

2.1 Company Profile and Authoritative Background

Founded in 1993, Huake Pharmaceutical Technology Co., Ltd. (hereinafter referred to as Huake) is a wholly-owned subsidiary of the Information Center of the NMPA (China Food and Drug Regulatory Data Center). With over 30 years of expertise in research and digital development for pharmaceuticals, medical devices and cosmetics, Huake specializes in data processing, software development, technical consulting, information system integration, intellectual property services, conferences and training.

It long serves the NMPA, local regulatory bodies, leading China domestic and international enterprises and internet platforms. Huake possesses five core capabilities: policy insight, data resources, technology R&D, project implementation and security assurance. It upholds state-owned enterprise responsibility and professional expertise to safeguard high-quality industrial development.

2.2 Huake's Core Role in Cosmetics Electronic Labeling

(1) Deep Participation in Policy Formulation

In 2021, Huake took the lead in launching dedicated R&D for cosmetics electronic labeling. It fully participated in drafting the pilot work plan, technical specifications and datasets, precisely grasping regulatory requirements and policy guidelines to provide comprehensive, professional and authoritative compliance support for the industry.

(2) Independent & Controllable Technology Platform

Huake independently built the Huake CloudLetter Cosmetics Electronic Labeling Management Platform (hereinafter referred to as Huake CloudLetter), establishing a digital management system covering production, circulation, consumption and supervision. The platform holds authoritative certifications including Cybersecurity Class III Protection, ISO20000, ISO27001 and ISO9001, ensuring security, compliance and stability.

(3) Comprehensive Pilot Implementation

As of April 2026, Huake has partnered with dozens of well-known China domestic and international brands, including Estée Lauder, L'Oréal, Shiseido Liyuan, Colgate, Amorepacific, Sephora, Mentholatum, Kosé, Yangshengtang, Marubi and Miqi Bio (in no particular order), and has built a cooperative ecosystem. Supported by an international-standard technical system, it has formed a replicable, scalable and internationally compatible industry benchmark model, laying the groundwork for nationwide rollout and cross-border application of cosmetics electronic labeling.

(4) One-Stop Ecological Service Building

Huake collaborates with high-quality industrial partners to build a full-chain managed service system: policy consultation → label design → coding implementation → notification declaration → traceability operation → global adaptation. Through standardized processes, professional support and integrated solutions, it greatly lowers technical barriers, time costs and trial-and-error risks for enterprises in digital transformation, helping them complete digital upgrades efficiently.

3. Platform Empowerment: Huake CloudLetter – An End-to-End Digital Compliance Solution

3.1 Platform Positioning and Core Principles

Huake CloudLetter is committed to "compliance, efficiency, security, traceability and industry empowerment". It deeply integrates regulatory requirements, corporate digital transformation needs and consumer rights, connects with the cosmetics registration and notification database, and uses advanced technologies to enable cloud synchronization, traceability, anti-tampering and easy iteration of labeling information. It solves industry pain points in one stop and injects strong momentum into high-quality industry development.

3.2 Three Core Advantages of the Platform

(1) Policy Compliance

The platform iterates synchronously with regulatory policy updates, with system functions aligned to pilot requirements. It provides intelligent form-filling and automatic data validation to boost notification efficiency. Backed by an expert team, it offers one-stop services including policy interpretation and declaration guidance.

(2) Data Security

The platform uses state-owned cloud storage with full SSL encrypted transmission and has obtained Cybersecurity Class III Protection certification. It ensures long-term data retention, immutability and multiple backups for robust security. It also opens API interfaces for seamless integration with ERP, WMS and other corporate business

systems, delivering strong compatibility and scalability.

(3) Technical Service

The platform supports multi-dimensional coding: product category, batch and SKU. It offers both SaaS lightweight services and local private deployment. It fully covers user management, labeling management, scan query, traceability & anti-counterfeiting and international adaptation. Supported by a 7×24-hour operation system and expert full-process accompanying implementation, it ensures stable performance from system launch to daily operation, meeting personalized and large-scale application needs of enterprises of all sizes.

3.3 Full-Scenario Platform Capabilities

(1) Enterprise Side: Efficient Compliance and Cost, Efficiency Improvement

Supports one-click label generation and code-free updates for changes. Equipped with an intelligent compliance review mechanism, it enables end-to-end traceability in production and circulation, greatly improving label compliance efficiency and digital operation capabilities.

(2) Consumer Side: Convenience & Transparency, Rights Protection

Consumers can scan to view full product information, with text zoom and voice broadcast. It also provides anti-counterfeiting verification and secondary page jumps, fully protecting consumers' right to information and choice.

(3) Regulator Side: Precision Empowerment, Scientific Governance

Provides regulators with scan verification, real-time data aggregation and intelligent risk early warning, enabling precise and scientific supervision to drive industry compliance.

(4) Global Side: Global Adaptation, Smooth Cross-Border Trade

Compatible with the GS1 international standard, it supports global product traceability and cross-border compliance adaptation, helping enterprises expand overseas markets.

3.4 One-Stop Implementation Services

(1) Pilot Application Guidance: Full-process support for pilot qualification applications and liaison with regulators to improve approval rates.

(2) Code Application & Planning: Agency for code application and customized coding rule planning in line with international and regulatory standards.

(3) Labeling Compliance Design: Graphic design and pre-review of labeling tailored to product features and compliance rules to meet regulatory standards.

(4) Coding Line Retrofit (Manual/Automatic): Equipment selection and line adaptation solutions for efficient and accurate coding.

(5) Notification Declaration Assistance: Support for organizing and submitting label-related notification materials to speed up approval.

(6) System Deployment & Operation: SaaS/private deployment, operator training and 7×24-hour technical support.

(7) Policy Updates & Function Iteration: Real-time synchronization with regulatory policies and free system upgrades for long-term compliance.

4. Global Vision: Electronic Labeling Leads Future Trends in the Beauty Industry

4.1 Global Wave of Digital Labeling Development

The global beauty industry is at a critical window for large-scale adoption of digital labeling. The EU, US, Japan and South Korea have successively issued industry standards for cosmetics digital labeling. Digitalization, traceability, transparency, green development and global mutual recognition have become core consensus in international beauty regulation and industrial development.

As a major consumer and producer of cosmetics, China officially launched its cosmetics electronic labeling pilot in 2025. This signals that China's beauty industry ranks among the world's top in digital supervision, core technology R&D and industry standard development, providing a "Chinese Solution" for global beauty digital governance.

4.2 Three Major Future Development Trends

(1) Full-domain Digital Interconnection: Integrated linkage of labeling management,

end-to-end traceability, regulatory collaboration, precision marketing and rapid recall. It promotes data connectivity across the industrial chain to build a data-driven digital industrial ecosystem.

(2) In-depth Intelligent Upgrading: Leveraging AI intelligent review, big data risk early warning and blockchain evidence storage to enable automatic labeling compliance verification, real-time market risk sensing, intelligent product flow tracking and precise user insight, greatly improving industrial efficiency and regulatory accuracy.

(3) Global Integrated Adaptation: Focusing on cross-border trade compliance, it promotes mutual recognition of digital labeling standards, compatibility of coding systems and cross-border data collaboration among countries, building a global digital trust system for beauty products.

5. Huake's Mission

As a wholly-owned subsidiary of the Information Center of NMPA, Huake has always stayed true to its original aspiration: "Serving Regulation, Empowering the Industry, Benefiting the People". Throughout the transition of cosmetics electronic labeling from policy to practice, Huake has shouldered state-owned enterprise responsibility and demonstrated professional value. With over 30 years of deep roots in the healthcare sector, Huake is not only a participant in policy standards and a leader in technological innovation, but also has built a four-in-one core competitiveness: policy - technology - service - ecosystem. It turns compliance transformation from an "option" into a low-threshold, high-efficiency "must-do" for enterprises.

Amid the global digital transformation of the beauty industry, Huake will link industrial resources with a more open attitude, respond to market demand with cutting-edge technology, and promote international mutual recognition with inclusive standards. By continuously optimizing Huake CloudLetter's scenario adaptability and global service network, Huake will let every beauty enterprise benefit from compliant digitalization and make China's beauty compliance standards a globally trusted "passport". Moving

forward, Huake will remain committed to its position as a national team, professional team and pioneer team. It will break industrial boundaries with digital intelligence, strengthen development confidence with compliance, and expand market space with a global vision. Together with the entire industry, Huake will write a new chapter of high-quality development and global rise for China's beauty industry.

6. Appendix: Authoritative Answers to Frequently Asked Questions (FAQ)

Based on key questions from enterprises during pilot promotion and in accordance with NMPA pilot requirements and Huake's implementation experience, unified authoritative answers are provided below:

6.1 Product Specifications and Labeling Use

Q1: Can different specifications of the same product use the same electronic labeling?

A: Yes, but separate electronic labeling are recommended for different specifications to support finer production, channel and management control, and to lay a data foundation for future integration of commodity barcodes and electronic labeling QR codes.

6.2 Labeling Information Changes and Notification

Q2: How to handle changes to electronic labeling information?

A: For any change to electronic labeling information, enterprises must re-submit electronic label-related information on the notification platform and complete the notification process before launching products with updated labeling. The platform automatically retains historical versions to ensure full traceability and accountability.

6.3 Secondary Page Usage Rules

Q3: What should be noted for secondary page jumps?

A: The electronic labeling homepage may include entrances to secondary pages for traceability, anti-counterfeiting, corporate websites, etc. Secondary page content is not part of cosmetics electronic labeling and does not require notification. It must be clearly labeled: "Content displayed on this page is not part of the cosmetics electronic

labeling information and is the sole responsibility of the enterprise" to clarify liability boundaries.

6.4 Coding Rules and Code Issuance

Q4: Can pilot enterprises customize codes?

A: No. To support long-term information technology development, multi-scenario application and global mutual recognition, enterprises must apply for codes from formal institutions with nationally recognized code-issuing qualifications to ensure global uniqueness, compliance, validity, circulation and mutual recognition. Huake can assist enterprises in connecting with formal code-issuing institutions for quick code application.

6.5 Coding Dimension Explanation

Q5: How to understand and choose among product category, batch and SKU dimensions?

A:

Product Category (One Code Per Product): Contains only product identification, applies to all batches, simplest data structure; suitable for standardized products with no traceability needs.

Batch (One Code Per Batch): Adds batch number and expiry date to product identification; distinguishes batches for batch management, recall and expiry control.

SKU (One Code Per Item): Contains unique serial number, production date, batch, expiry date and full details; enables precise full-lifecycle traceability, anti-counterfeiting and anti-diversion for high-end, high-value and key-regulated products.

6.6 Full Pilot Implementation Process

Q6: What is the full procedure of the electronic labeling pilot implementation?

A:

(1) Submit application materials → Obtain pilot qualification

(2) Confirm code-issuing institution → Apply for product identification code

(3) Select system building (self-built / third-party platform)

(4) Generate compliant electronic labeling QR code

(5) Fill in electronic labeling information on the registration/notification platform

(6) Code-assigned production, market launch and daily operation

6.7 QR Code and Logo Style

Q7: Can electronic labeling QR codes and logos be in color, black-and-white or solid color?

A: Any color is allowed, as long as the QR code and logo are clear, have sufficient contrast and are scannable by mobile phones. Enterprises may integrate them into packaging design while balancing compliance and aesthetics.

References:

[1] National Medical Products Administration. Notice on Launching the Pilot Program for Cosmetics Electronic Labeling (NMPA Cosmetics [2025] No. 16) [Z]. 2025.

[2] National Medical Products Administration. Cosmetic Supervision and Administration Regulation [S]. 2020.

[3] National Medical Products Administration. Administrative Measures on Cosmetic Labeling [S]. 2021.

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Interpretation of the Pilot Policy for Electronic Labeling of Cosmetics

CACHCA

To improve the administration of cosmetics labeling, protect consumers' right to know and meet the needs of elderly-friendly services, and boost the digital and green transformation of the industry, the National Medical Products Administration (NMPA) issued a notice in October 2025, officially launching the pilot program for electronic labeling of cosmetics. This article summarizes the core policies based on the NMPA's pilot requirements and authoritative Q&As from regulatory agencies in Beijing, Shanghai and Guangzhou for industrial reference.

1. Basic Overview of the Pilot Program

Launch Date: Starting from February 1, 2026, with a 3-year pilot period.

Pilot Regions: Beijing Municipality, Shanghai Municipality, Zhejiang Province, Shandong Province, Guangdong Province, Chongqing Municipality; cosmetics sold in Hainan's offshore duty-free shops shall be implemented by reference.

Eligible Entities: Cosmetics registrants, notifiers or their authorized China domestic responsible persons, who shall possess corresponding technical capabilities and quality management systems.

Policy Basis: *Cosmetic Supervision and Administration Regulation* (CSAR)*, Requirements for the Pilot Work of Electronic labeling of Cosmetics, Dataset for Electronic labeling of Cosmetics, Technical Specifications for QR Codes of Electronic labeling of Cosmetics.*

2. Definition and Reading Requirements of Electronic labeling

An electronic labeling of cosmetics is an integral part of the product's Chinese labeling, consisting of electronic labeling content and a QR code generated by an information system. Consumers may directly scan and read the code with commonly used communication or payment apps on mobile phones. No pop-ups, redirection barriers

or other reading restrictions shall be set to ensure one-click access to complete Chinese labeling information.

3. Core Specifications for QR Code Marking

(1) Position: Prominently placed on the visible surface of the sales package; for products with an attached Chinese labeling, the QR code shall be marked prominently on the Chinese labeling.

(2) Text: The words "Electronic Labeling of Cosmetics" or "Electronic Labeling of Toothpaste" shall be clearly marked below the QR code.

(3) Size: No smaller than 9mm×9mm in principle, printed clearly, pasted firmly and easily identifiable, taking into account the impact of damage during storage and transportation on readability.

(4) Encoding: Generated in accordance with the *Technical Specifications for QR Codes of Electronic labeling of Cosmetics*, and the URL data structure encoding shall be specific to the product identification unit.

4. Display Content and Mandatory Items on Physical Packaging

(1) Display Content of Electronic labeling

① Fully cover all mandatory marking items specified in Article 7 of the *Administrative Measures on Cosmetic labeling*, and shall not exceed the scope of the labeling draft;

② the addition of elderly-friendly functions such as text enlargement and voice broadcast is encouraged;

③ Enterprises may provide consumers with complete written/electronic labeling information as needed.

(2) Mandatory Items on Physical Packaging (marked in standard Chinese characters)

① Product Chinese name, registration certificate number of special cosmetics;

② Name of registrant/notifier;

③ Net content;

④ Service life;

⑤ Statutory safety warning statements;

⑥ Children's cosmetics shall be marked with the children's cosmetics logo.

Exemption: Small-size packaged products with net content ≤15g/15ml may be exempted from marking the above safety warning statements.

5. Notification, Uploading and Information Change Management

(1) Pre-market Upload: The URL data structure encoding of electronic labeling, display content and pictures of sales packages marked with electronic labeling shall all be uploaded to the NMPA Cosmetics Registration and Notification Information Service Platform.

(2) Information Change: In case of adjustment to electronic labeling content, the updated information shall be uploaded to the platform before the changed products are marketed.

(3) Anti-counterfeiting and Promotion: Anti-counterfeiting, traceability, official website promotion and other contents shall only be displayed on the secondary redirection page, with a prominent prompt: "This page is not part of the electronic labeling information and is solely responsible for by the enterprise".

6. Information Retention Period

After a product is discontinued or import is stopped, the electronic labeling shall remain normally displayed:

(1) General products: Until 1 year after the expiration date of the last batch of products;

(2) Products with a service life of less than 1 year: The display period shall be no less than 2 years to ensure regulatory traceability and consumer inquiry needs.

7. Relevant Q&A

(1) Q: What is the relationship between electronic labeling and traditional labeling?

A: An electronic labeling is an integral part of a cosmetics labeling, having the same legal effect as a physical labeling, and together forming complete labeling information.

(2) Q: Who shall build the electronic labeling system?

A: Enterprises may build the system by themselves, entrust a third party or use provincial medical products administration systems, which shall comply with national unified technical specifications.

(3) Q: Must batch numbers and expiration dates be coded per batch/per item?

A: Not mandatory. Coding may be done per product identification unit, and relevant information may be marked "See sales package". Enterprises may choose to code by category, batch or single item according to production capacity; variable data printing may be used to achieve per-batch/per-item coding, ensuring consistency between scanned information and physical products.

(4) Q: Can electronic labeling contain promotional or anti-counterfeiting content?

A: Electronic labeling are only allowed to display statutory labeling information. Anti-counterfeiting, traceability and brand promotion may be displayed through secondary links, which must be clearly distinguished and prompted as non-statutory labeling content, and shall not interfere with the reading of core information.

(5) Q: What simplifications are available for physical packaging of small-size products?

A: Products with net content ≤15g/15ml may be exempted from marking safety warning statements on physical packaging, while all other mandatory items shall still be fully marked.

(6) Q: Is re-notification required after changing electronic labeling information?

A: Updated electronic labeling information shall be submitted to the notification platform; repeated product notification is not required, ensuring information synchronization.

(7) Q: How can enterprises participate in the pilot program?

A: Apply to the provincial medical products administration department where the enterprise is located, and become a pilot enterprise after selection; build the system, mark QR codes and upload notification information as required.

(8) Q: Can pilot products be sold nationwide?

A: Yes. Cosmetics using electronic labeling in the pilot program may be produced and sold within the territory of the People's Republic of China.

The electronic labeling pilot simplifies physical packaging marking, reduces packaging waste and enterprise printing and revision costs, realizes dynamic management and convenient update of labeling information, improves consumers' reading experience, promotes the digital, standardized and green upgrading of cosmetics labeling administration, and provides important support for the high-quality development of the industry.

International Exchange

- Shaping a Strategy to Foster a Sustainable European Bioeconomy
- Insights from Dr. Yang Jianzhong on Cosmetics R&D and Technological Innovation
- French Cosmetics Exports Report 2025

Shaping a Strategy to Foster a Sustainable European Bioeconomy

Dr Mark Smith
Director General of NATRUE

A sustainable, circular bioeconomy: defossilisation and innovation

The bioeconomy is a cross-sectoral concept whose success can help to foster the increased global demand for defossilisation, alongside increased industry investments in sustainability. Within the cosmetics sector, a combination of regulatory and consumer trends continues to shape both the direction of innovation and how the market moves towards a greater environment focus.

Central to a successful bioeconomy is its capacity to leverage renewable biological resources to produce biomass. In cosmetics, biomanufacturing and biotechnology are increasingly used to develop innovative ingredients derived from green, white and blue biotechnology, alongside the more traditional use of natural resources such as plant extracts– most notably the historical use of essential oils for fragrances. More recently, cosmetics ingredients from upcycled waste streams and industrial by-products have also begun to emerge.

Besides primary biomass, there is significant potential to ensure renewable raw materials are used in a truly circular way, reducing impact across the life cycle. Whilst biobased materials usually mean reduced greenhouse gas (GHG) emissions compared with petrochemical alternatives, their benefits may be less clear beyond the manufacturing stage. To this extent, the environmental benefits of biobased products across all sectors may be narrow beyond the simplistic view of GHG emissions. For instance, in any life-cycle assessment one would also need to account for the resources needed to grow, harvest and distribute these products. Equally, it is important not to conflate biobased with biodegradable: although biobased and petrochemical

plastics differ in feedstock origin, the resulting polymer can still be chemically indistinguishable.

Therefore, to properly push sustainable innovation towards, renewable origin must therefore be coupled with circular waste management, ensuring that biobased materials can be reused, recycled or biodegradable at the end of life.

Sustaining a Strategic Bioeconomy

Following the publication of the EU's Competitiveness Compass[1], the Clean Industrial Deal[2], and the EU Climate Law[3], the bioeconomy has become central in the intersection between the region's climate and energy goals by 2030 and its target of climate neutrality by 2050. Although an EU bioeconomy strategy has existed since 2012, with an updated in 2018, a new "Strategic Framework for a Competitive and Sustainable EU Bioeconomy" was only published recently, in November 2025[4]. This updated strategy aims to expand the Union's bioeconomy, support market scale-up of biobased products, materials and industries, and ensure sustainable sourcing and biomass resiliency.

A factual summary report[5] published in August 2025 had already identified key priorities from stakeholders, including increased circularity in bioeconomy value chains, environmentally sustainable biomass use, halting biodiversity loss, supporting climate mitigation and adaptation, and strengthening the biotech and biomanufacturing sectors. Running in parallel, the proposed EU Biotech Act[6] further underlines the importance of scaling up biotech and biomanufacturing, including derisking upstream investments and support primary producers.

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[1] https://commission.europa.eu/topics/competitiveness/competitiveness-compass_en

[2] https://commission.europa.eu/topics/competitiveness/clean-industrial-deal_en

[3] https://climate.ec.europa.eu/eu-action/european-climate-law_en

[4] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_2819

[5] https://circulareconomy.europa.eu/platform/en/news-and-events/all-news/summary-report-public-consultation-future-eu-bioeconomy-strategy-now-available

[6] https://health.ec.europa.eu/publications/proposal-regulation-establish-measures-strengthen-unions-biotechnology-and-biomanufacturing-sectors_en

The Strategic Framework sets out a 2040 vision in which sustainable biobased materials and products are widely available, providing fossil-free alternatives at industrial scale. To achieve this, the strategy investigates the need for affordable, competitive, and deployable solutions for biobased supported by appropriate skills, investment certainty, and reliable biomass supply. Given that Europe meets most of its biomass needs through sustainable domestic production, the strategic use of by-products and residues remains essential.

As in other regions, fully realising the bioeconomy's potential will require more efficient use of biomass to support long-term competitiveness, supply stability, and environmental sustainability. To achieve this momentum, the Framework identifies five: (1) scaling up innovation and investments; (2) developing lead markets for materials and technologies; (3) sustainably sourced biomass; (4) harnessing global partnerships and opportunities; (5) joining forces for delivery across EU Member States, industry, investors, and civil society.

Notably, the 2025 strategy includes measures to increase the uptake of biobased materials, including content targets. Under Regulation (EU) 2025/40 (PPWR[7]), provisions are introduced for bio-based plastics and novel materials, in complementarity with recycled content targets. The strategy also foresees possible bio-based content requirements for certain products utilising biobased chemicals. To this end, cosmetics are explicitly mentioned among the users of these biobased substances alongside pharmaceuticals, food, and textiles. Currently, while the text addresses more the need for stable and resilient biomass supply chains, where food is prioritised, it also recognises the importance of directing biomass towards higher-value applications.

Interestingly, the sustainability of biobased materials and products is also addressed. An example includes enhancing the Product Environmental Footprint (PEF[8]) methodology to better assess and compare biobased materials, chemicals

[7] https://environment.ec.europa.eu/topics/waste-and-recycling/packaging-waste_en

[8] https://environment.ec.europa.eu/publications/recommendation-use-environmental-footprint-methods_en

and products; as well as preserving and restoring raw material production areas. Although sustainability criteria are not formally included in the strategy, this issue is reflected in an accompanying Commission communication[9]. In parallel, CEN/TC 411 has published the European norm EN 18027:2025[10], providing guidance for comparing the life cycles of bio-based products with fossil-based equivalents. As such, tools are being developed to support the recognised needs of industry. While standardisation is a meaningful step forward, but additional tools, such as third-party certification and labelling, are likely to be necessary.

Besides biomass, sustainable financing was highlighted by the Framework, with persistent financing gaps across the bioeconomy value chain. The European Investment Bank has pointed to current barriers to scaling-up biomanufacturing, advanced bio-based materials and circular bioeconomy infrastructure, which continue to prevent promising innovations from reaching commercial maturity.

Building Balance, Opportunities and Monitoring Impact

According to data referenced by the Commission, in 2023 the bioeconomy generated up to €2.7 trillion in added value and supported an estimate 60-62 million jobs across bioeconomy-related sectors.

The strategy's scope remains wide to support and deliver sustainable biobased solutions that create added value across biological resources, including primary biomass (directly harvested biological material), secondary biomass (by-products and residues), as well as biogenic carbon captured through innovative technologies. While the policy document sets the vision for the coming legislative cycle (principally 2026-2028), it does not create new legal obligations. Instead, the Commission is expected to prepare implementing measures, delegated acts and potential legislative proposals to advance the framework's strategic priorities.

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[9] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52025DC0960

[10] https://standards.cencenelec.eu/ords/f?p=205:32:::::FSP_ORG_ID,FSP_LANG_ID:874780,25&cs=1E694150FD7064B5280129D21F711E43F

Between 2026–2028, active monitoring of follow-up legislative proposals – especially files linked to product-policy (e.g. packaging) and standardisation (e.g. claims substantiation) – will be essential. The Framework is likely to be most immediately relevant for companies with bio-based dependencies, such as natural products and raw material suppliers, including those involved in scale-up investments aligned with emerging workstreams.

The coming years will bring clarity to whether investment gaps can be closed, biobased innovation scaled, lead markets for bio-based materials and technologies secured, and regulatory complexity managed without overburdening operators, particularly in relation to binding legislation such as the CSRD[11], CSDDD[12], and EUDR[13]. Despite these challenges, for natural cosmetics the transition to a bio-based, sustainable industry is not a passing trend but a structural shift driven by consumer expectations, scientific advancement, and environmental necessity. In this context, the bioeconomy represents a powerful, offering a way to reconcile innovation with responsibility.

[11] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022L2464

[12] https://eur-lex.europa.eu/eli/dir/2024/1760/oj

[13] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02023R1115-20241226

Insights from Dr. Yang Jianzhong on Cosmetics R&D and Technological Innovation

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Part I. Is Basic Research Necessary for the Cosmetics Industry?

1. Basic Research Should Not Be the Direct Goal of Cosmetics Enterprises

As a professional with over 30 years of experience in hair and scalp care product R&D, I increasingly want to share my long standing thoughts on R&D and technological innovation with my peers in cosmetics industry. I have always focused more on how technological innovations take shape step by step – the methodology of R&D itself – rather than the subsequent marketing narratives (in which China has countless experts in the industry). I would be more than satisfied if this article serves as a catalyst for further discussion.

In September 2025, I attended the IFSCC Congress in Cannes, France, known as the "Olympics of the cosmetics industry." I was deeply impressed by the overall leap of Chinese enterprises in international cosmetic science. Both the novelty of research topics and the rigor of experimental design and data presentation were markedly different from the past.

For more than a decade, I have proposed at many China domestic industry exchanges that cosmetics enterprises should allocate 2%–3% of annual sales revenue to R&D. Initially, this view sparked much skepticism and even disdain. Today, this ratio has become almost a "standard" for listed cosmetics enterprises, and enterprises generally express a "desire" for basic research. However, an increase in R&D investment ratio does not mean a simultaneous improvement in R&D capabilities; nor does the statement "valuing basic research" carry a single, uniform interpretation. For many enterprises, this so called emphasis remains mostly at the level of resource allocation

or declaratory attitude, and has not yet solidified into a clear, actionable methodology. Born and raised in the Academy of Sciences compound in Zhongguancun, Beijing, I have an innate respect for basic research from an early age. In my youth, I aspired to dedicate myself to basic research. After completing my doctoral studies in Japan, I pursued two postdoctoral research programs in the United States. It was not until the age of 32 that I entered the industry by chance and became a cosmetics R&D professional – a career path rarely seen in the industry. Admittedly, industry is not entirely insulated from basic research. For example, Koichi Tanaka, a researcher at Shimadzu Corporation of Japan, won the 2002 Nobel Prize in Chemistry for developing MALDI related technology, a case often cited as a model. Yet to be frank, such cases remain extremely rare.

Basic research aims not at products or specific application prospects, but at exploring principles, mechanisms, and regular patterns. Its outputs mostly take the form of new theories, new models, or mechanistic explanations of existing phenomena. Given the nature of the cosmetics industry and my 30+ years of experience, I do not believe cosmetics companies should undertake the responsibility and mission of basic research in the strict sense.

2. Applied Basic Research Is the Key to Cosmetics R&D

From the perspective of cosmetics R&D and technological innovation, applied basic research is indispensable and critical. While it also focuses on mechanisms and principles of action, it clearly targets application scenarios. Its core questions shift from "whether a mechanism exists" to: Which mechanisms can be effectively intervened via topical application? Through which ingredients and pathways can stable effects be achieved? Do these conclusions hold under real world application conditions and engineering constraints?

If basic research is the answer to "how the world works," applied basic research is the solution to "how these regular patterns can be utilized." In the cosmetics field, typical questions include: Which signaling pathways can be modulated by topical ingredients?

Which ingredients act through these pathways? What correlations exist between ingredient concentration, formulation design, and efficacy?

Applied basic research validates, screens, and deepens insights based on mechanistic discoveries from basic research, acting as a critical bridge between scientific knowledge and technological innovation. Thus, what the cosmetics industry truly lacks is not the label of "conducting research," but solid work in applied basic research. There are two common biases prevail in practice: Naive "copy paste" of basic research findings, such as equating literature data directly with the efficacy of products containing the ingredient; Overfocus on formulation stability and sensory experience, lacking systematic understanding of underlying mechanisms of action.

3. Organizational Support for Applied Basic Research

Applied basic research requires R&D personnel to understand mechanisms while respecting real world constraints. Many pathways that appear "effective" under laboratory conditions may fail, become unstable, or be unreproducible in real application. The root cause is often not "unscientific ingredients," but insufficient research on action boundaries: Under what conditions is it effective? Which variables, if changed, invalidate the conclusion? Truly valuable questions are rarely grand; they are specific and "incisive" .These questions cannot be answered by a single experiment or simple literature citation, but only through sustained, systematic, and reproducible applied basic research.

This is why I maintain that technological barriers in cosmetics R&D lie not in a "magic ingredient" or "exclusive concept," but in depth of mechanistic understanding, ability to control variables, and patient accumulation of failure data. Genuine technological innovation is rarely a sudden discovery, but long term exploration that reveals the "way" to technological differentiation.

Organizationally, the difficulty of sustaining applied basic research often stems not from a lack of "technological focus," but from its natural misalignment with corporate evaluation

logic and timelines. Compared with product development work that can be quickly translated into selling points, applied basic research has long cycles, uncertain outcomes, and value that is hard for non technical managers to accurately evaluate – hence it is often misunderstood as "unproductive." Over time, organizations implicitly favor short cycle validation and avoid long term mechanistic exploration.

Moreover, applied basic research demands high organizational stability. It relies on long accumulated data, methods, and research hypotheses; frequent personnel turnover often interrupts or even loses these accumulations. Many enterprises have conducted such research but failed to persist, seemingly "investing annually" while actually stagnating.

4. Personal Qualities for Applied Basic Research

Individually, the challenge of applied basic research often lies not in technology itself, but in R&D personnel's uncompleted cognitive upgrade and role transition. People like me, trained systematically through doctoral and postdoctoral programs, tend to prioritize "generating new knowledge" as the core goal. This orientation is fully valid in basic research but becomes a "personal interest" in a corporate setting, difficult to directly apply to industrial R&D.

In the corporate, R&D personnel must shift from "proving whether a mechanism exists" to "clarifying under what conditions the mechanism works and fails." Based on my personal experience, this transition is not easy: it means continuously facing imperfect conclusions and even proactively defining failure boundaries rather than avoiding them. After two postdoctoral stints, I entered the corporate and experienced confusion in my first two to three years, even considering a career change. Health issues followed; only during hospitalization did I gradually adjust my mindset and fully embrace the role of a corporate R&D professional focused on applied basic research and technology development.

In my view, a mature applied basic research R&D professional must possess two

capabilities: Break down problems and understand mechanisms like a researcher; Respect real constraints and manage complex variables like an engineer. They do not rush to give a "definitive answer", but focus on "under what premises this answer holds, and under what conditions it no longer applies".

5. Conclusion: Applied Basic Research is the Foundation of Rational Innovation

Returning to the original question: Is basic research necessary for the cosmetics industry? My answer is clear – the industry should not undertake basic research in the strict sense, yet it cannot do without solid, sustained applied basic research.

What truly determines R&D capability is not how many cutting edge concepts are borrowed. Technological innovation never relies on sudden inspiration, but on repeated inquiry into mechanisms, continuous control of variables, and patient accumulation of failure data.

If basic research expands the boundaries of human understanding of the world, applied basic research safeguards the rational boundaries of industrial R&D. For the cosmetics industry, what is truly scarce is not concepts, ingredients, or gimmicks, but respect for mechanisms, reverence for evidence, and the ability to go "deep" and "systematic" amid long term uncertainty.

This may sound unglamorous, but it is the reliable path for corporate R&D and product technology to go far and steady.

Part II. Applied Basic Research Should Not Be Monopolized by Biological Sciences

In recent years, applied basic research in the cosmetics industry has been almost equated with biological science research. Cells, genes, pathways, signaling molecules have gradually become the main narrative of technological advancement, as if only biology related work deserves the title of "(applied) basic research."

Objectively, this tendency is not entirely unfounded. Cosmetics act on the skin

and hair – human organs. Only by deeply understanding their physiological characteristics can we establish reasonable action pathways; only by accurately measuring changes in skin physiology before and after product use can we reliably judge efficacy. Even I, a "veteran" from the chemical field, have been continuously "catching up" on biological knowledge.

Yet equating applied basic research solely with biological science is a dangerous trend. In real cosmetic systems, what truly supports technological differentiation and long term controllability is often applied basic research in chemistry related fields. Why does the industry systematically overvalue biology and undervalue chemistry?

The industry's strong pursuit of biological science is no accident, but the result of long term overlapping factors.

Firstly, biology is easier to market to KOLs and consumers. Pathways, targets, cell signaling, gene expression naturally have seemingly clear causal structures, easily simplified into linear narratives of "A therefore B." They are communication friendly: logically complete, abstract, cutting edge sounding, without immediate pressure to prove stable realization.

Moreover, chemistry-related applied basic research lacks convenient marketing narratives. System compatibility, molecular stability, phase behavior windows, process tolerance have no "catchy names" and are hard to compress into slogans. They are a series of judgments approaching real boundaries, not repeatable stories. In the communication driven market, the industry prefers visible, explainable, fast technical labels over invisible underlying logic.

Last but the most, biological science is often used to answer what we want to achieve, whereas chemical research is left to address what we can actually deliver. The former is closer to vision and aspiration, while the latter is grounded in real world constraints. In organizational decision making, the former is more readily seen as "innovative",

while the latter is often mislabeled as “conservative”. Yet it is precisely within these “conservative” limits that valid technical judgments are made. Which systems are incompatible? Which effects cannot be achieved within safety boundaries? Which solutions work in the short term but fail over time? These questions can almost only be answered through applied basic research in chemistry related fields. When an industry habitually avoids these questions, it does not become more advanced; it merely defers sound judgment to the future. Therefore, the cosmetics industry systematically overestimates biology and underestimates chemistry - not because the former is more important, but because the latter is far less appealing. In the long run, however, what truly determines whether a product is controllable, reproducible, and sustainable is never how cutting-edge its concepts are, but how deeply it understands the real physical world. This is precisely why, in an industry like cosmetics whose core lies in product form and user experience, applied basic research in chemistry-related fields has always been the most reliable yet most underrated cornerstone of technological differentiation.

Before the age of 32, I received basic research training in the university; after entering the industry, I began to engage in product formulation development. The five years from 1998 to 2002 were the most technically challenging and stressful period of my life, with mental pressure comparable to the various challenges encountered in the early stage of my entrepreneurship. In a sense, it was this five year experience and the confidence built therefrom that allowed me to remain calm in the face of any difficulties thereafter.

Today, some in the industry call me the “Father of Silicone Free Hair Care”, which is certainly an overstatement. Yet this title often reminds me of the messages written by colleagues in a farewell album when I left my former employer to start a business in March 2009. At that time, many colleagues called me “Father of Conditioner”. This was obviously not because I invented the conditioner – it had long existed before I entered the industry. So where did the title “Father of Conditioner” come from? The answer lies precisely in that pivotal five years.

In 1998, after four years of integration in the company and a transfer from the United States to the R&D center in Kobe, Japan, I joined a newly established project team for conditioner platform technology development. The goal of this project sounded extremely simple: to develop "the world's best conditioner". Looking back now, this was almost an impossible task. The real difficulty was not the title of "world's best", but the extremely stringent technical standards behind it. Every candidate product formulation had to undergo weeks of continuous use testing by hundreds of volunteers in a blind test manner – subjects knew nothing about the brand, ingredients, or product concepts, and could only evaluate based on pure user experience, and finally score dozens or even hundreds of questions. The project goal was to achieve statistically significant differentiated advantages compared with all top selling similar products worldwide. Frankly, I do not think there are many teams in today's global cosmetics industry that dare to challenge themselves with such standards.

In the first two years, we suffered repeated defeats. As a result, the team members were constantly replaced, with dozens of people coming and going, and I was the only one who persisted from beginning to end. During that period, waiting for the results of consumer testings was a torment for me, and insomnia became a normal state.

The key to our eventual turnaround and the sustained development of the world's best selling conditioner technology was not a breakthrough in biological concepts, but applied basic research in the field of chemistry.

With the support of the company, I first spent several months systematically sorting out the research scope related to conditioner technology, and sorting out dozens of technical and academic issues surrounding the core structure of conditioner – the Lamellar Gel Network. Then, we invited many experts from around the world covering relevant sub fields (including 8 university) to conduct a week of intensive brainstorming, and gradually clarified the directions worthy of focused research.

On this basis, we signed joint research agreements with three professors of them

to systematically test key parameters such as the morphology, structure, and size of the Lamellar Gel Network, identify controllable variables, and integrate them into formulation design... It was this path that transformed conditioner from "a mere accumulation of formulation experience" into "a technical system that can be understood, regulated, and reproduced".

In retrospect, the reason why those five years of experience were so important to me was not only the great success of the project itself, but also that it made me realize for the first time so clearly: what truly determines the technological boundaries of cosmetics is not the advanced level of concepts, but the depth of understanding of the relevant material systems. At that stage, we did not rely on any "cutting edge biological" narratives, nor did we try to explain product advantages by introducing new physiological mechanisms. On the contrary, almost all breakthroughs came from re dissecting the chemical system – in depth exploration of the core structure of the Lamellar Gel Network. Although these issues are not easily packaged into market-friendly rhetoric overnight, they directly determine whether products can achieve sustainable development in the market through differentiated consumer use effects.

Biological science helps us clarify "what problems to solve," while applied basic research at the chemical level often answers "whether stable realization, controllability, and reproducibility are possible". Only when the two go hand in hand can products not only attract consumers at the first time, but also win trust in long term use and form real "repeat customers." Based on this thinking, our team has always insisted on promoting biological applied basic research represented by "follicle revitalization" and "scalp microbiome balance", while simultaneously advancing chemical applied basic research in "selective cleansing" and "selective repair", so as to continuously promote the iterative upgrading of hair care technology through the dual wheel drive of biology and chemistry.

Biology helps us understand ourselves; chemistry makes beauty a reality. We love biology, and we love chemistry even more!

Part III. A Good R&D Individual Requires True Consumer Understanding and the Courage to Speak the Technical Truth

Often, we subconsciously equate "consumer centricity" with "satisfying all demands put forward by consumers". However, in the real R&D process, this understanding is often dangerous.

The direction of technological development should neither be led by market sentiment nor indulge in technical self absorption, but must be based on the intersection of real needs and practical constraints. Understanding consumers is the starting point of R&D work; daring to say "no" when something is unfeasible is a responsibility that R&D personnel must undertake.

1. Consumers Are "Bosses", Not Product Managers

Looking back on my 15 years working at my former employer, one of the most memorable keywords is undoubtedly consumer understanding. For my former employer, this was not a slogan, but a set of long term, consistent, and operable R&D and business tenets. The reason why it was repeatedly mentioned is that it was indeed written into the decision making mechanism.

"The consumer is the boss, but you don't ask the consumer what to make - you understand the consumer well enough to decide what to make". This sentence is important because it directly negates two common misunderstandings: first, "do whatever consumers say"; second, "market data equals consumer understanding". True consumer understanding is not completely equivalent to research results, but identifying unspoken but real needs and constraints on the basis of in depth real application scenarios, so as to influence technical trade offs and R&D decisions.

Although I am a technical professional, I have participated in many consumer symposiums in Japan and China to obtain first hand consumer insights. I still remember a seemingly simple statement at a symposium in Osaka in the late 1990s that has impressed me to this day. At that time, several Japanese consumers said almost in

unison: “Shampoo is for washing the scalp, and conditioner is for caring for the hair.” This statement may sound taken for granted today, but nearly 30 years ago, it was the first time I clearly realized that the scalp and hair are not the same problem space. Hair is essentially a “dead” keratin structure, while the scalp is a living tissue that still metabolizes and experiences inflammation and aging. For a long time in the past, our technological development focused more on the hair itself and failed to pay sufficient attention to the scalp. This cognitive shift prompted me to re examine the technological focus of hair care products, and also laid an important foundation for promoting scalp care, silicone free, sulfate free and other technological directions in the Chinese market after my entrepreneurship.

Therefore, true consumer understanding is not just “listening to more opinions”, but forcing R&D to redefine the boundaries of problems. The responsibility of R&D is to translate vague human needs into clear, actionable technical boundaries that can bear consequences.

2. Speak the Technical Truth: Dare to Say No!

If at the beginning of my career I remembered consumer understanding, then the principle that has accompanied me until now is a repeatedly emphasized principle - speak the technical truth.

Consumer understanding determines whether you find the right problem; the technical truth determines whether you have the courage to deny wrong answers. The former teaches me how to see real needs, understand why people choose this way in specific scenarios, and why they have to compromise for a long time; it makes me understand that the starting point of technology and products is never in the laboratory, but in real application scenarios. This is an outward looking ability that helps me avoid talking to myself and working behind closed doors in technical details.

However, over time, I gradually realized that merely understanding consumers is not enough to support long term correct R&D judgments. The real difficulty is, after

understanding, still being able to say no to unfeasible assumptions and remain vigilant against solutions that may seem effective in the short term but may bring systemic risks in the long run.

This is particularly important as China's cosmetics market has fully entered the "efficacy oriented" stage. We must clearly recognize that cosmetics address preventive improvements, not therapeutic changes. Different from pharmaceuticals and medical aesthetics, cosmetics are not allowed to bear "harmful side effects" in any form, otherwise the price paid will not only be the product cost, but also fatal damage to the brand and enterprise. It is this essential nature of products that determines that cosmetics should not endlessly pursue the ultimate efficacy.

Therefore, when the demand for efficacy is strongest, R&D needs to adhere to boundary awareness more and stick to the bottom line of technical judgment. It is the tension between this practical constraint and market expectation that makes trade offs and judgments unavoidable in cosmetics R&D.

We have more or less witnessed some projects that deliberately bypass technical judgments in the name of "respecting market voices" and "responding to consumer needs". In the short term, such products may seem to have more selling points and sell better, but the problem is not in the effect itself, but in the technical risks that have been suppressed but never disappeared. In the end, R&D does not eliminate risks, but only delays, amplifies them, and passes them on to brands and enterprises.

Speaking the technical truth does not mean making technical details more complicated, but being willing to clarify real constraints, risks and trade offs under pressure, expectation and uncertainty, even if it means saying "no".

In my opinion, the technical truth includes at least three meanings: firstly, there is a clear technical basis; secondly, there are clear applicable boundaries; thirdly, there is a subject willing to bear the consequences. This is why many "sound right statements"

are not real technical truths. The technical truth is not “talking tough”, but clarifying risks. If a sentence can only be said in a good situation, but cannot be uttered when the pressure is greatest, then it is not the technical truth.

Understanding consumers lets R&D know “where the problem is”; speaking the technical truth determines “which problems are worth solving and how to solve them”. The former helps you learn about the real situation; the latter requires you to take responsibility for the results.

3. When Consumer Understanding Conflicts with Technical Truth: Which Side Should R&D Take?

In real R&D scenarios, consumer understanding and technical truth are not always consistent. What consumers want is often an immediate perceptible effect, and sometimes even a medical effect beyond the boundaries of cosmetics.

From an organizational perspective, R&D personnel must be left some leeway to say “no” and given the courage to say “no”. Otherwise, when pressure continues to be transmitted downward, the two most common mistakes that R&D is prone to make will follow.

The first is to avoid technical judgments on the grounds of “respecting consumers”. Taking “consumer demand” as a basis for exemption and deferring all uncertainties to after the system. In the short term, this is conforming to the market; in the long term, it is transferring technical risks to products, brands, and even consumers themselves.

The second is to ignore real application scenarios on the grounds of “technical correctness”. Obsessed with data, but refusing to face the complexity and compromise of the real world. Such technology may be valid in the laboratory, but cannot play a role in reality.

Truly mature R&D does not “take sides” between the two, but should have the ability to make the conflict itself explicit. What R&D needs to do is translate consumers’ vague

demands into clear problems; then use the technical truth to judge which needs can be met, which need to be reshaped, and which must be rejected.

Rejection is not disrespect for consumers, but long term responsibility for brands, enterprises and consumers.

4. Conclusion: A True R&D Professional Never Avoids Trade Offs

The real difficulty is never understanding consumers or mastering technology, but whether someone is willing to stand up and take responsibility for judgments when the two conflict.

The value of R&D is reflected not only in "what has been done", but also in what has been explicitly rejected and why. Those seemingly abandoned choices are often the prerequisites for the long term viability of the system.

Understanding consumers is to not deviate from real needs; speaking the technical truth is to not be coerced by short term sentiment. The technical direction is established in the balance between the two.

When R&D is willing to take responsibility for trade offs, technology will not only be a tool, but will become a force that truly guides the market direction. "Lead trends with technology, change the market with innovation" – this is our long term pursuit and my most sincere expectation for the younger generation of peers.

Part IV. When Ingredients No Longer Form Barriers: Where Does Differentiation Come From?

In recent years, China's cosmetics market has entered a typical "ingredient worshipping era." Consumers memorize niacinamide, retinol, peptides, pro xylane, etc.; brands blindly overload ingredients, raise concentrations, and display literature data. The ingredient list is gradually equated with product value itself. Ingredients have evolved from "scientific language" to "marketing labels," from "research results" to "a core

point for consumer attention." However, behind the ingredient-centric trend, a hidden problem has gradually emerged: Do ingredients really equal efficacy?

Undoubtedly: popular ingredients is not equal to real efficacy; high concentration stacking is not equal to scientific effectiveness; pleasant sounding names is not equal to valid mechanisms. I believe R&D personnel in our industry have a deep understanding of this.

When ingredients become a belief, mechanisms are forgotten. And this may be the starting point for the next reshuffle of efficacy cosmetics. When ingredients no longer constitute barriers, and consumers move from "listening to names" to "learning about logic", what will truly determine the outcome is not who adds more, but who understands deeper, designs more completely, and verifies more solidly.

Ingredients are replicable, whereas mechanisms and systems form the brand's real core competitive edge.

1. Mechanistic Understanding Built on Applied Basic Research

Truly sustainable development of efficacy products must be grounded in applied basic research. The so-called "applied basic research" related to efficacy is not pure theory; it starts from skin biological mechanisms, establishes verifiable action pathways around real-world problems, and ultimately achieves transformation at the formulation level. It includes at least three levels:

Level 1: Basic Biological Understanding

Such as stratum corneum barrier structure, epidermal differentiation, inflammatory pathways, pigmentation (tyrosinase regulation), collagen degradation, etc. Without these foundations, anti aging, repair, and whitening are just conceptual expressions.

Level 2: Ingredient Mechanism Validation

Whether it affects inflammatory cytokine expression? Whether it inhibits MMP 1? Whether it regulates keratinocyte differentiation? Whether it promotes ceramide synthesis? Without pathway validation, it is only "possibly effective".

Level 3: Formulation System Integration

The real mechanism driven logic should be: skin problem → pathological mechanism disassembly → target selection → ingredient combination → formulation design → penetration pathway → clinical validation.

The significance of mechanistic understanding lies in:

(1) Avoiding following trends: Without a systematic framework, brands can only be led by fleeting trends - one day chasing Pro-Xylane, the next pursuing blue copper peptides.

(2) Improving efficiency: clarifying targets and reducing ineffective ingredient accumulating.

(3) Building technological barriers: ingredients are copyable, while mechanistic systems are difficult to copy.

(4) Supporting compliance: under stricter regulation, mechanistic evidence is an important support for efficacy claims.

True differentiation does not come from the ingredient list, but from understanding the root mechanisms of skin problems. Only by forming a mechanistic closed loop from cell pathways, inflammation regulation, barrier repair to matrix metabolism can efficacy have scientific support and sustainable vitality.

2. Mechanism Driven R&D Will Become the Industry Dividing Line

Efficacy cosmetics are entering a new stage. The core variable is no longer “what is added”, but “how deep the understanding is”. Mechanism driven R&D is becoming a dividing line for the following reasons:

Firstly, stricter regulation. Efficacy evaluation has become a mandatory requirement. Efficacy claims are no longer marketing expressions, but require an evidence chain. Single ingredient stories are difficult to form logical proof, and “adding an ingredient” cannot naturally deduce “achieving a certain efficacy”. What will support efficacy in the future are: clear mechanistic pathways, rigorous experimental design, multi

dimensional validation data, and reproducible results. Mechanistic data will become the infrastructure for efficacy expression.

Secondly, consumer rationality upgrade. Consumers are turning to "mechanism understanding" from "ingredient awareness". They want to learn about the action pathway, clinical validation, improvement range and safety boundaries. In an environment of transparent information, brands lacking scientific logic are easily exposed. Scientific depth is becoming the core of trust.

Thirdly, technological barrier migration. In the past, barriers relied on scarce ingredients; but with open supply chains, ingredients can be quickly copied now. What is really difficult to copy is the mechanistic system. Long term advantages come from self built mechanistic databases, multi dimensional validation systems, applied basic research accumulation, ingredient synergy network design capabilities, and the ability to transform mechanisms into product language. These cannot be purchased in the short term and can only be accumulated over the long term.

3. How to Help Consumers Understand Mechanistic Advantages?

We must see that mechanisms are R&D language, while consumers understand result language. The problem is not that consumers cannot understand mechanisms, but whether brands translate mechanisms into expressions "relevant to them". Consumers do not pay for "mechanisms", but for "certainty". What they really care about is not the pathway name, but whether the product is trustworthy, stably effective and predictable or not.

Therefore, the significance of mechanisms is not to make consumers remember NF κB or MMP 1, but to convince them that this product is not lucky, not accidentally effective, not simply accumulating ingredients, but systematically designed.

This sense of "being designed" comes from three levels:

(1) The brand understands the fundamentals of skin

Consumers may not understand inflammatory pathways, but they can perceive whether the brand really understands the cause of the problem. For example: Simply saying "anti aging" or explaining "the pathway of collagen loss"; Generally talking about "barrier repair" or clarifying "why the barrier is repeatedly damaged".

When a brand can clearly disassemble the problem logic, consumers will have an intuitive judgment: this brand is not chasing trends, but studying problems. This ability to "understand the essence" will foster professional trust.

(2) The logic is complete

The core of mechanistic advantage is not "knowing one point", but establishing a complete pathway. Consumers do not need to see all experimental data, but need to feel a logical closed loop: skin problem → cause →intervention target → ingredient selection → formulation design → validation results.

If the expression only stays at "adding an ingredient", the logic is broken; if it can explain "why it is chosen", "which link it solves", and "how it synergizes", the logic is continuous. Complete logic reduces decision making anxiety.

(3) The effect is explainable

The real advanced trust does not come from exaggerated promises, but from "explainability". For example: why does improvement take 4 weeks? Why repair first before anti aging during sensitive periods? Why mild stinging may be due to accelerated metabolism rather than irritation damage? When effects can be explained, consumers will not regard fluctuations as failures, but as processes. Mechanistic advantage essentially provides a "causal instruction manual".

If mechanistic expression stays at the professional term level, it is difficult to turn into purchasing power. Really effective mechanistic communication usually requires three steps of translation:

Step 1: Professional language is internally valid. Mechanisms at the R&D level must be real and verifiable.

Step 2: Translate into problem logic. Convert pathway language into "causes of problems".

Step 3: Turn into certainty promises. Frame mechanisms as "predictable outcomes".

For example: “slow down the rate of collagen breakdown for longer lasting firmness” instead of “inhibit MMP 1 expression”; “reduce the frequency of repeated redness” instead of “regulate the NF κB inflammatory pathway”. The mechanism remains, but the language changes.

When the following three points are true, the mechanistic advantage is truly established: ① The brand is perceived as “understanding the problem”; ② The product is perceived as “having design logic”; ③ The effect is perceived as “explainable and predictable”.

At this time, consumers may not understand the mechanism itself, but they will understand one more important thing – this product is not just telling stories, but has a system. And “systematicity” is the strongest trust currency in the efficacy era.

4. Building Intellectual Property and Competitive Barriers through Mechanistic Innovation

Mechanistic innovation may usually include: ① Problem mechanism models; ② Action pathway design; ③ Ingredient combination logic; ④ Delivery/release systems

While intellectual property protection paths may include: ① Mechanism patents (pathways + technical solutions); ② Application patents (new mechanisms and new target interventions for old ingredients); ③ Composition patents (ratio ranges, synergistic effects); ④ Trademark protection (branded mechanism naming); ⑤ Trade secrets (ratios, processes, structural parameters)

Ingredients can be copied, and mechanisms can be learned. However, an integrated system that combines mechanisms, patents, and brand communication can form a genuine and sustainable competitive barrier.

5. Mechanism Orientation as an R&D Culture

In Japan, leading brands have long taken mechanism research as their core focus. Shiseido, for instance, has systematically explored immunity, skin aging, lymphatic

senescence, and skin sagging pathways, then turned these findings into product development. Their focus is never simply "which ingredients to add", but rather "how skin problems arise and how they can be addressed." This is also a major reason why Japanese companies remain highly influential at the IFSCC Congress.

Of course, we do not need to fully copy the Japanese model; we can develop our own approach suited to China's market environment. The emphasis on mechanisms in Japan essentially places scientific credibility at the foundation, while many high-end Western and American brands prioritize narrative and emotional value. Neither model is inherently superior - they simply reflect different brand philosophies.

Looking at the Chinese market, we can identify three key characteristics:
Firstly, consumers are relatively rational, so brands relying purely on emotion struggle to maintain long-term stability. Secondly, competition is extremely fierce; without a solid mechanistic foundation, differentiation can quickly vanish. Thirdly, communication relies heavily on emotional resonance; purely rational expression struggles to generate momentum.

For this reason, China can neither fully replicate Japan's mechanism-driven model nor simply follow the luxury narrative approach of Europe and the United States. The real opportunity lies in an integrated path: mechanism-driven innovation plus emotional communication. We could use mechanisms to build credibility, and expression to amplify influence. We could use science to establish sustainable barriers, and narrative to enhance communication efficiency.

Mechanisms ensure that a brand stands firm in the long run, while effective expression allows it to move rapidly. Ingredient fads will fade, and marketing narratives will evolve. The ability to integrate deep mechanistic understanding with compelling brand expression will be the key to lasting success.

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French Cosmetics Exports Report 2025

Fédération des Entreprises de la Beauté (FEBEA)

While French cosmetics exports have traditionally been on the rise, they have stalled in 2025, with a sharp decline recorded in the US market–the sector's primary outlet. A knock-on effect of US customs duties, this has led to stagnation in total exports, a slump that has not been sufficiently offset by growth in other geographic regions. In 2025, French cosmetics exports fell by 0.1% to reach €22.4 billion (compared with €22.5 billion the previous year). Despite this shift, the cosmetics industry remains France's second-largest export sector, behind aeronautics and ahead of wines and spirits, reaffirming its strategic role in the national economy. Against this backdrop, FEBEA underscores the importance of boosting the international competitiveness and diversification of the cosmetics industry.

An Unprecedented Drop in Exports

In 2025, French cosmetics exports totalled €22.4 billion, down 0.1% from €22.5 billion in the same period the year before. This marks the first contraction seen since the 2008 global financial crisis, excluding the health crisis period. Up to now, the sector has posted an average annual export growth rate of around 7% over the past decade; exports stood at just €7 billion in 2000 and €11 billion in 2010.

At the same time, imports into France rose by 6% to €5.4 billion, driven by increased shipments from Asia (South Korea, China, etc.). This trend has led to a slight deterioration in the trade balance[1].

The trade balance nonetheless remains strongly in surplus, hitting nearly €17 billion in 2025. As such, the cosmetics sector retains its position as a pillar of French foreign

trade, yet its growth trajectory is slowing in an increasingly constrained international environment.

Sharp Decline in the US, Europe as a Growth Driver

The overall trend in exports is first and foremost a reflection of the sharp slump in the US market, the top destination for French cosmetics. Due to new tariff barriers imposed by the United States combined with the depreciation of the US dollar, French cosmetics exports to this market plummeted by nearly 19% to a net value of €2.4 billion. The drop in transatlantic exports amounts to €541 million in value terms.

The European Union has confirmed its role as a stability anchor, with exports up 4%, and has increased its share of total exports (rising from 51.3% to 54.3%), totaling €12.1 billion in value.

Outside the EU, strong growth was also recorded in the United Arab Emirates (+8%) and the United Kingdom (+2.9%).

Finally, exports to China posted a modest positive trend (+1.2%), pushing the net value of French cosmetics exports to China to €1.8 billion. By contrast, other regions, particularly in Asia, have seen more mixed performance amid heightened international competition,notably in the 11 countries of the Association of Southeast Asian Nations (ASEAN), where exports fell by 10%.

Make-up, Skincare and Fragrances Account for the Bulk of Exports

Exports continue to be driven by make-up and facial skincare products, which account for nearly half of international sales (€11 billion, or 49% of the total), despite a 2.1% decline.

Fragrances, the second-largest export category (totaling €8 billion, or 36% of the total), posted growth of 1.9% and saw an uptick in sales across the globe. Fragrance exports have more than doubled in six years.

Lastly, shampoos and hair care preparations continued their growth (+5.5%, or €1.5 billion), demonstrating the ability of certain product categories to hold their ground amid a general slowdown.

Caution for 2026

Risks continue to weigh on the trajectory of French cosmetics exports to the US market, and a further decline is likely in 2026[2].

A stark contrast can be drawn between these export results and those of South Korean cosmetics, which recently recorded global growth of 12% in 2025.

Against this backdrop of trade tensions and intensified international competition, the French cosmetics industry must enhance its competitiveness—a top priority for the sector outlined in its *Beauty Industry Package* action plan.

"Despite this stagnation in total exports, the French cosmetics sector remains confident, thanks to new opportunities opened up by free trade agreements with countries such as India and Indonesia, to name but a few. Despite the slump in the US market, the sector is showing resilience. Most importantly, brands' commitment to the ecological transition and the global appeal of French cosmetics products, especially fragrances, remain strong assets," commented Emmanuel Guichard, Director General of FEBEA.

Footnotes

[1] The trade balance is the difference between the value of exports and the value of imports.
[2] Study conducted by the consulting firm Asterès for FEBEA on the impact of US customs duties on French cosmetics exports in 2026, published in October 2025.

Cutting-edge Technologies

- Research and Practice on the Application of Artificial Intelligence Agent (AI Agent) in the Cosmetics Industry

Research and Practice on the Application of Artificial Intelligence Agent (AI Agent) in the Cosmetics Industry

Li Jincong

Abstract: In early 2026, open-source Artificial Intelligence Agent (AI Agent) frameworks experienced explosive development. Desktop AI Agent frameworks represented by OpenClaw broke through the execution boundaries of traditional AI, realizing the technological leap from "thinking" to "acting". Taking OpenClaw as the core research object, this article systematically analyzes its architectural design and core features, expounds the pros, cons and applicable scenarios of three deployment modes of AI Agent (local, cloud and hybrid), as well as the necessity and technical path of building enterprise-specific knowledge bases. Combined with the industrial characteristics of the cosmetics industry, this article discusses in detail the customized development and application implementation of AI Agent in core business scenarios such as R&D, regulation and production quality, analyzes the practical pain points of its application in the field of cosmetics regulations, and puts forward the core requirements for the safe and large-scale implementation of AI Agent in the cosmetics industry. Research shows that AI Agent is the core technology driving the revolution of efficiency and experience in the cosmetics industry. Its large-scale implementation relies on multiple guarantees of technical optimization, data governance and human-machine collaboration, ultimately realizing the reconstruction of the entire chain of R&D, marketing, retail and compliance in the cosmetics industry.

Keywords: Artificial Intelligence; AI Agent; Intelligent Agent; OpenClaw; Cosmetics Regulations; Knowledge Base

1. Core Development Status of Artificial Intelligence Agents - Taking OpenClaw as an Example

1.1 Development Background and Positioning of OpenClaw

In early 2026, open-source AI Agent frameworks gained over 3 million stars on GitHub at a record-breaking growth rate, and their core capability system significantly broke through the functional boundaries of traditional AI. Developed by retired Austrian developer Peter Steinberger in November 2025, OpenClaw was originally designed as a localized solution to address the technical limitations of cloud-based AI agents. After multiple iterations and renamings, the project has become the fastest-growing open-source project in GitHub's history. Different from conversational AIs such as ChatGPT and Doubao, OpenClaw can directly operate user devices, call software systems and complete continuous tasks with authorization, truly achieving the leap from "thinking" to "acting".

1.2 Core Architectural Design of OpenClaw

OpenClaw adopts a modular structure, consisting of four parts: Gateway, Agent, Skills and Memory. Each module performs its own duties and collaborates to form a complete task execution system:

Gateway: As the entry point for instruction interaction, it is mainly responsible for receiving users' natural language instructions, classifying and distributing them according to instruction types, acting as a bridge connecting users and the agent system.

Agent: It undertakes the core functions of task planning and decision-making. Based on the reasoning ability of large language models, it decomposes users' complex goals into executable subtask chains and schedules corresponding skill modules to complete tasks.

Skills: It provides specific operational capabilities for the agent, serving as the core module for device and system control, supporting the invocation of various software and services.

Memory: It implements cross-session context management, capable of storing and invoking historical interaction data, task status and user preferences, providing data support for the continuous progress of tasks.

This flexible structural design enables seamless integration with mainstream large language models such as ChatGPT, Gemini, DeepSeek, Qwen and Kimi, becoming a key carrier connecting the AI "brain" with real-world tasks.

1.3 Four Core Features of OpenClaw

The explosive growth of OpenClaw stems from its four core features adapted to actual business scenarios, which work together to realize the transformation from "natural language instructions" to "automated execution" and significantly improve work efficiency:

(1) Autonomous task planning capability: It can independently decompose complex user goals into logically coherent executable subtask chains without manual task splitting.

(2) Cross-platform execution capability: Through a modular plug-in system, it can operate various tools such as Office software, browsers and professional databases, supporting seamless collaboration across multiple platforms and software.

(3) Long-term memory capability: It has data storage and invocation functions, recording historical interactions, task status and user preferences to support long-term project advancement, solving the limitation of traditional AI's in-session memory.

(4) Open-source and customizable nature: As an open-source project, global developers can contribute plug-ins, and enterprises can conduct private deployment and secondary development according to their business needs to adapt to the personalized requirements of different industries.

2. Deployment Modes of AI Agent and Building of Enterprise-Specific Knowledge Bases

The successful implementation of AI Agent not only relies on the technical capabilities of the framework itself, but also requires selecting an appropriate deployment mode according to enterprise needs and building a matching dedicated knowledge base. This is the basis for solving the limitations of general large models and ensuring the operational accuracy of AI Agent.

2.1 Comparison and Applicable Scenarios of Three Deployment Modes of AI Agent

AI Agent is mainly deployed in three modes: local, cloud and hybrid. Each mode has its own advantages and disadvantages, suitable for different enterprise scenarios and needs, as shown in Table 1.

Table 1 Characteristics and Applicable Scenarios of Three AI Agent Deployment Modes

Deployment Mode	Core Advantages	Main Disadvantages	Applicable Scenarios
Local Deployment	High privacy and security, low response latency, no ongoing traffic costs	High hardware configuration requirements, complex deployment and maintenance, limited computing power and large model intelligence	Enterprise scenarios with high requirements for data privacy, operational stability and latency
Cloud Deployment	Out-of-the-box, elastic computing power, easy operation and maintenance, multi-terminal collaboration and rapid iteration	Strong network dependence, privacy and security concerns over data uploading to the cloud, high long-term usage costs	Enterprise scenarios pursuing convenient deployment, elastic computing power and rapid business launch
Hybrid Deployment	Balances data privacy and local controllability, fully leverages the efficiency and flexibility of cloud computing power	More complex deployment logic than single modes	Enterprise scenarios with data privacy requirements and demand for advanced intelligent capabilities of large models

As a combination of local and cloud deployment, the hybrid deployment mode has become the preferred solution for most enterprises: core data, knowledge bases and business records are stored on local devices; business logic such as Agent scheduling, RAG retrieval and process control runs in the local AI Agent framework, while core intelligent

capabilities such as thinking comprehension and semantic reasoning are realized through cloud large model APIs, achieving the dual effect of "local control + cloud empowerment".

2.2 Building Logic and Technical Implementation of Enterprise-Specific Knowledge Bases

The training data of general large models comes from public networks, which has problems such as insufficient timeliness, low domain accuracy and factual deviations, and is prone to "hallucinations" when answering enterprise-specific business questions – this is the core pain point of general large models in vertical industry applications. Therefore, building an enterprise-specific knowledge base is a necessary prerequisite for the implementation of AI Agent in vertical industries. Its core logic is to enable large models to prioritize using enterprise-private, authentic and credible internal knowledge for decision-making and output through data governance and technical application.

The building of an enterprise-specific knowledge base mainly includes two core steps:
(1) Data cleaning and structuring: Unify and clean unstructured and semi-structured data within the enterprise (such as internal documents, business records, formula data, regulatory materials, etc.), remove invalid information, and convert it into standardized formats (CSV, TXT, MD, JSON, XML, etc.) that AI can efficiently read and understand.
(2) Application of RAG technology: Connect the enterprise-specific knowledge base with large models through Retrieval Augmented Generation (RAG) technology, allowing large models to first retrieve relevant information from the enterprise-specific knowledge base when executing tasks, then perform reasoning and output, reducing large model "hallucinations" from the source and improving the professionalism and security of responses.

The enterprise-specific knowledge base is a reliable data foundation for the implementation of AI Agent in vertical industries, providing core support for the accurate operation of intelligent agents.

3. Development and Application Implementation of AI Agent in the Cosmetics Industry

The business links of the cosmetics industry are characterized by strong professionalism, high compliance requirements and multiple data dimensions. Based on enterprise-specific knowledge bases, customized development of dedicated agents is the core way for AI Agent to be implemented in the cosmetics industry. Different business scenarios can build dedicated agents with clear role positioning and professional capabilities to realize the intelligent implementation of business processes.

3.1 Customized Development Logic of AI Agent for the Cosmetics Industry

Based on the built dedicated knowledge bases, enterprises can customize and build exclusive AI Agents according to the needs of different departments, positions and functions. Each exclusive agent has a clear role positioning and professional capabilities, and its core development requirements include:

(1) Support invoking enterprise's own knowledge bases to accurately obtain industry and enterprise-exclusive data.

(2) Connect with internal business APIs of the enterprise to realize linkage with various business systems.

(3) Have code program running capabilities to adapt to professional needs such as data processing and formula calculation.

(4) Rely on the planning and reasoning capabilities of large models to independently decompose complex business tasks, schedule adaptive tools and form a complete execution closed loop.

Customized development enables AI Agent to deeply adapt to various business links of the cosmetics industry, avoiding the "generalization" problem of general agents and improving the operational accuracy of agents.

3.2 Core Application Scenarios of AI Agent in the Cosmetics Industry

AI Agent can cover core business links such as R&D, compliance and production in

the cosmetics industry. Relying on the exclusive knowledge bases of each link, it provides enterprises with intelligent task execution and decision support. The specific application scenarios are as follows:

(1) R&D: Based on the internal formula knowledge base covering scientific literature, ingredient information, formula structure, process flow, quality indicators, safe dosage, efficacy and skin feel evaluation, cost analysis, etc., it provides R&D engineers with formula generation and optimization suggestions, and automatically generates relevant R&D materials to improve R&D efficiency.

(2) Regulation: Based on the cosmetics regulation knowledge base, it realizes formula compliance review, publicity material audit, automatic generation of notification materials, issuance of compliance opinions, etc., and tracks global regulatory dynamics in real time to support enterprises' compliant operation.

(3) Production quality: Based on the quality system knowledge base, it completes automatic audit of quality management materials, analysis of production deviations and output of rectification suggestions, troubleshooting of unqualified sampling problems, and automatic generation of daily quality reports to realize intelligent management of production quality.

(4) Safety assessment: Based on the ingredient safety information knowledge base, it intelligently captures, parses and analyzes toxicological data, conducts ingredient exposure assessment and risk characterization, and automatically generates ingredient safety assessment conclusions and reports to simplify the safety assessment process.

(5) Efficacy claim: Based on the efficacy claim evaluation knowledge base, it deeply explores the characteristics and mechanism of each component in the formula, scientifically generates efficacy claim abstracts and claim basis descriptions, and conducts compliance review of efficacy claim content to realize scientific brand information output.

4. Professional Position Allocation and Application Pain Points of AI Agent in the Cosmetics Industry

The implementation of AI Agent in the cosmetics industry requires not only technical and data support, but also professional positions for operation and maintenance. At

the same time, affected by technology, data, industry characteristics and other factors, AI Agent still faces many practical pain points in actual application, becoming an obstacle to its large-scale implementation.

4.1 Core Responsibilities of AI Agent Specialists in the Cosmetics Industry

To ensure the efficient and accurate operation of AI Agent, the cosmetics industry needs to set up an AI Agent specialist position, which is the core connecting AI Agent technology and the actual business of the enterprise. It is mainly responsible for the task execution and process design of AI Agent, with four core responsibilities:

(1) High-quality prompt engineering: Compile accurate prompts according to enterprise business needs to guide AI Agent to complete specific tasks such as notification material generation and compliance review.

(2) Agent skill training: Design task execution procedures for AI Agent combined with specific scenarios of cosmetics production and operation to improve the agent's adaptability to industry scenarios.

(3) Agent optimization and iteration: Collect problems and feedback according to the actual use effect of AI Agent, and continuously optimize professional capabilities such as compliance judgment of the agent.

(4) Compliance knowledge base maintenance: Update the regulatory database of AI Agent in real time and supplement the latest regulatory information to ensure the accuracy of the agent's compliance judgment.

4.2 Core Application Pain Points of AI Agent in the Cosmetics Industry

At present, whether deploying large models locally or relying on networked large model API services, AI Agent faces many practical pain points in the implementation of cosmetics regulations. These pain points are concentrated in information processing, regulatory interpretation, result output and other links, specifically including:

(1) Deviations in multi-format file recognition: Errors exist in text extraction, data analysis and information recognition of multi-format regulatory files such as HTML, PDF, Word and Excel, which are prone to problems such as content omission, format disorder and loss of key information.

(2) Difficulty in accurately distinguishing regulatory versions: Mixed regulatory documents of different validity (current effective documents, drafts for comments, revised drafts, new regulations to be implemented, etc.), making the model unable to automatically judge the applicable status and legal effect of documents.

(3) Difficulty in sorting out regulatory systems and associated logic: The cosmetics regulatory system is complex with numerous articles, and there are strong correlations between different regulations and articles. The model easily breaks the logical chain and cannot fully restore the regulatory system and applicable logic.

(4) Difficulty in identifying the authenticity of information sources: Mixed official authoritative announcements and non-official information such as self-media interpretations and informal training materials, making the model easily adopt non-authoritative information and leading to distorted decisions and output conclusions.

(5) Insufficient adaptation to differences between China domestic and foreign regulations: Significant differences exist in regulatory frameworks, standard limits and compliance requirements of cosmetics at home and abroad, making the model unable to accurately adapt to compliance rules and application scenarios in different regions.

(6) Insufficient credibility of final output results: Affected by multiple factors such as information recognition deviations, confusion of regulatory versions, logical fragmentation and inaccurate information sources, the accuracy, authority and reliability of regulatory interpretations, compliance judgments and audit conclusions output by AI Agent are difficult to guarantee.

The existence of the above pain points leads to the application of AI Agent in the cosmetics industry still being in an "auxiliary" stage, and comprehensive large-scale implementation has not yet been realized.

5. Core Requirements for Safe and Large-Scale Implementation of AI Agent in the Cosmetics Industry

As the core of the next round of efficiency and experience revolution in the cosmetics industry, AI Agent can reconstruct the entire chain of R&D, marketing, retail and compliance. To realize its safe and large-scale implementation, strict requirements

must be put forward from technology, data, operation and other aspects combined with industry characteristics and application pain points. It mainly includes five aspects:

(1) Strictly control model “hallucinations”: For professional data such as ingredients, formulas and regulations in the cosmetics industry, RAG technology should be continuously optimized and enterprise-specific knowledge bases should be improved to reduce large model "hallucinations" from the source and ensure the accuracy of data output by agents.

(2) Break down data silos: Break down data barriers between R&D, production, compliance and other departments within cosmetics enterprises, realize the interconnection of internal data, provide a complete and comprehensive data source for AI Agent, and improve the task execution capability of agents.

(3) Strictly abide by the compliance bottom line: Establish a real-time update mechanism for the regulatory knowledge base, combined with manual review by AI Agent specialists, to ensure that the agent's regulatory interpretation and compliance judgment meet the latest industry regulatory requirements and guarantee the compliance of enterprise operation.

(4) Deep industry adaptation: Continuously optimize the skill modules and task execution procedures of AI Agent based on the industrial characteristics of the cosmetics industry, so that the agent can deeply adapt to the professional scenarios and business needs of the industry and avoid the "technical generalization" problem.

(5) Adhere to human-machine collaboration: Clarify the "auxiliary" positioning of AI Agent, build an operation mode of "agent execution + manual review", and solve the agent's decision-making problems in complex scenarios and fuzzy rules through manual intervention to ensure the accuracy of task execution.

Only by meeting the above core requirements can the application pain points of AI Agent in the cosmetics industry be effectively solved, promoting its transformation from "technical pilot" to "large-scale implementation".

Conclusion

Open-source AI Agent frameworks represented by OpenClaw have broken through the execution boundaries of traditional AI, realizing the technological leap from "thinking" to "acting". Its core features such as autonomous task planning, cross-platform execution and long-term memory provide new solutions for the intelligent upgrading of vertical industries. As an industry with high refinement and compliance requirements, the introduction of AI Agent in the cosmetics industry can effectively solve repetitive tasks in various business links, improve the overall operational efficiency of the industry, and is the core technology driving the revolution of efficiency and experience in the cosmetics industry.

By analyzing the technical characteristics, deployment modes and knowledge base construction logic of AI Agent, combined with the application practice in the cosmetics industry, this article finds that AI Agent can deeply adapt to core business scenarios such as R&D, regulation and production quality in the cosmetics industry. However, in practical application, it still faces pain points such as file recognition deviations, difficulty in distinguishing regulatory versions and low credibility of output results. The safe and large-scale implementation of AI Agent in the cosmetics industry needs multiple guarantees of strictly controlling model hallucinations, breaking down data silos, abiding by the compliance bottom line, deep industry adaptation and human-machine collaboration to realize the deep integration of technology and industry.

In the future, with the continuous iteration of AI Agent technology, the continuous improvement of enterprise data governance capabilities and the gradual optimization of industry adaptability, AI Agent will further reconstruct the entire chain of R&D, marketing, retail and compliance in the cosmetics industry, promoting the development of the cosmetics industry towards intelligence, refinement and efficiency. At the same time, the sustainable development of open-source AI Agent frameworks will provide more small and medium-sized enterprises with opportunities for intelligent transformation, lower the threshold of intelligentization in the industry, and promote the digital upgrading of the entire cosmetics industry.

Enterprise Highlights

- Cultural & Technological Empowerment: MIQI Biotech Forges a Benchmark in Beijing's Beauty Industry

Cultural & Technological Empowerment: MIQI Biotech Forges a Benchmark in Beijing's Beauty Industry

I. Company Overview

Beijing Miqi Biotechnology Co., Ltd. (shortened as "Miqi Bio") is a state-owned enterprise under the Beijing Municipal Civil Affairs Bureau, dedicated to providing centralized employment for people with disabilities. The company is affiliated with Beijing Municipal Civil Affairs Industry Corporation and specializes in the manufacturing of skincare products. Established in 1987, Miqi Bio is located in Huitong Times Cultural Industry Park at No. 1 Yaojiayuan South Road, Chaoyang District, Beijing. It primarily produces and sells cosmetics under the "Miqi" brand, employing over 240 staff members, among which more than 130 are employees with disabilities, accounting for over 50% of the total workforce, with the vast majority being hearing-impaired individuals.

II. Business Performance

Since 2020, Miqi Bio has adhered to the principles of "Product Reconstruction, Brand Reshaping, and Channel Rebuilding," focusing on developing the "Miqi - Peony Series" products, achieving significant growth in sales revenue. The company achieved a sales volume of 345 million yuan in 2024 and has exceeded 300 million yuan in 2025, establishing itself as a leading domestic cosmetics enterprise in the capital city.

III. Dual Empowerment through Technology and Culture

In recent years, leveraging Beijing's abundant resources of excellent traditional culture, Miqi Bio has focused on positioning itself in the "China Chic" (Guochao) trend, driving brand breakthrough marketing and cross-industry collaborations. For instance: partnering with Master Zhong Liansheng, a Chinese arts and crafts master,

to create limited-edition cloisonné "National Beauty Treasure Box"; collaborating with young designers from 798 Art District to develop the "New Youth" cultural and creative product series; joining hands with the Summer Palace to create an imperial garden peony state gift set, which was selected as a "Beijing Gift"; cooperating with Youku to launch co-branded products with the popular TV drama "Empresses in the Palace" (Zhen Huan Zhuan); and collaborating with deaf graduates from the Art and Design Department of Beijing Union University's Special Education College to jointly create China's first barrier-free braille gift box. The peony of the capital conveys the message of beauty, adding cultural wings to the revitalization of domestic brands.

In response to national calls for developing new quality productive forces, the company has increased R&D investment to drive technological empowerment. Miqi Bio has established the "Medicinal Plants for Skin Health Research Institute" in collaboration with the research team of Academician Jiang Jiandong from the Institute of Medicinal Biotechnology, Chinese Academy of Medical Sciences. Miqi Bio has filed 2 independent R&D patents and published 2 core academic papers. Its products have won 2 international awards at the Paris International Cosmetics Innovation Awards (PIA): the "Star Product Award" and the "Innovative Raw Material Award." The company has filed for 60 patents in total. It has obtained five management system certifications including the ISO 22716:2007 certification and GMPC certification issued by the U.S. FDA, National High-Tech Enterprise certification, and Beijing Innovative Small and Medium-sized Enterprise certification. In 2025, the "Miqi Fingertip Dancers Factory" became the only "Beijing Industrial Tourism Demonstration Site" in Chaoyang District.

The Miqi Bio remains committed to its original mission of assisting people with disabilities. Over the past five years, through internet-based new media vocational skills training, it has helped people with disabilities increase their employment income, generating 1.54 million yuan in revenue, and has obtained qualifications for national and municipal-level vocational training bases.

IV. Future Outlook

Miqi Bio will achieve new breakthroughs in digital transformation, intelligent manufacturing and personalized customization, strengthening, optimizing, and expanding its core business, continuously improving product market share and profitability. During the period of 15th Five-Year Plan, it aims to be listed on the Beijing Stock Exchange (BSE), establish itself as the premier domestic time-honored cosmetics brand in the capital, and continue to support the employment and income growth of people with disabilities, achieving a perfect integration of social and economic benefits.

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