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Review

Final Publication of the "Regulations on the Supervision and Administration of Cosmetics" and New Prospectives of Cosmetic Science in China

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Abstract: In June 2020, the new "Regulations on the Supervision and Administration of Cosmetics" (CSAR) was finally issued and published in China. This is the first revision of the "Regulations on Hygiene Supervision of Cosmetics" (CHSR) since its publication in 1989. As the basic and fundamental legislation for cosmetics, CSAR has a far-reaching impact on the whole industry and also reveals new trends in scientific research work. To provide an interpretation of this regulation and help enterprises and researchers better understand the new policies, in this study, the main contents of CSAR and its regulatory system were introduced, and the major changes and background considerations were summarized, especially in the definition and scope of cosmetics, classification and categorization, ingredient management, safety evaluation, efficacy substantiation and technical evaluation work. A brief review of technical progress worldwide and a comparison of regulatory requirements were provided where necessary. Finally, new prospects of cosmetic science in China were discussed. In conclusion, CSAR will initiate a renewed and integrated regulatory system for cosmetics. Advanced concepts of supervision, encouragement of innovation, utilization of technical approaches and emphasis on scientific investigations are reflected in the regulations, which will deeply influence the development of both cosmetic products and new ingredients. With all these new challenges and opportunities, everyone involved should get prepared.

Keywords: CSAR; cosmetics; ingredient; categorization; safety evaluation; efficacy substantiation

1. Introduction

In June 2020, the long-waited "Regulations on the Supervision and Administration of Cosmetics" (CSAR) was finally issued by the State Council of China, and this regulation will be implemented from 1 January 2021 [1]. CSAR is the first-time revision and replacement of the "Regulations on Hygiene Supervision of Cosmetics" (CHSR), which was published in 1989. During the past 30 years, substantial changes have happened both in the industry and in consumer needs, and the market has increased significantly. According to incomplete statistics, there are more than 1,800,000 valid cosmetic products in China currently in 2020. In addition, new techniques and approaches have appeared, and the concepts of supervision and administration have evolved. As a result, CSAR, the very basic and fundamental legislation for cosmetics in China, must adapt to the rapid growth and the new trends of cosmetics nowadays.

The project of CSAR was formally initiated as early as 2013. In order to get technically prepared and establish a solid foundation for this legislation, a series of research work and policy study had been started even earlier. To support CSAR, a whole regulatory system is being built up by the

National Medical Product Administration (NMPA), the administration in charge of drugs, medical devices and cosmetics, which was known as China Food and Drug Administration (CFDA) before. With an overview and discussion of the regulatory system, we can get a better understanding of the new policies in CSAR, as well as the latest research progress and new prospects in cosmetic science in China.

2. CSAR and Its Regulatory System

There are 6 chapters and 80 articles in CSAR, while the previous CHSR has only 35 articles. The 6 chapters include general provisions, ingredients and products, production and distribution, supervision and administration, legal liability, and supplementary provisions. Key points concerning cosmetics are specified in CSAR, for example, the definition, product classification, ingredient management, registration and notification, requirements for production, post-market supervision and inspection, and the roles and corresponding responsibilities in cosmetics-related activities.

There is a shift of regulatory focus in CSAR when compared to CHSR, which can be reflected in the change of names. CHSR emphasizes more on the hygiene qualification of cosmetic products, while in CSAR, advanced management philosophy and measures are introduced or further promoted, such as key responsibilities of enterprises (by introducing the concepts of registration person and notification person), classified risk management, encouragement of innovation, safety evaluation, and efficacy substantiation. If a keyword in CHSR is "hygiene", the new will be "safety" and "quality". Similar changes once happened when the technical regulation for cosmetics, the "Hygienic Standards for Cosmetics", was revised into "Safety and Technical Standards for Cosmetics" (STSC) in 2015.

As the fundamental regulation, CSAR provides a basis for detailed regulations and technical documents. NMPA has made a legislation plan to build up the CSAR related regulatory system (as in Table 1), covering both the procedure rules and technical guidance. In brief, these subordinated regulations and documents can be functionally divided into four units. The first group is about registration and notification, with the procedural and technical requirements for both ingredients and final products. The second is about production and distribution, taking producers and enterprises as the main objects of administration. The third part is about toothpaste. Moreover, the last one is for standardized management of labeling. In addition, more regulations and documents are also being drafted or revised.

Table 1. Major parts of the CSAR related regulatory system.

No.	Legislative Level	Name of the Regulation	Brief Introduction of the Regulation	Current Status
About Registration and Notification:				
1	Departmental Regulation	Provisions for Cosmetic Registration	General requirements and procedures about registration and notification of cosmetic products and new ingredients.	Draft published online for public comments on 21 July 2020 [2].
2	Normative Document	Standards of Information File for Cosmetic Product Registration or Notification	Detailed requirements about the information file submitted for registration or notification of cosmetic products.	Draft published online for public comments on 4 November 2020 [3].
3	Normative Document	Standards of Information File for New Cosmetic Ingredient Registration or Notification	Detailed requirements about the information file submitted for registration or notification of new cosmetic ingredients.	Draft published online for public comments on 4 November 2020 [3].

Table 1. *Cont.*

No.	Legislative Level	Name of the Regulation	Brief Introduction of the Regulation	Current Status
4	Normative Document	Rules and Catalog for Categorization of Cosmetics	Rules and catalog for categorization of cosmetic products, to help give a unique category code for each product.	Draft published online for public comments on 29 July 2020 [4].
5	Normative Document	Notes of Guidance for Cosmetic Safety Evaluation	Technical guidelines for the safety evaluation of cosmetic ingredients and cosmetic products.	Draft published online for public comments on 29 July 2020 [4].
6	Normative Document	Efficacy and Claims Substantiation Standards for Cosmetics	Technical guidance and basic requirements for the efficacy and claim substantiation of cosmetic products.	Draft published online for public comments on 4 November 2020 [3].
7	Normative Document	Guidance for Quantified and Classified Management of General Cosmetics Notification	Rules and guidance for the quantified and classified management of general cosmetics. For example, to grade enterprises according to their historical performance in product notifications.	There is still no public draft, but the mechanism is under experiment.
8	Normative Document	Inventory of Existing Cosmetic Ingredients in China (IECIC)	An objective collection of ingredients already used in cosmetics in China, but different from a "positive list of cosmetic ingredients".	Published on 23 December 2015 [5].
9	Normative Document	List of Substances Prohibited in Cosmetic Products (collected in the Safety and Technical Standards for Cosmetics, STSC)	STSC is a basic technical regulation for cosmetics covering general safety requirements, list of prohibited substances, list of restricted ingredients, lists of allowed preservatives, UV filters, colorants and hair dyes, and analytical methods and evaluation methods for cosmetics.	Published on 23 December 2015, with several supplementary revisions afterward [6].
About Production and Distribution:				
10	Departmental Regulation	Provisions for Supervision and Administration of Cosmetic Production and Distribution	General requirements and legal responsibilities of the production and distribution activities of cosmetics.	Draft published online for public comments on 21 July 2020 [7].

Table 1. *Cont.*

No.	Legislative Level	Name of the Regulation	Brief Introduction of the Regulation	Current Status
About Production and Distribution:				
11	Normative Document	Standards for Management of Cosmetic Production and Quality Control	Detailed requirements, standards and key points for the process of cosmetic production and quality control.	Draft published online for public comments on 27 September 2020 [8].
12	Normative Document	Management Measures for Adverse Reaction Monitoring of Cosmetics	Basic requirements and responsibilities for adverse reaction monitoring of cosmetics.	Draft published online for public comments on m [8].
About Toothpaste Management:				
13	Departmental Regulation	Provisions for Supervision and Administration of Toothpaste	General requirements for the supervision and administration of toothpaste.	Draft published online for public comments on 13 November 2020 [9].
14	Normative Document	Standards of Information File for Toothpaste Notification	Detailed requirements about the information file submitted for notification of toothpaste.	There is still no public draft by now. According to CSAR, toothpaste shall be regulated in a similar way to general cosmetics. As a result, these regulations (or similar alternatives) can be necessary for toothpaste management.
15	Normative Document	Catalog of Toothpaste Efficacy	Categorized list of toothpaste efficacy.	
16	Normative Document	Inventory of Existing Toothpaste Ingredients in China	An objective collection of ingredients already used in toothpaste in China, but different from a "positive list of cosmetic ingredients".	
About Labeling Management:				
17	Normative Document	Management Measures for Cosmetic Labeling	Requirements, principles and key points for the labeling of cosmetic products.	Draft published online for public comments on 21 September 2020 [10].

3. Definition, Scope and Classification of Cosmetics

3.1. Definition and Scope

In the regulations concerning cosmetics, it is important to set a definition first to help judge product classification and limit the applicable range. In Table 2, different definitions of cosmetics in some countries or regions are summarized and compared. As the result shows, application way and use purpose are the basic and common elements in the definitions, and some also stipulate the applied area. Moreover, in the definitions in Japan and Korea, it is also emphasized that cosmetics should only perform a moderate effect on the human body. With any variation in these aspects in the definition, the actual scope of cosmetic products can be totally different. The definition in China does not cover teeth, mucous membranes or any other parts of the oral cavity. However, according to CSAR, toothpaste shall be regulated in a similar way to general cosmetics. Thus, toothpaste is also

a product category under the regulation of NMPA. Soaps, except for those claiming the efficacy of special cosmetics, are free of supervision by CSAR.

Table 2. A comparison of the definitions of cosmetics.

Country/Region	Definition of Cosmetics
China [1]	Daily chemical industry products intended to be applied by spreading, spraying or other similar ways to human body surfaces, such as skin, hair, nails, and lips, for the purpose of cleaning, protecting, beautifying and decorating.
EU [11]	Any substance or mixture intended to be placed in contact with the external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition or correcting body odors.
US [12]	(1) articles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body or any part thereof for cleansing, beautifying, promoting attractiveness, or altering the appearance, and (2) articles intended for use as a component of any such articles; except that such term shall not include soap.
Japan [13]	Applied by spreading, sprinkling or other similar ways for the purpose of cleaning, beautifying, promoting attractiveness, altering appearance, or keeping the health of skin or hair, with a moderate effect on the applied site. Not including the products also having pharmaceutical purpose or quasi-drugs.
Korea [14]	Articles applied by spreading, rubbing, sprinkling or other similar ways, with the effect of cleaning or beautifying, in order to promoting attractiveness, altering appearance, and keeping or enhancing the health of skin or hair, with a moderate effect on the human body. Not including pharmaceutical products.

The definition of cosmetics in CSAR remains unchanged when compared to CHSR, and cosmetics are divided into special cosmetics and general cosmetics in both CHSR and CSAR. Special cosmetics are regulated with registration and must get approval before production or importation, with passing technical evaluation from the National Institutes for Food and Drug Control (NIFDC), a subordinated institution of NMPA. General cosmetics can be directly put into the market with the completion of a notification.

Although the definition of cosmetics remains the same, the interpretation of this definition and the scope of cosmetic products have actually been changed. In CHSR, there are nine special cosmetics, including products for/as hair dye, hair perm, sunscreen, depilatory, deodorant, spot corrector (including skin whitener), hair growth, breast care and body beauty (help to keep body shape). According to the approved products published online by NMPA, the approximate distribution of existing special cosmetics is shown in Figure 1. In CSAR, only five out of the nine still remain as special cosmetics, including products for/as hair dye, hair perm, spot corrector/skin whitener, sunscreen and preventing hair loss (instead of products for hair growth). Moreover, there is a new category in special cosmetics called "cosmetics with new efficacy claim".

As mentioned above, four categories will no longer belong to special cosmetics in the future. Depilatories are likely to be classified as general cosmetics since the mechanism is generally clear, and the product risk is relatively low. Existing deodorants are mostly designed for the armpit with several mechanisms: some function by covering the odor, some by absorbing sweat, and some by repressing perspiration. These products will also be classified as general cosmetics in the future. Products for breast care and body beauty, which were expected to help stimulate breast tissue growth or keep body shape, actually have a useful purpose beyond the definition of cosmetics and will no longer be cosmetics. As for the products for hair growth, three levels of claims were usually used in the past: (1) preventing hair breakage, with which the products will be classified as general cosmetics in the future; (2) preventing hair loss, will be as special cosmetics; (3) promoting hair growth, will be no longer cosmetics for suggesting a medical effect. Since 2014, NIFDC has been working on the study

and comparison of cosmetic regulations worldwide. From an investigation and comparison of product classification in this study (as in Table 3, generated from both regulation interpretation and product survey), it is easy to conclude that products with strong physiological effects and high risks (such as products for breast care, body beauty and hair growth) are mostly classified as drugs or quasi-drugs.

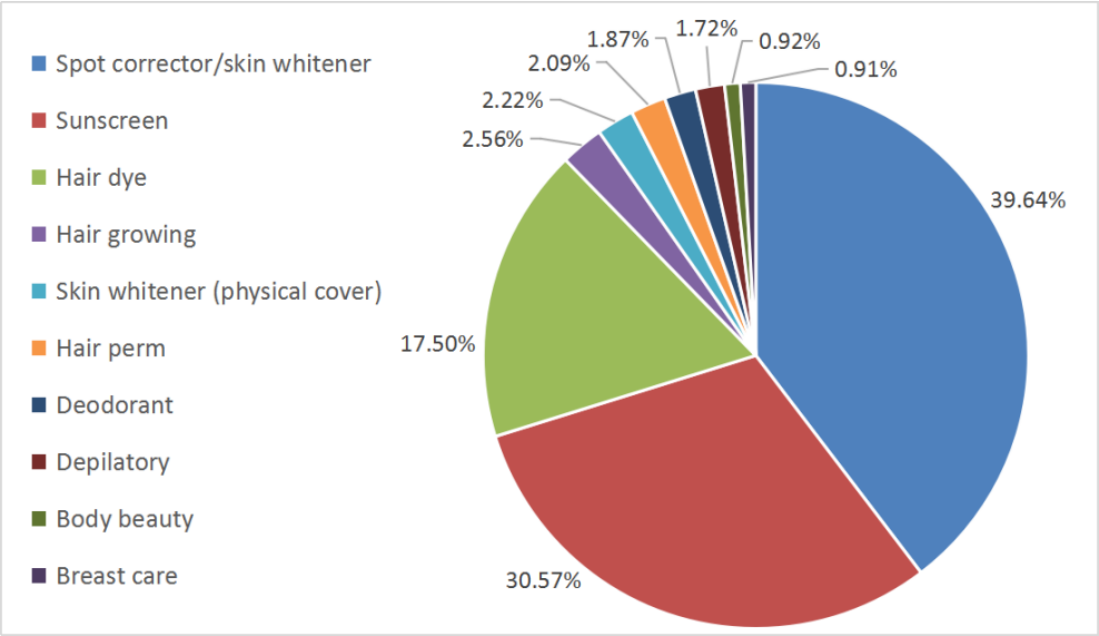

Figure 1. General distribution of existing special cosmetics in China. It is an approximate proportion generated from the total numbers of valid products in each category.

Table 3. A general comparison of product classification.

Function/Claim	1989 CHSR	2020 CSAR	EU [11,15]	US [12,15,16]	Japan [13]	Korea [14]
Hair dye	Special cosmetics	Special cosmetics	Cosmetics	Cosmetics	Quasi-drug	General cosmetics (temporary hair dye)/functional cosmetics (permanent hair dye)
Hair perm	Special cosmetics	Special cosmetics	Cosmetics	Cosmetics	Quasi-drug	General cosmetics
Spot corrector /skin whitener	Special cosmetics	Special cosmetics	Cosmetics/drug	Drug	Quasi-drug	Functional cosmetics
Sunscreen	Special cosmetics	Special cosmetics	Cosmetics	Over the counter (OTC) drug	Cosmetics/quasi-drug	Functional cosmetics
Hair growth/ Preventing hair loss	Special cosmetics (products for hair growth)	Special cosmetics (products for preventing hair loss)	Cosmetics/drug	Drug	Quasi-drug	Functional cosmetics
Depilatory	Special cosmetics	General cosmetics	Cosmetics	Cosmetics	Quasi-drug	Functional cosmetics
Breast care	Special cosmetics	No longer cosmetics	Drug	Drug	Depends on the specific case	Drug
Body beauty	Special cosmetics	No longer cosmetics	Cosmetics/drug	Drug	Depends on the specific case	Drug
Deodorant	Special cosmetics	General cosmetics	Cosmetics	Cosmetics (deodorizer)/OTC drug (sweat inhibitor)	Quasi-drug	Quasi-drug
		A new special cosmetics: cosmetics with new efficacy claim				

3.2. Borderline between Cosmetics and Drugs

In reality, some drugs can also be applied to the skin or other external parts of the human body and have functions similar to cosmetics. It is a common practice to set a borderline between cosmetics and drugs. For example, a guidance document and specific manual were published in the EU to clarify the applicable scope of cosmetic regulations and help distinguish cosmetics from pharmaceutical products and medical devices, as well as from toys, biocides and other articles [17–19]. In recent years, the concept of "cosmeceutical" is getting increasingly popular, which is often interpreted by consumers as cosmetics with medical effects. In fact, the status of "cosmeceutical" is still controversial [20]. For example, as the US Food and Drug Administration (FDA) declares, the Federal Food, Drug, and Cosmetic Act (FD&C Act) do not recognize any such category as "cosmeceutical" [21].

Compared to drugs, cosmetics are designed for some limited purposes. They differ in the use of ingredients, risk characteristics and management, tolerance of adverse reactions, regulatory requirements, supervision systems and other important aspects. In addition, cosmetics are designed for normal people, while drugs are for those with health issues, and some should only be used under doctors' instructions. When mistaking drugs for cosmetics, one can underestimate the possible adverse effects and thus, an extra risk to users can be generated; when taking cosmetics for drugs, the precious chance to seek professional medical care can be delayed.

In January 2019, NMPA clarified it illegal to claim "medicated cosmetics" or "medical skincare products" in China [22]. This principle will be maintained in the implementation of CSAR. Foreign quasi-drugs and drugs can only be imported as cosmetics under the premise of meeting the definition and requirements in China, including the legal compliance of the product itself and a probable adaption of labeling information.

3.3. Categorization and Catalog

With a vast diversity of cosmetic products, it will be helpful to use a categorization system to reflect the characteristics of each product. For example, The US FDA employs a set of category codes to help describe a cosmetic product in the Voluntary Cosmetic Registration Program (VCRP) [23]. In Japan, there is a list of about 56 admitted efficacy claims for cosmetics, which could also be a description of product features.

On 29 July 2020, NMPA published a draft of "Rules and Catalog for Categorization of Cosmetics" online for public comments. With this regulation, a cosmetic product can be described in five dimensions and get a unique category code. The five dimensions are efficacy claim, applied area, product form, users and exposure way (rinse-off or leave-on). Detailed items and descriptions are listed in these dimensions term-by-term, with a numerical code for each one. In this catalog, industrial development and newly emerging techniques are also taken into account. For example, the efficacy of "restoring and protection" is collected considering the increasing consumption demands [24,25], and freeze-dried powder, which is becoming increasingly popular in production these years, is also collected as a product form. Once none of the numerical codes can cover a practical case, a capital letter code shall be picked up, which means "other". Any appearance of a capital letter in efficacy claim, applied area or users can be an indication of "cosmetics with new efficacy claim", the newly added special cosmetics in CSAR.

To give an example, according to the draft, a facial lotion with functions of sunscreen and moisture can get a code of 0409-05-02-01-02, which means "moisture and sunscreen-face-lotion-general population-leave on"; a hair shampoo made especially for infants can get a code of 01-01-03-02-01, which means "clean-hair-liquid-babies and infants (under 3 years old)-rinse off".

The category code is a new invention in the supervision and administration of cosmetics in China. A brief sketch of the product information can be immediately delineated with the code, and this system will help in accurate statistics and analysis. Furthermore, with reading the category code and some other submitted information, for example, the formula information, a high-throughput automated judgment of regulatory compliance can be possible, which is hoped to replace some labored work in the technical evaluation of cosmetics in the future.

4. Management of Cosmetic Ingredients

4.1. Ingredient Lists in STSC

The safety of cosmetic products highly depends on the use of ingredients. In the EU, prohibited substances, restricted substances (including hair dyes), allowed colorants, allowed preservatives and allowed ultra-violet (UV) filters are, respectively, collected in the annexes of the "Regulation (EC) No 1223/2009 on Cosmetic Products" [11]. In the US, substances prohibited or restricted in cosmetic products are listed in the Code of Federal Regulations Title 21 (21CFR). FDA also pays attention to the management of colorants. Allowed colorants and related requirements are also specified in 21CFR. Sunscreen is recognized as a drug in America, and a list of sunscreen active ingredients is collected in the sunscreen OTC monograph. In some East Asian countries where consumption demands for skin whitening are strong, such as Japan and Korea, there is also a positive list of whitening agents.

In China, there are also technical lists of cosmetic ingredients. In STSC, high-risk ingredients are collected in the lists of prohibited substances, restricted ingredients, as well as allowed preservatives, UV filters, colorants and hair dyes. The use of these ingredients must strictly meet the requirements and technical standards specified in STSC. The current STSC was published in 2015 and is open to revision all the time.

Moreover, as shown in Figure 1, spot corrector/skin whitener product is the biggest share in all the special cosmetics in China. As a result, it is important to consider the necessity to build a list of whitening agents in STSC in the future, where Japan and Korea have already provided some experience.

4.2. New Cosmetic Ingredients

Another key point in the management of cosmetic ingredients in China is to distinguish between "existing ingredient" and "new ingredient". New cosmetic ingredients refer to the natural or artificial ingredients used in cosmetics for the first time within China. To better help identify new ingredients, an Inventory of Existing Cosmetic Ingredients in China (IECIC) was published in 2014 and revised in 2015, generating a collection of 8783 items of ingredients (some are collected as a group of ingredients, and besides the 8783 items, ingredients collected in the restricted or positive lists in STSC are also part of IECIC). IECIC is only an objective collection of cosmetic ingredients already used in China, different from a "positive list of cosmetic ingredients". One, who intends to use the ingredients in it, should take a safety evaluation before using.

Ingredients excluded by IECIC are regarded as new ingredients. According to CHSR, new ingredients can only be used after approval. In CASR, the policy is optimized by dividing new ingredients into different risk levels: ingredients that function as a preservative, UV filter, colorant, hair dye or spot corrector/skin whitener are considered to be relatively high-risk and will be regulated with a registration-based system by NMPA continuously; others can be immediately used after notification to NMPA. On the basis of scientific development, NMPA can submit an application to adjust the range of high-risk ingredients.

Innovative management for the use of new ingredients in CSAR is the three-year period of monitoring after registration or notification. Within the three years, the registration person or notification person shall submit a feedback report to NMPA about the use and safety situations every year, and any emergency shall be reported immediately. When a certain safety issue occurs, if any, this registration or notification can be withdrawn by NMPA. In order to protect the interest of enterprises and encourage the development of new ingredients, within the monitoring period, the ingredient will still be regarded and managed as a new ingredient: any other person who intends to use the ingredient shall complete the registration or notification of all independently, or obtain use permission from any previous registration person or notification person. Ingredients successfully passing the three-year monitoring period will have the chance to be incorporated into IECIC.

5. Technical Requirements about Safety and Efficacy

5.1. Safety Evaluation

The safety of cosmetics is strictly required since they are daily used products by a large population. In the EU, the Scientific Committee on Consumer Safety (SCCS) published an "SCCS Notes of Guidance for the Testing of Cosmetic Ingredients and Their Safety Evaluation", with the 10th revision published in 2018 [26], to give technical instruction for safety evaluation of cosmetics. With the trend of the 3R principle [27,28], animal tests for cosmetic ingredients and products have been banned in the EU, as well as in some other countries or regions. Study on alternative methods has become a common topic of concern these years, and SCCS has also emphasized replacement methodology in the recent versions of guidance. Moreover, in recent years, a new technical system called next-generation risk assessment (NGRA) has emerged [29]. NGRA aims to incorporate new approach methodologies into an integrated strategy for risk assessment of cosmetic ingredients and has newly become a topic of interest in the work of International Cooperation of Cosmetics Regulation (ICCR) [30,31].

Safety evaluation for cosmetics has also developed rapidly in China. With an announcement published by the former CFDA in 2013, toxicological tests of final products are no longer compulsive requirements for general domestic cosmetics if a safe conclusion can be derived from risk assessment. To better help improve the understanding and practical use of risk assessment and safety evaluation in China, NIFDC has held a series of workshops and seminars and has built broad cooperation with foreign governments, international organizations and research institutions. In addition, NIFDC has been increasing the input in research and verification work of alternative methods. Since 2016, six new alternative methods have been adopted into STSC as standard test methods, and more methods are under development at full speed [32]. In 2018, NIFDC initiated a Workgroup on Research and Validation of Cosmetic Alternative Methods in China, together with several advanced institutions in this field, which will further accelerate the development, verification/validation and usage of alternative methods.

According to Article 21 of CASR, before registration or notification (of new ingredients and cosmetic products), the registration person or notification person shall perform a safety evaluation by themselves or by entrusting a professional agency. In the future, safety evaluation will play a more important role, and it is necessary to establish a scientific and practical technical system in China. On 29 July 2020, NMPA published a draft of "Notes of Guidance for Cosmetic Safety Evaluation" online for public comments. Learning from the SCCS guidance and other advanced technical documents, this guidance covers the general principles and requirements about evaluation work, evaluator, risk assessment procedure and toxicological research, and it provides pragmatic guidelines for the safety evaluation work of both ingredients and final products.

Unlike the EU, there is no compulsive animal test ban in China. Both animal tests and alternative methods are collected in STSC, and enterprises can choose any when applicable. In addition, in the future, imported general products meeting certain prerequisites and with a satisfying conclusion from safety evaluation can also be exempted from toxicological tests of final products, the same as the domestic ones.

5.2. Efficacy and Claim Substantiation

Besides the requirement of safety, efficacy realization, and proper claims are also focus on cosmetics. As a basic principle to protect the right to know of consumers and fair competition, claims and labeling contents should be based on the actual functions and necessary substantiation. For example, according to Commission Regulation No. 655/2013 of the EU, claims for cosmetic products, whether explicit or implicit, shall be supported by adequate and verifiable evidence [33]. In the US, cosmetics must comply with the labeling requirements of the FD&C Act and the Fair Packaging and Labeling Act (FP&L Act) [34].

Human trials, consumer use tests, experimental tests and research literature are the main types of evidence for efficacy and claim [35,36]. In some authorities, official or semi-official methods are provided to give better guidance for efficacy claim substantiation. For example, in Japan, the Japanese Cosmetic Science Society (JCSS) has published guidelines for the evaluation of quasi-drug whitening products and anti-wrinkle products [37,38], both of which are human test methods. In Korea, the National Institute of Food and Drug Safety Evaluation (NIFDS) has published a series of documents for the efficacy substantiation of functional cosmetics, including products for preventing hair loss (human test), whitening products (human test and in vitro methods), sunscreen products (human test), and anti-wrinkle products (human test and in vitro methods) [39]. The method for sun protection factor (SPF) of sunscreen products is relatively mature, and there is also a standard collected by the International Organization of Standards (ISO), which was recently renewed and published as ISO 24444: 2019 [40].

In the past, requirements about cosmetic efficacy were relatively limited in China. Among all the special and general cosmetics, sunscreen product was the only one with a requirement for clinical tests (human trial). Test methods for SPF value, water-resistant performance, and protection factor of ultra-violet A (PFA) value are collected in STSC. For products for hair growth, breast care and body beauty, it was required to specify the functional ingredients and submit efficacy related evidence. However, it was hard to evaluate the real efficacy without detailed requirements or standards for the data and information submitted.

According to Article 22 of CASR, there shall be sufficient scientific evidence for efficacy and claim of cosmetics; the registration person or notification person shall publish the summary of evidence on a website designated by NMPA and accept public supervision. In addition, according to the "Management Measures for Cosmetic Labeling" drafted by NMPA, claims on the label shall be based on efficacy substantiation.

On 5 November 2020, NMPA published a draft of "Efficacy and Claims Substantiation Standards for Cosmetics" online for public comments. According to this guidance, functions or claims that can be directly detected by sensory perception, such as optesthesia and olfaction, can be exempted from efficacy substantiation. Some examples can be a cleanser, perfume, hair dye, hair perm, depilatory and deodorant. Moreover, those that function via physical mechanisms, such as covering, adhering or rubbing, can also be exempted, as long as it is clearly clarified in the labeling. Examples include skin whitening products by physical covering, exfoliators by physical rubbing and pore cleansers by physical adhering and pulling.

This guidance also gives a basic principle of evidence required for each certain efficacy or claim. A human trial is compulsory in some cases, for example, products for preventing hair loss, spot corrector/skin whitener, sunscreen, acne product and products claiming skin-restoring or claiming tear-free. For the "cosmetics with new efficacy claim", the new special cosmetics in CASR, methods for efficacy substantiation should be based on the actual functions to be claimed. On 12 November 2020, methods for evaluating hair loss prevention and for spot corrector/skin whitener were published online for public comments by NIFDC [41], which are expected to be supplemented into STSC soon.

6. Technical Evaluation of Cosmetics and New Ingredients

6.1. Introduction of Technical Evaluation Work

Special cosmetics, general cosmetics and new ingredients shall go through a technical evaluation during registration or after notification. Since 2019, NIFDC has taken over the responsibility of technical evaluation of special cosmetics and new ingredients, and it offers technical support and quality inspection for the technical evaluation of general cosmetics, which is separately carried out in local provinces. The publication of CSAR will have a profound influence on technical evaluation work.

According to CASR, when submitting registration or notification of new ingredients, the following information and materials are required: (1) name, address and contact information of the registration

or notification person; (2) research and development (R&D) report of the new ingredient; (3) producing process, stability, quality control standards and other research data; (4) safety evaluation materials. On 5 November 2020, NMPA published a draft of "Standards of Information File for New Cosmetic Ingredient Registration or Notification" online for public comments. Detailed items and requirements are listed to give a better direction for the registration or notification of new ingredients. In some specific cases, such as ingredients with a safe history of edibility or ingredients with a safe conclusion from authoritative organizations, some toxicological data can be exempted in the information file.

The following information and materials are required in registration or notification of cosmetic products: (1) name, address and contact information of the registration or notification person; (2) name, address and contact information of the producer; (3) name of the product; (4) product formula; (5) standards the product follows; (6) sample of product label; (7) product test reports; (8) safety evaluation materials. In submitting registration or notification for the first time, extra information and related materials shall be provided to prove the qualification of the registration or notification person. NMPA also published a draft of "Standards of Information File for Cosmetic Product Registration or Notification" on 5 November 2020.

6.2. Future of Technical Evaluation

The CSAR related regulatory system is deeply involved in technical evaluation, as shown in Figure 2. These regulations work as an integrated whole, rather than independent individuals. First of all, the "Provisions for Cosmetic Registration" is an important basis for all the activities in registration or notification, including technical evaluation. Second, the two standards of information file, for cosmetic products and for new ingredients, respectively, are the core regulations in product or ingredient submission, with an aggregation of related technical regulations. In addition, some other small but important links exist between the regulations. For example, the "Efficacy and Claims Substantiation Standards" and "Rules and Catalog for Categorization" share a unified logic and principle of efficacy category, and labeling information of cosmetic products should be based on efficacy and claim substantiation according to the "Management Measures for Cosmetic Labeling".

It should be emphasized that the distinction between registration and notification is the way how cosmetic products or new ingredients are managed- the overall technical standards and the requirements for safety are equally applicable in both. Another key principle is the equal treatment of domestic and imported products. In the past, the required information for the notification of general domestic cosmetics is rather limited. In the future, basic requirements for information files of both domestic and imported products are generally parallel.

With these regulations and documents, technical evaluation work will be more scientific and standardized. Moreover, NIFDC is working on a plan of building up technical evaluation principles on specific products or certain techniques, for example, products with nanotechnology, cosmetic nanomaterials, plant ingredients and biotechnical ingredients. These detailed principles will be important support and criteria in the technical evaluation work in the future.

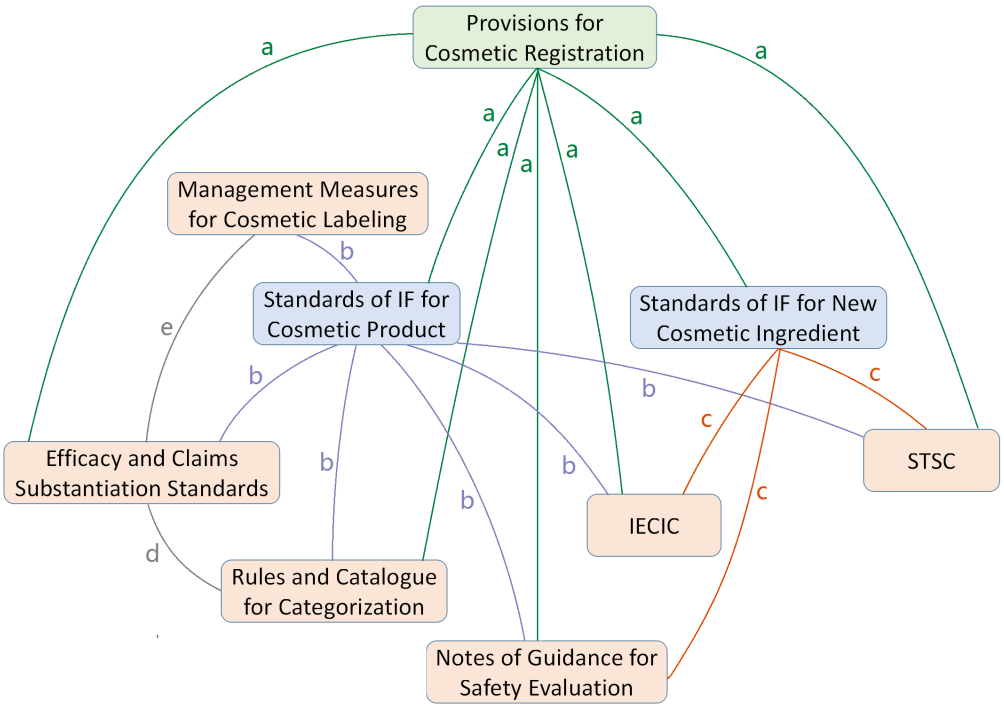

Figure 2. Major regulations involved in the technical evaluation of cosmetics. In this figure, regulations directly or strongly related to the technical evaluation work of cosmetic products and new ingredients are included, and the curves indicate the relevance of the regulations: (a) these regulations are based on and under the system of the "Provisions for Cosmetic Registration"; (b) the "Standards of IF for Cosmetic Product" is the core regulation in product submission, and technical regulations are cited in the standards as basis or reference; (c) the "Standards of IF for New Cosmetic Ingredient" is the core regulation in new ingredient submission, and technical regulations are cited in the standards as basis or reference. In addition, it contributes to the ingredient management system together with IECIC and STSC; (d) the "Efficacy and Claims Substantiation Standards" and "Rules and Catalog for Categorization" share a unified logic and principle of efficacy category; (e) labeling information of cosmetic products should be based on efficacy and claim substantiation.

7. New Prospects for Cosmetic Science in China

7.1. Advanced Concepts in CSAR

Advanced concepts are presented in CSAR, for example: defining registration person and notification person, a role similar to the "responsible person" in the EU cosmetic regulation; controlling risk by reasonable classification; introducing social shared governance; shifting the focus of supervision from "pre-market" to "post-market".

These measures will highlight the key responsibilities of enterprises and stimulate their initiatives, and will also help to improve the overall efficiency of supervision and administration.

7.2. Encouragement of Innovation

It is specifically mentioned in CSAR to encourage and support: research and innovation of cosmetics to meet consumer needs; advanced technology and management practices to improve the quality and safety of cosmetics; combination of modern techniques and traditional/plant resources. Under the premise of safety, more innovative technologies will be utilized in cosmetic R&D, stimulating the industry vitality and motivating scientific investigation and application. In addition, the positive policies in CSAR are hoped to boost enterprises' interest in developing new ingredients and products with new efficacy claims.

These changes will bring new challenges to the technical evaluation of cosmetics. NIFDC will make more efforts on fundamental research and technical readiness. As one of the consequences, a series of principles for technical evaluation is being planned.

7.3. Technical Approaches and Scientific Research

CSAR will definitely promote the development and practical application of safety evaluation in China. In the past, toxicological tests of final products are widely performed and regarded as a guarantee of safety. According to CSAR, a considerable proportion of toxicological tests, including some animal tests, will not be compulsive in some circumstances because of safety evaluation. To obtain a trustable conclusion from safety evaluation, the registration person or notification person must have a comprehensive and clear understanding of the product and relative risks, for example, the safety data, sources and risk substances of the ingredients. Thus, it will be of more importance to building databases [42]. In addition, the development of new methods and integrated approach strategies will be an urgency in the future.

Another important technical opportunity is the efficacy and claim substantiation. It is an inevitable stage of development to meet the diverse needs of consumers. With the publicity of the summary of the evidence, enterprises will be of more self-discipline and self-responsibility to conduct the substantiation work, and consumers will receive more information and make a clever choice. Thus, cosmetic enterprises will face a new business competition pattern and those who are willing to make more efforts on true innovation will win this game. Moreover, scientific study in related fields will be more important, for example, functional ingredients, functional mechanisms, evaluation methods and dermatological investigation. It will help accelerate the transformation of basic research work into practical use, which is hoped to form a positive and favorable circle between science and industry.

7.4. "Regulatory Science" on Cosmetics in China

Since 2019, NMPA has launched a study program called "Regulatory Science", which aims to seek the best combination of scientific research and regulatory practice. As one subject in this program, a new regulatory system and technical supports for the implementation of CSAR have been studied and realized by NMPA and its subordinated institutions. Moreover, a fusion of supervision requirements and information technology has also been explored to help improve the overall efficiency. Several e-systems are under construction or optimization with some advanced designs, including online submission, intelligent evaluation and analysis of big data.

In conclusion, policies in CSAR are considered revolutionary and will have a profound influence. More study work will still continue, including but not limited to fundamental research, industry investigation, comparative study of regulations, the establishment of technical standards, development of methods and approaches and utilization of statistics and analysis. In addition, more cooperation, both domestically and internationally, will be built to accelerate and contribute to the further improvement of "Regulatory Science" on cosmetics. In the future, with CSAR and its new regulatory system, both the industry and cosmetic science will enter a new stage, and the supervision and administration of cosmetics will achieve unprecedented progress in China. With all these challenges and opportunities, everyone involved should get prepared.

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