

EVALUATION OF MULTIFUNCTIONALITY IN COSMETICS

ABSTRACT

In recent years, with the development of new raw materials and ingredients in the field of cosmetics, the use of botanical extracts, application of systems and methods to increase the effect and stability in products, the performance and component-based multi-functionalities of cosmetic products have been increased. This has partially contributed to the condition-dependent functionality, developments in the field of marketing, monitoring of expectations and their reflection on marketing and as a result led to the creation of new ideas in the field of claim-driven multifunctionality. Multifunctionality in cosmetic products can be evaluated in four groups. These are performance-based multi-functionality, component-based multi-functionality, conditional multi-functionality and claim-driven multi-functionality. In the first two groups, performance related to formulation and production comes to the fore, while in the last two, safety becomes important.

Keywords: Multifunctional cosmetics, legislation, claim, efficacy, safety, performance tests

INTRODUCTION

Legislations and scope of cosmetics have some differences according to countries. Mainly European, American and Asian cosmetic legislations have differences in borderline products. According to European legislation, cosmetics generally means 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. In addition, according to EU cosmetic legislation, cosmetic substance means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition [1]. In general, cosmetic products have borderlines with medicines, medical devices, biocidal products, toys, textiles and nutrition products [2].

Through the diversity of definition and scope, there are various classes and expressions attributed to cosmetics even in the legislations or the literature. Of these expressions, some of which can be found in global scientific articles are; cosmeceuticals, dermocosmetics, functional cosmetics, dermatocosmetics, active cosmetics, etc. The first three are generally widespread in America, Europe and the Far East, of which only "functional cosmetics" is included in South Korean legislation [1,3,4]. Products under such expressions in the world in general; related to the aesthetic appearance, are considered as products that can be on the border of cosmetics and medicines or medical devices. Cosmeceuticals can be defined as substances and products that are claimed to have biological activity, achieve the desired cosmetic result with a physiological effect, affect the structure and functions of the skin and skin-related formations positively [5,6]. Such products can be sold over the counter-OTC in many countries. Dermocosmetics are considered as products related to the aesthetic appearance of the skin, which can be on the border of cosmetics and medicines such as skin care products, eliminates superficial skin problems and improves skin appearance and health. Dermocosmetics is a category of products that have or are claimed to have a therapeutic effect, such as cosmeceuticals [7].

The Korean Cosmetic Products Act divides cosmetic products into the following three categories [4] and between those functional cosmetics and quasi-drugs are subjected to premarket license of competent authority.

- General cosmetics
- Functional cosmetics; sunscreens, skin-whitening products, etc.
- Quasi-drugs; anti-acne preparations etc.

On the other hand, the conditions required for a product to be accepted as cosmetic within the scope of EU cosmetic legislation can be indicated as;

- The intended use of the product is within the scope of cosmetic application and it is not intended to be used by ingestion, inhalation, injection or insertion into the body.
- If there is an apparatus intended to be used within the scope of its application, it is not intended to impair the integrity or function of the skin (for example, micro-needle instruments).
- Does not contain any prohibited ingredients due to its content,
- If there is a limited component in its content, it does not exceed the allowed limits.
- Within the scope of formula features; the structure of the formula does not give the formula and/or its components a feature or activity that will exclude the cosmetic function.
- In case a carrier or applicator material is needed in the application of the formula to the human body; this material does not have negative reflections on the effect and stability of the product. The material is expected to meet the requirements of the legislation and/or standard to which it is included (e.g. textiles carrying or delivering cosmetics).
- The effect of the product and /or its mechanism of action; not for the diagnosis, treatment or prevention of diseases, not for the purpose of correcting, regulating or changing a physiological function.
- Its claim to remain within the scope of cosmetic legislation, not within the scope of medicine, medical device or biocidal legislation, and not contain a health claim.
- The perception created within the scope of its presentation; not to give the product the image that it has features that are exceeding/unsuitable for the cosmetic legislation other than cosmetic features.
- Safety assessment of the product is required.

In recent years, with the development of new raw materials and ingredients in the field of cosmetics, the use of botanical extracts, the use of carrier systems and methods to increase the effect and stability in products, the performance and component-based multi-functionalities of cosmetic products have been increased and this has partially contributed to the condition-dependent functionality. Moreover, developments in the field of marketing and the monitoring of expectations and their reflection on marketing has led to the creation of new ideas in the field of claim-driven multifunctionality [8-10].

Multifunctional Cosmetics

In case of a cosmetic product covers more than one purpose in line with the intended use of the products, it becomes multi-functional. From this point of view, the multi-functional criteria of cosmetic products can be evaluated under four headings, and those are [8-10];

- I. Performance-based multifunctionality
- Ii. Component-based multifunctionality
- Iii. Conditional multifunctionality (multifunctionality dependent on the condition)
- Iv. Claim-driven multifunctionality

Performance-based multifunctionality

In performance-based multifunctionality, at least two separate functions must be present in the product and the following examples are included in this group [9-12];

- Two-in-one shampoos that offer both cleaning and easy combing functions.
- Foundations that change skin appearance, moisturize the skin and protect from UV rays.
- UV filter, moisturizing lipsticks or lip balms.
- Nourishing hair gel with UV filters.

Component-based multifunctionality

In case of component-based multifunctionality, a component has more than one function. Examples of this type are odor components with odoring and product protection (preservation) functions. The aluminum salts, which have ability to control the number of microorganisms that cause odor, also reduce wetness and they are used in antiperspirants. Some examples of component-based multifunctionality in cosmetics are presented below [9,13-18]:

- Fragrance ingredients with scent and product protection (preservation) functions.
- Aluminum salts that control the number of microorganisms that cause odor, reduce wetness, and are used in antiperspirants by reducing sweating.
- Most botanical extracts are cosmetic ingredients with multiple functions.
- Green tea extract is an ingredient with antioxidant, anti-inflammatory and anti-microbial properties.
- Rose oil is an ingredient with antioxidant, antimicrobial, skin barrier function enhancer, fragrance and skin softening properties.

Conditional multifunctionality

It is possible for a conditional multifunctional feature to be used in more than one situation. Eyelash mascara can be used as hair mascara, lipstick can be used as blush and blush can be used as eyeshadow (in condition to meet the safety principles for all intended use). In this type of multifunctionality, besides the purpose for which the product is prepared, it provides the safety principles for other usage purposes and these uses are taken into account in the evaluation. Examples for this group are given below:

- The ability to use eyelash mascara as hair mascara.
- The ability to use a lipstick as blush.
- The ability to use naturally sourced dyes such as henna for skin and hair coloring.

Claim-driven multifunctionality

In the claim-driven multifunctionality, it is decisive that the effects of the product are included in the claims besides the main purpose. As an example of this type, it can be stated that the claims for a shampoo with a cleansing function include issues such as cleaning, refreshing and scenting the hair. In the claim-driven multi-functionality, besides the main purpose of the product, its effects are included in the claims. Examples of this group are given below:

- The claims for a shampoo with a cleansing function include the expressions of cleaning, refreshing and scenting the hair.
- In the claims for the hair conditioner, it softens the hair, provides easy combing, prevents the hair strands from tangling, enhances the appearance and scents.
- The claims for a nail polish with a coloring function include the expressions that it allows the nails to grow easily, prevents them from breaking, and hardens them.
- The claims for the sun protection skin lotion include the expressions of anti-aging, helping to prevent sun spots and provides moisturizing.

The views that are encountered in some consumer products and that meeting more than one purpose with a product provides ease of use and economic advantage encourage the effort to give products multi-functionality in various ways.

Critical Factors and Steps in Designing Multifunctional Cosmetic Products

In designing a multifunctional cosmetic product, at first, the type of multifunctionality must be decided and the steps that follow must be shaped based on this. Two approaches can be followed to bring multi-functional properties to cosmetic products. The first of these is a multi-functional

cosmetic product in a single primary package, and this feature can be obtained directly from the cosmetic formula or by a function brought by the packaging in addition to the formula. For example, the packaging head of a cuticle removing formula has the function of mechanically repelling the cuticle. In addition to the eyelash mascara formulation, the mascara brush has a function that simulates physical activity due to the presence of a vibrating motor. The other is to provide multifunctionality with the cosmetic product set. For example, it is the case of having a hair care mask or cream to be applied after the dyeing process in the hair dye set. Some of the cosmetic products in the primary packaging are in the status of multifunctional cosmetic products in line with the formulation components. For example, some shaving foam formulations together provide lubricity, moisturizing and anti-redness properties. Among the critical factors to give multi-functional properties to such cosmetic products are compatibility, stability and proof of functionality. In addition, these cosmetic products must meet the basic aesthetic features in terms of user expectations. It is important that the process should be guided/completed by conducting performance tests and stability tests during the formulation development process [17,19,20].

In case of the performance-based multifunctionality and component-based multifunctionality in cosmetic products, evaluation parameters and methods need to target the formulation and the manufacturing of the product. In case of condition-dependent multifunctionality and claim-based multifunctionality evaluation parameter is directed to the safety evaluation of the product. In the claim-based multifunctionality, the product is fully evaluated on the basis of marketing methods, and all the features of the product, which are not planned and arising from the nature of the formulation, are transferred to the claims.

In the design of multifunctional cosmetic products, a systematic should be established with the following steps and technical information should be compiled, evaluated and documented according to the nature of each step, making the determinations for the expectation of the consumer with measurement-based methods or reference sources will allow it to be shaped correctly.

- Identifying and evaluating the type of multifunctionality.
- Evaluation of consumer habits and expectations.

After the type of multifunctionality is determined below listed main steps need to proceed;

- Formulation development in component or formulation-oriented multifunctionality (performance-based multifunctionality, component-based multifunctionality), evaluation of packaging selection and compatibility, scale-up work after tests and evaluations to prove functionality, good manufacturing practices and processing quality elements.
- The third type, conditional multi-functionality; A safety assessment is required for a new function within the scope of the new properties defined for an existing product.
- In the fourth type, claim-based multifunctionality; Functionality in which the inherently existing features of an existing formulation or product are transformed into a claim to provide the main purpose, and for this purpose, testing the existing product, determining the properties that can be claimed by means of sensory tests and shaping it with consumer expectations at this point.
- Determination of marketing method and strategy.

In the design of multifunctional cosmetic products below listed factors need to be considered at the beginning/planned from the pre-formulation stage of the product [1-3,10,21,22];

- Compliance with legal regulations,
- Researching existing intellectual property / patent rights for design,
- Compatibility of the components
- Toxicological pre-evaluation
- Microbiological pre-evaluation
- Sustainable supply of components at defined quality and expected cost
- Manufacturability and industrial adaptation vision

- O Packing process
- O Shipping
- O Expectations for marketing

When the literature is examined, it is seen that there are many studies on multifunctional cosmetics in recent years. The search to produce better cosmetic products has led to the development of multifunctional cosmetic formulations containing different active substances. Especially combining creams with vitamins and herbal extracts gives cosmetic products antioxidant and protective effects that improve the appearance of the skin, provides anti-aging effects and prevent damage caused by UV radiation and oxidative stress. Many researchers have developed cosmetic formulations that combine inorganic (TiO₂) and organic (octokrylene, ethylhexyl methoxycinnamate, benzophenone) UV filters with vitamin derivatives (tocopheryl acetate, retinyl palmitate, etc.) and plant extracts (*Phorphyra umbilicalis*, *Ginkgo biloba*) to increase activity and effectiveness against UV radiation [23, 24]. Another group of researchers has developed functional cosmetic products by using herbal biosurfactants to stabilize the vitamin C added to creams or the active ingredients in anti-dandruff shampoos [25]. Inoue et al. (2017) have designed a multifunctional cosmetic product by taking advantage of the moisturizing and whitening effects of water-soluble elastin [26]. The widespread use of nanomaterials has also come through in the field of cosmetics. For example, nanosuspensions have been added to skin-protective and anti-aging cosmetic products to gain functionality [27].

CONCLUSION

In conclusion, the views that are encountered in some consumer products and that meeting more than one purpose with one product provides ease of use and economic advantage encourage the effort to give the products multifunctionality in various ways.

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