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Editor
Komarytskyy M.L.
Ph.D. in Economics, Associate Professor

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DEVELOPMENT OF THE FORMULATION AND MANUFACTURING TECHNOLOGY OF A SHOWER GEL CONTAINING DEXPANTHENOL

Tarasenko Hanna V.,
Candidate of Technical Sciences, Associate Professor,
Associate Professor at the Department of Industrial Pharmacy
Fedirko Anna M.,
Master's Student
Kyiv National University of Technologies and Design
Kyiv, Ukraine

Abstract: The component composition of a shower gel containing dexpanthenol was substantiated, and a technological approach to its preparation was developed. A combination of anionic, amphoteric, and nonionic surfactants – Sodium Laureth Sulfate, Cocamidopropyl Betaine, and Coco-Glucoside – was proposed to form the cleansing base. Glycerin was incorporated as a moisturizing component, while dexpanthenol was used as the active ingredient. Sodium chloride was selected for viscosity adjustment, and citric acid was used to adjust the pH. To investigate the effect of dexpanthenol concentration on the properties of the finished product, six model formulations were developed, including five samples with different dexpanthenol concentrations and a control sample without this component. A sequence of technological operations was proposed, comprising preparation of the aqueous base, incorporation of surfactants and dexpanthenol, pH adjustment, viscosity regulation using an electrolyte, and deaeration. The main quality attributes and methods for evaluating the model samples were determined, including organoleptic characteristics, homogeneity, pH, structural and mechanical properties, foaming capacity and foam stability, cleansing ability, and physical stability. The proposed approach enables a comprehensive investigation of the effect of dexpanthenol concentration on the properties of the gel system and provides a basis for substantiating the formulation of a shower gel with skin-care properties.

Keywords: Shower gel, dexpanthenol, surfactants, Sodium Laureth Sulfate,

Cocamidopropyl Betaine, Coco-Glucoside, technology, quality control.

Introduction. Shower gels are products intended for daily skin care and are multicomponent aqueous systems containing one or more surfactants that provide a cleansing effect, as well as auxiliary ingredients intended to ensure the required rheological, organoleptic, and consumer properties of the product. A review of the literature confirms that an effective shower gel should combine efficient cleansing with skin care [1, 2]. Such formulations also contain moisturizing agents, viscosity regulators, preservatives, fragrances, and pH adjusters [3].

The selection of the components of a shower gel base is an important stage in formulation development, since the cleansing efficiency, foaming intensity, and dermatological properties of the finished product depend on their nature and proportions. The formulation process also takes into account the possibility of combining surfactants with skin-care ingredients that help maintain adequate skin hydration, reduce the sensation of dryness after cleansing, and support the skin barrier function. In particular, the combination of anionic, amphoteric, and nonionic surfactants makes it possible to develop cleansing systems with different cleansing, foaming, and rheological characteristics [3, 5, 6].

The development of modern skin-cleansing products involves not only ensuring adequate cleansing performance but also incorporating ingredients with skin-care properties into their formulations. One such ingredient is dexpanthenol, whose use in skin-cleansing products is associated with its ability to help maintain adequate skin hydration and normal epidermal barrier function. Clinical studies of skin-cleansing products containing dexpanthenol indicate that effective cleansing can be combined with the maintenance of skin hydration and barrier function [4].

An important aspect of shower gel development is ensuring the required structural and mechanical characteristics of the system. Electrolytes, particularly sodium chloride, are commonly used to regulate its viscosity. However, the effectiveness of their use depends on the composition of the base, the proportions of individual surfactants, and their total concentration in the formulation [2].

In view of the above, the development of a shower gel formulation based on Sodium Laureth Sulfate, Cocamidopropyl Betaine, and Coco-Glucoside, supplemented with dexpanthenol, and the investigation of the effect of its concentration on the properties of the finished product are relevant.

The aim of the study was to substantiate the component composition of a shower gel containing dexpanthenol, develop its manufacturing technology, and determine quality control methods for the comprehensive evaluation of model samples based on organoleptic, physicochemical, and structural and mechanical parameters, as well as to investigate the effect of dexpanthenol concentration on the properties of the finished hygiene product.

Materials and Methods. The objects of the study were model samples of a shower gel based on a combination of anionic, amphoteric, and nonionic surfactants containing different concentrations of dexpanthenol. Sodium Laureth Sulfate (SLES), Cocamidopropyl Betaine (CAPB), and Coco-Glucoside were proposed for the formation of the cleansing base. Glycerin was included as a moisturizing component, while a dexpanthenol solution with a mass fraction of the active substance of 75% was used as the active ingredient. Sodium chloride was used to regulate viscosity, and citric acid solution was used to adjust the pH. A mixture of Phenoxyethanol (and) Ethylhexylglycerin was included as a preservative, and a fragrance composition was used as a fragrance.

To establish the relationship between the properties of the shower gel and dexpanthenol concentration, a comparative study of six model samples was proposed. The main quality attributes and methods used for their determination are presented in Table 1.

Table 1.

Quality attributes and control methods for the model shower gel samples

Quality attribute	Quality attribute	Quality attribute
Appearance, colour, odour	Organoleptic method, visual assessment	Evaluation of homogeneity, characteristic colour and odour, and identification of foreign inclusions and visible defects
Homogeneity	Visual assessment of consistency and the	Detection of inhomogeneity, lumps, sediment, and other visible signs of

	presence of mechanical inclusions	disruption of the gel structure
pH	Potentiometric method	Determination of compliance with the specified pH range and assessment of changes during storage
Structural and mechanical properties	Rheological investigation	Evaluation of the flow behaviour and structural and mechanical characteristics of the gel system
Foaming capacity and foam stability	Physicochemical method	Determination of the height of the generated foam and its stability over time
Cleansing ability	Gravimetric method (based on the degree of removal of model soil)	Comparative assessment of the cleansing efficiency of the model samples under identical test conditions
Physical stability	Visual assessment and monitoring of physicochemical parameters	Detection of phase separation, sediment, and changes in colour, odour, consistency, and pH
Microbiological quality	Microbiological testing in accordance with ISO 17516:2026	Determination of compliance of the finished cosmetic product with the established microbiological criteria
Efficacy of the preservative system	Testing in accordance with ISO 11930:2019	Assessment of the ability of the preservative system to ensure adequate microbiological protection of the cosmetic product

Results and Discussion. The selection of the components of the cleansing base is one of the key stages in shower gel formulation development, since the composition and proportions of surfactants affect cleansing ability, foaming, and compatibility of the product with the skin. When developing such a system, not only the functional properties of individual surfactants but also the characteristics of their combination and interaction in an aqueous medium must be taken into account. The use of anionic, amphoteric, and nonionic surfactants in a single formulation makes it possible to obtain a cleansing base with the required characteristics and to balance its main consumer properties.

Six model samples were developed for a comparative investigation of the effect of dexpanthenol on the properties of the gel (Table 2). One sample served as a control and did not contain dexpanthenol, while the other five samples were formulated with dexpanthenol concentrations ranging from 1.50 to 3.00%.

Table 2.

Model formulations of the shower gel containing dexpanthenol

Component	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Control
Sodium Laureth Sulfate	11,0	11,0	11,0	11,0	11,0	11,0
Cocamidopropyl Betaine	6,0	6,0	6,0	6,0	6,0	6,0
Coco-Glucoside	2,5	2,5	2,5	2,5	2,5	2,5

Glycerin	3,0	3,0	3,0	3,0	3,0	3,0
D-Panthenol	1,50	1,75	2,00	2,25	3,00	–
Sodium Chloride	1,0*	1,0*	1,0*	1,0*	1,0*	1,0*
Phenoxyethanol (and) Ethylhexylglycerin	0,9	0,9	0,9	0,9	0,9	0,9
Parfum	0,4	0,4	0,4	0,4	0,4	0,4
Citric acid	to pH 5,0–5,5	to pH 5,0–5,5	to pH 5,0–5,5	to pH 5,0–5,5	to pH 5,0–5,5	to pH 5,0–5,5
Purified water	q.s. to 100	q.s. to 100	q.s. to 100	q.s. to 100	q.s. to 100	q.s. to 100

* Note. The sodium chloride content was adjusted according to the required viscosity level of the model samples.

The model samples were prepared by sequential mixing of the components under stirring. The technological process involved preparation of the aqueous phase, incorporation of surfactants into the base, addition of dexpanthenol, pH adjustment, and regulation of the rheological properties of the finished product. The model samples were manufactured in a jacketed reactor equipped with a paddle stirrer.

Stage 1. Raw material preparation. The components were weighed on electronic scales in accordance with the formulation of each model sample.

Stage 2. Preparation of the gel base. The calculated amount of purified water was added to the reactor, followed by glycerin. The mixture was stirred at 300-400 rpm and a temperature of 20–25 °C for 5–10 min until a homogeneous system was obtained. Sodium Laureth Sulfate (SLES), Cocamidopropyl Betaine (CAPB), and Coco-Glucoside were then sequentially added to the prepared aqueous phase. The mixture was stirred at 200–300 rpm and a temperature of 20–25 °C for 15–20 min until a homogeneous mixture was obtained.

Stage 3. Addition of dexpanthenol. The calculated amount of dexpanthenol was preliminarily dissolved in a portion of purified water. The resulting solution was gradually added to the base, and the mixture was stirred at 200–300 rpm and a temperature of 20–25 °C for 10–15 min until homogeneous.

Stage 4. pH adjustment. The previously prepared citric acid solution was gradually added to the resulting system. The mixture was stirred at 200–250 rpm and a temperature of 20–25 °C until the pH reached the range of 5.0–5.5. After pH adjustment, stirring was continued for 5 min.

Stage 5. Gel formation and deaeration. A sodium chloride solution, previously

prepared using a portion of the purified water allocated in the formulation, was gradually added to the resulting system. After the addition, the mixture was stirred at 150–200 rpm and a temperature of 20–25 °C for 10–15 min until a homogeneous mixture was formed. To remove air inclusions, the model samples were left in the processing vessel at a temperature of 20–25 °C for 30–60 min.

Stage 6. Quality control and packaging. The resulting model samples were evaluated for appearance, homogeneity, consistency, and pH. After quality control, the samples were filled into bottles, followed by quality control of the finished product.

The evaluation of the model samples indicated the need for a comprehensive analysis of their physical stability, taking into account dexpanthenol concentration and the characteristics of the surfactants. The main criteria for comparing the formulations include maintenance of homogeneity and the absence of phase separation, sediment, turbidity, and other visible changes. Additional indicators of stability include the constancy of pH and viscosity values during storage.

The rheological properties of the model samples were evaluated with regard to their influence on the technological and consumer characteristics of the shower gel, particularly its ability to be dispensed, flow out of the bottle, and spread evenly over the skin surface. The main parameters selected for the comparative study were effective viscosity at different shear rates, the relationship between shear stress and shear rate, and the flow behaviour of the formulations. Thixotropic properties were also taken into account, as they characterise the ability of a system to partially recover its structure after mechanical stress.

Conclusions. The component composition of a shower gel containing dexpanthenol was substantiated based on a combination of Sodium Laureth Sulfate, Cocamidopropyl Betaine, and Coco-Glucoside, with glycerin incorporated as a moisturizing component. Five model formulations containing different concentrations of dexpanthenol and a control sample were developed to investigate the effect of its concentration on the properties of the gel system. The technological sequence for product preparation was developed, and the main quality attributes and methods for

their control were determined. The proposed approach provides a basis for the comprehensive evaluation of the model samples and the determination of the optimal dexpanthenol concentration, taking into account the physicochemical and rheological characteristics and the stability of the finished product.

REFERENCES

1. Mijaljica D., Spada F., Harrison I. P. Skin Cleansing without or with Compromise: Soaps and Syndets. *Molecules*. 2022. Vol. 27, No. 6. Article 2010. https://doi.org/10.3390/molecules27062010.

2. Barrionuevo-Gonzalez A., Trapp S., de Salvo R., et al. Two New Dexpanthenol-Containing Wash Gels: Skin Hydration, Barrier Function, and Cosmetic Performance Upon Single and Repeated Usage in Subjects with Dry Skin. *Cosmetics*. 2021. Vol. 8, No. 2. Article 44. https://doi.org/10.3390/cosmetics8020044.

3. Peltier E., Trapp S., de Salvo R., et al. A New Dexpanthenol-Containing Liquid Cleanser for Atopic-Prone Skin: Results from Two Prospective Clinical Studies Evaluating Cutaneous Tolerability, Moisturization Potential, and Effects on Barrier Function. *J. Cosmet. Dermatol.* 2022. Vol. 21, No. 9, pp. 3859–3866. https://doi.org/10.1111/jocd.15252.

4. Ferreira V. T. P., Silva G. C., Martin A. A., Maia Campos P. M. B. G. Topical dexpanthenol effects on physiological parameters of the stratum corneum by Confocal Raman Microspectroscopy. *Skin Res. Technol.* 2023. Vol. 29, No. 9. Article e13317. https://doi.org/10.1111/srt.13317.

5. Bjelošević Ž., Grilc B., Gašperlin M., Gosenca M. M. Exploring the Potential of Cleansing Hydrogel and Shampoo with Whey as a Contemporary Approach to Sustainability. *Gels*. 2025. Vol. 11, No. 5, Article 374. https://doi.org/10.3390/gels11050374.

6. Dick A., Stolz H. J., Sonsmann F. K. Mild but effective skin cleansing – Evaluation of laureth-23 as a primary surfactant. *Int. J. Cosmet. Sci.* 2024. Vol. 46, No. 3, pp. 403–413. https://doi.org/10.1111/ics.12940.