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The general methodological approach to development of modern foam washing agents

As the results of the analysis of the modern Ukrainian market for personal care products show, there is a clear tendency of the increased consumer interest, in particular to detergent-based liquid hygiene products.

**Aim.** To develop a methodological unified approach for creation of foaming agents in two pH intervals of 3.5-4.5 and 5.0-6.0.

**Materials and methods.** The methodological basis of this research is general scientific and applied methods of research, including methods of logical, historical, physicochemical, technological and analytical analysis. The modern Ukrainian market of foam washing agents and various types of detergents for obtaining satisfactory consumer properties were analyzed.

**Results and discussion.** A wide production range of foam washing agents of the foreign and domestic origin has been analyzed, and the active functional groups, as well as excipients and biologically active substances have been systematized. The conceptual differences in the approaches to development of parapharmaceutical cleansing agents and the tendency to use modern surfactants with the “soft” action have been revealed. It has been found that creation of uniform foaming agents in two pH intervals of 3.5-4.05 and 5.0-6.0 when applied to sensitive areas of the skin and mucous membranes determines the selection of detergents that would combine sufficient functional properties and dermatological characteristics. The analysis has shown that there is a need to develop new approaches to the use of multifunctional complexes of modern detergents.

**Conclusions.** A methodological unified approach for creation of foam washing agents in two pH intervals of 3.5-4.05 and 5.0-6.0 has been offered. It allows facilitating development of products and their introduction into domestic production.

**Key words:** cleansing foam washing agents; detergents; pH; shampoos; gels; personal hygiene products
Материалы и методы. Методологической основой данного исследования являются общеучебные и прикладные научные методы исследования, в том числе: методы логического, исторического, физико-химического, технологического и аналитического анализа. Был проанализирован современный украинский рынок пенообразующих средств и различные типы детергентов для получения удовлетворительных потребительских свойств.

Результаты и их обсуждение. Проанализирован широкий ассортиментный ряд пенообразующих средств за рубежного и отечественного производств и систематизированы активные функциональные группы, вспомогательные и биологически активные вещества. Определены концептуальные различия в подходах к разработке парафармацевтических средств очистительного действия и тенденции использования современных поверхностно-активных веществ «мягкого» действия. Установлено, что создание унифицированных пенообразующих средств в двух интервалах рН (3,5-4,5) и (5,0-6,0) при нанесении на чувствительные участки кожи и слизистые обо лочки обусловливает выбор детергентов, которые бы объединяли достаточные функциональные свойства и дерматологические характеристики. Проведенный анализ показал, что есть необходимость разработки новых подходов к использованию многофункциональных комплексов современных детергентов.

Выводы. Предложенный методологический унифицированный подход к созданию пенообразующих средств в двух интервалах рН (3,5-4,05) и (5,0-6,0), что позволит облегчить разработку средств и их внедрение в отечественное производство.

Ключевые слова: пенообразующие средства очистительного действия; детергенты; рН; шампуни; гели; средства личной гигиены.

As the results of the analysis of the modern Ukrainian market for personal care products show, today there is a clear tendency of the increased consumer interest, in particular to detergent-based liquid hygiene products. Shampoos, gels for personal hygiene and shower, liquid soaps, etc., are becoming increasingly popular among all categories of the population. Firstly, this is due to simplicity and ease of use, economy and aesthetics. Secondly, they have many advantages over other personal care products, such as solid soaps. These advantages are the solubility in water of different hardness, high foam formation, cleansing ability, additional actions (antifungal, bactericidal, moisturizing, etc.) [1-3]. Development of the composition of any foaming agent can be considered from the standard approach, namely the choice of detergents of different ionic nature — the choice of excipients — the choice of preservatives. However, when developing these agents the latest tendency is the use of detergents with the “soft” action, which leads to implementation of completely different mechanisms of thickening [4-8]. For example, if detergents of the anionic nature were used as the main or primary detergents, then it was just sufficient to use the electrolytic type of thickening. At present due to the fact that other types of detergents are increasingly used to achieve certain consumer properties (extrusion and ease of dosing, stability for two to three years, etc.), it is necessary to use several types of thickeners at the same time. To meet these requirements it is advisable for technologists to combine the associative and electrolytic thickening mechanisms. Associated thickening occurs due to natural and/or semi-synthetic detergents and / or their combination [5, 6].

The aim of the article is to develop a methodological unified approach for creation of foaming agents in two pH intervals of 3.5-4.5 and 5.0-6.0.

Materials and methods

The methodological basis of this research is general scientific and applied methods of research, including methods of logical, historical, physicochemical, technological and analytical analysis. The modern Ukrainian market of foam washing agents and various types of detergents for obtaining satisfactory consumer properties were analyzed [9-12].

Results and discussion

The study of technological conditions for production of foam washing agents and scientific literary sources showed a number of uncertain issues. The substances used in production of foam washing agents were investigated in the scientific works of such Ukrainian scholars as G. S. Bashura, D. I. Dmitrievsky and foreign scientists (Yu. V. Pletnev), but the issue of creating unified foaming agents in two pH intervals of 3.5-4.5 and 5.0-6.0 in their works was not analyzed. However, despite the increasing interest of researchers and practitioners to this problem the issue of creating unified detergent-based foaming agents in two pH intervals of 3.5-4.5 and 5.0-6.0 remains poorly studied. Based on the above the subject is relevant and requires individual research.

After analyzing and summarizing the literary data on theoretical and practical measures for creation of cleaning agents, as well as on the basis of the practical experience, we proposed the methodological approach to development of detergent-based foaming agents in two pH intervals of 3.5-4.5 and 5.0 -6.0 (Fig.). From a scientific and practical point of view, rather specific foam washing agents differing from each other by the complex of detergents, the pH value, peculiarities of their application and the physiological significance of the pH value for these areas were selected.

The methodology for development of any foam washing agents consists of two directions of research (theoretical and experimental), which should be carried out in parallel and complement each other. Taking into account the aforementioned the methodology for creating detergent-based foaming agents in two pH intervals of 3.5-4.5 and 5.0-6.0 has been developed (Fig.).

In the first place, a number of detergents in the composition of modern foam washing agents and the subs-
an electrolyte with a similar ion should be added. For example, sodium chloride is used when using disodium laureth sulfosuccinate; if amorphous laureth sulfate is used, it is reasonable to introduce ammonium chloride.

It should be also noted that from the technological point of view, it is more appropriate to use solutions of electrolytes which can be optimally introduced in the last place under the strict supervision of the technologist and in small portions since oversaturation of the system with this type of viscosity modifiers can lead to the instantaneous system dilution and turbidity of the gel.

It should be noted that in the experimental studies, first of all, the concentration of detergents affecting the cleansing effect and the presence of side effects is determined, but not the concentration of active substances. Then there is selection of other excipients and active substances, the sequence of their introduction is studied, and the temperature modes are set for each stage.

Using a systematic approach during the scientific and theoretical research it is possible to choose the rational concentration of the selected detergents and active substances.

The study of a number of physicochemical and pharmacological indicators is a combining element of this research with the pharmaceutical development order to determine the optimal shelf-life.

When developing an agent a certain attention is paid to optimization of the manufacturing technology, which includes reduction of the number of stages of the technological process, the use of a reasonable amount of the equipment, determination of critical factors and their parameters, reduction of energy consumption for production.
Due to the complex of the experimental studies (pharmaceutical, structural and mechanical, physico-chemical, microscopic) the rational composition of the foam washing agent is substantiated, the technology of its production under manufacturing conditions is developed and tested.

CONCLUSIONS

The methodological approach for development of foam washing agents with different pH values allows introducing them to the domestic market as safe, competitive products with high cleansing and sufficiently high consumer characteristics.

Based on the above said development or, as we see it, creation of modern foam washing agents is a balanced process with a joint participation of scientists and professionals of pharmaceutical and cosmetic industry.

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