

SECTION 9. Chemistry and chemical technology

Detsina Anatolyi Nikolaevich

Candidate of Chemistry, Director of the Open Joint Stock Company "Laboratory of Novosibirsk Cosmetology Society", Russia,

Egina Natalya Sergeevna

Candidate of Chemistry, Associated professor, Novosibirsk Technological Institute (branch) of Moscow State University of Design and Technology, Russia

Evseeva Larisa Petrovna

Associated professor, Novosibirsk Technological Institute (branch) of Moscow State University of Design and Technology, Russia

DEVELOPMENT OF MEANS OF HANDS PROTECTION FROM AGGRESSIVE ENVIRONMENT EFFECTS AND ASSESSMENT OF THEIR QUALITY

***Abstract:** In the paper the problem of development of protective cream for hands is considered, the requirements to its components are analyzed, the possible compositions of two hand creams intended for protection from aggressive agents effects of water and organic environment are offered on the basis of carried out tests.*

***Key words:** aggressive agents effects, biological gloves, cellular pathology activity, metabolic processes, acid-base balance (pH) of the skin, nutritive additives, micro flora growth, protective film.*

In such human activities as housekeeping and gardening manual labor plays an important role and can't be replaced by technical devices completely. As the result of doing this work the hands skin becomes coarse, chaps and peels. So wearing special gloves is recommended in order to protect hands. But if the work demands accurate movements and cannot be done with gloves put on hands.

The problem of hands protection in conditions when the special gloves cannot be used is very important and demands the solution. It can be solved by means of "biological gloves". Most dermatological protective substances are known to create a film on the surface of a hand imitating a glove. But in the development of such "biological gloves" it should be taken into consideration that the skin is a rather complicated organ in its composition, structure and functions, so any subsection on it must be justified [1, 15]:

Firstly, a hand cream must not contain substances which prevent epidermis cell division, i.e. cellular pathology activity must be excluded.

Secondly, the cream components must not prevent metabolic processes in skin including skin breath.

Thirdly, the cream must not influence the acid-base balance (pH) of the skin.

The cream cannot contain harmful substances as they will unavoidably join the blood and influence not only on the skin but also on the other organs and systems.

So the selection of the protective creams components was done according to their natural origin. Synthetic materials were allowed only after their testing for cellular pathology activity. The tests were carried out at Novosibirsk Production Association "Vector", naukograd (scientific town) Koltsovo.

The task of the given work was to select materials which prevent micro flora growth but at the same time do not stop the processes of vital activity of epidermis cell of a human. Two kinds of a protective cream were planned to obtain: One cream is supposed to be used in

water conditions (e.g. electrolytic solution) and the other is intended for protection hands in organic environment.

As the base of the cream intended for protection from organic environment the edible gelatin was used. Along with protection it has feeding impact on the organism. It is known that the optimal value of pH cream compositions is close to 7,2, so they were added nonorganic salts with certain buffer capacity. As these additives are used in microbiology in order to create nutritive medium, they will assist increasing of nutritive value of the cream composition. For performance of soften and moistening function glycerin and vegetable oil were used, bee wax was applied as a structured agent. Moreover, nutritive additives were introduced (recipe 1).

While increasing the quantity of salts, glycerin and vegetable oil the chances of micro flora growth decrease in the protective cream, the user having unpleasant feeling (skin contraction and reddening) . The composition variations allowed to block micro flora growth and eliminate unpleasant sensations. Nevertheless, gelatin application leads to stickiness of the protective film which couldn't been eliminate by adding the cellic gel. So the dose of gelatin is going to be decreased and other hydrophilic film-forming are going to be used, e.g. polyethylene oxide.

As the base for cream intended for water protection silicon organic polymers were used. In selecting the polymer its influence on vital activity of cell structure of skin was taken in consideration. To do this, a few samples of silicon organic products were tested in order to assess their cellular pathology activity.

As the result of the done analysis the one was chosen - Pentacos 1135. In addition there was found out that this product possess the certain antivirus activity. The contact of the given product with the hand skin doesn't block the processes of vital activity of epidermis cells and safe for people. The advantage of Pentacos 1135 is also creation of discrete film on the hand skin surface providing gas permeability and don't prevent removal of cell metabolism products from the skin (recipe 2).

Then the quality of the obtained means for hands protection from aggressive agents effects (acids, alkalis, organic liquids) were assessed. To check the skin permeability for different agents the haemostatic collagen sponge was used as a model on which the lay of protective cream was spread and then it was being dried for 15 minutes under the temperature of 15 C. After that a drop of the examined substance was applied by sterile syringe and the time of its absorbing by the sponge was being marked with the stopwatch.

After the done tests the survey among twenty respondents was carried out to find out consumers' meanings about the cream. The questionnaire contained ten questions with the followed ranging of the answers using a computer.

There was taken into consideration the fact that the protective coating must have a discrete (porous) structure in order to avoid effects on metabolic processes and pH state close to neutral one, be easy removable with soap solution and meet a number of requirements established by the State Standard R 52343 - 2005 "Cosmetic creams. General technical conditions" and Sanitary Code 1.1.681-97 "Hygienic requirements to production and safety of fragrance and cosmetic products ". Beside, the rate of drying was evaluated as well as stickiness, color, smell, consistence, interleaving through the time and micro flora growth.

As the result of the carried out experiment twelve compositions of the protective cream of different purposes was obtained. The optimal variants of the considered cream were selected by the results of performed tests (recipes 1 and 2).

The quantitative composition of the cream can't be told as the creams are in the process of patenting now.

Recipe 1 contains the salt system in the quantity according to the proportion in blood. The salt system is intended to make nutrition effects on the blood and at the same time prevent micro flora growth while cream storing.

Water is actually absent in recipe 2 so this variant of cream composition is resistant to micro flora growth.

Recipe 1.

Composition of hand cream for protection from organic environment effects

Gelatin

Water

Glycerin

Vegetable oil

Bee wax

NaCl

HCl

MgSO₄

CaCl₂

Na₂HPO₄

Sodium benzoate

Cellic gel

Clinturen

Recipe 2.

Composition of hand cream for protection from water environment effects

Pentacos 1135

Vegetable oil

Bee wax

Wax emulsion

Inphezol-40

Clinturen

Actually all the components of the developed creams are well known. The exceptions are Pentacos 1135, clinturen and inphezol. Pentacos 1135 is a mixture of cyclometicon and dimeticon. The advantage of this preparation is as it was mentioned above absence of cellular pathology activity. Besides, it easily spread along skin creating a thin porous film which dries quickly.

Clinturen is an adequately balanced dry food mixture with vitamins added.

Inphezol-40 is a water solution consisting of the amino acids mixture using in medicine for inner injections.

Inclusion of these components into the cream composition is stipulated by the aim to increase nutritive activity of the cream as it is applied for rather long time, providing migration of useful substances to the blood.

The offered cream compositions don't contain substances which can block cell division. All the used ingredients are nontoxic and according to previous observations they do not cause allergic reactions.

The final testing on the animals is planned in the process of certification of the products.

References

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