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THE USAGE OF BIOSURFACTANTS TO MAKE MODERN SHOWER GELS WITH A HIGHER SAFETY OF USAGE

ZASTOSOWANIE BIOSURFAKTANTÓW DO WYTWARZANIA NOWOCZESNYCH ŻELI POD PRYSZNIC O PODWYŻSZONYM BEZPIECZEŃSTWIE STOSOWANIA

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Abstract: In the paper the influence of the type of surfactant in shaping safety of shower gels was presented. For this purpose, two types of washing cosmetics different in terms of surface active compound were used. In regard of increasing environmental awareness of consumers and on the basis of „green chemistry", a mild surfactant – *Inulin Lauryl Carbamate* (INCI) has been used in the former preparation. The ingredient in the second washing cosmetics was *Sodium Laureth Sulfate* (SLES) – a widely used anion surfactant. The irritation potential on the basis of the zein value as well as the skin dryness level were assessed in these preparations.

Keywords: biosurfactants, washing cosmetics, inulin, irritation.

Streszczenie: W pracy przedstawiono wpływ rodzaju surfaktantu na kształtowanie bezpieczeństwa stosowania żeli pod prysznic. W tym celu opracowano dwa prototypy kosmetyków myjących, różniących się zastosowanym związkiem powierzchniowo czynnym. W związku ze stale wzrastającą świadomością środowiskową konsumentów oraz na podstawie zasad „zielonej chemii" w pierwszym z preparatów zastosowano delikatny biosurfaktant – *Inulin Lauryl Carbamate* (laurylokarbaminian inuliny). W składzie drugiego prototypu kosmetyku myjącego znalazł się powszechnie stosowany anionowy surfaktant – oksyetylenowany laurylosiarczan sodu (SLES). Dla preparatów dokonano oceny potencjału drażniącego na podstawie liczby zeinowej oraz stopnia wysuszenia skóry.

Słowa kluczowe: biosurfaktanty, kosmetyki myjące, inulina, podrażnienia.

1. INTRODUCTION

Shower gels are aqueous solutions of surface active compounds or mixtures of them. Due to good washing and foaming properties as well as resistance to hard water, most frequently used surfactants in these type of preparations are synthetic anionics and non-ionic surfactants. They also contain other additional substances like preservatives, pigments, scent compositions, re-greasing substances, rheology modifiers and other additives improving useful properties of the product [Wasilewski and Klimaszewska 2007; Sułek and Pytlas 2010; Zięba et al. 2017].

Apart from its basic functions, surfactants being the foundation of cosmetics may deteriorate the condition of skin. They interact with the proteins of the epidermis causing its denaturation and, in consequence, irritation of the skin. Moreover, they may extract lipids from top layers of the skin, the effect of which is drying and limiting its barrier functions. Thus using accordingly gentle cosmetics with the basis of delicate washing compunds is very important [Wasilewski and Klimaszewska 2007; Sułek and Pytlas 2010; Zięba et al. 2017].

What consumers value the most are products manufactured on the basis of natural resources. They believe that these products are safe, eco-friendly do not have negative effects on human organism. Their environmental awareness is increasing thus producers want to meet their expectations and pursue in the direction of balanced development. On the basis of „green chemistry" principles much more attention is being paid to the replacement of synthetic surfactants with their ecological counterparts, among which biosurfactants are included [Domagalska and Pytkowska 2014; Gołek, Chęcińska and Bednarski 2005].

Biosurfactants are chemical compounds obtained in processess of microbiological synthesis. They seem to be an interesting alternative for surfactants extracted in the methods of traditional chemical synthesis in view of their low toxicity, biodegradability, accessibility of raw materials and biocompatibility [Gołek, Chęcińska and Bednarski 2005; Piotrowski, Lewandowska and Wojciechowski 2011; Krzan 2013; Domagalska and Pytkowska 2014].

An example of biosurfactant used in cosmetic industry is *Inulin Lauryl Carbamate* (INCI). Inulin and its derived products are used widely in the production of preparations intended for hygiene, especially recommended as substances alleviating irritation and additives lowering the irritation potential of washing cosmetics. As a surfactant it may be used for the production of cosmetics especially recommended for sensitive skin [Gołek, Chęcińska and Bednarski 2005; Seydlova and Svobodová 2008; Piotrowski, Lewandowska and Wojciechowski 2011; Kucińska 2012; Krzan 2013].

The aim of the thesis was to show on empirical basis the role of different kinds of surfactants in shaping the usage safety of shower gels. In order to do it, the irritation potential was measured together with the level of skin dryness of two prototype washing cosmetics having a different surfactant implemented.

2. MATERIAL AND RESEARCH METHODS

Two shower gel prototypes different in the kind of surfactant have been developed. In those preparations widely used Sodium Laureth Sulfate (SLES) as well as Inulin Lauryl Carbamate (INCI) was utilised. A designation has been made for the irritation potential and the level of skin dryness in given shower gels. Gel prototypes have been made in identical conditions and on the base of one's proprietary technological process methodology. The ingredients have been shown in the table below.

Table 1. Shower gel formulas with different surfactants used
Tabela 1. Receptury żeli pod prysznic z zastosowaniem różnych ZPC

The name according to INCI nomenclature	Concentration in terms of pure ingredient [wt%]	
	R_1	R_2
Aqua	do 100	do 100
Xanthan Gum	1.0	1.0
Sodium Laureth Sulfate	**5.0**	**-**
Inulin Lauryl Carbamate	**-**	**5.0**
2-Methyl-2-isothiazol-3one-1,2Benzisothiazol-3one	0.5	0.5
Citric Acid	0.3	0.3

Source: own study.

2.1. Irritating potential

Assessment of shower gels irritation potential was conducted with the use of methodology showed in academic literature [Fisher at al. 1982]. The zein value designation was carried out in two stages. As a first step water mixtures out of corn protein preparations have been made and shaken in the right temperature. Next, the Kjeldahl's method being implemented, the nitrogen percentage in the sample was designated. The result was received from the average of three measurements.

2.2. Measuring of skin dryness

The evaluation of skin drying effect of the examined shower gels was conducted on the basis of one's own elaboration. Corneometry was performed with the use of Courage-Khazaka appliance CM 825. The examination concerns measuring different areas of skin (test area and control area), conducting a model washing and next, after strictly limited period of tim3e, measuring the skin moisture level in the test and control areas again. The changes obtained (expressed in a percentage) are the basis to define the drying effect of the preparation evaluated. It has been assumed that the drying effect (expressed in a percentage in comparison with the baseline) is

the amount expressing how much the skin hydration is lower after 2 hours since the application of the preparation, the change of skin moisture of the skin area examined different from the change of skin moisture in the control area expressed in percentage (after the same time). The results constitute the average value of the measurings performer after 10 probants.

3. RESEARCH RESULTS

3.1. Irritation potential

As Figure 1 shows, the kind of base surfactant in a preparation has substantial influence on the preparation's irritation potential.

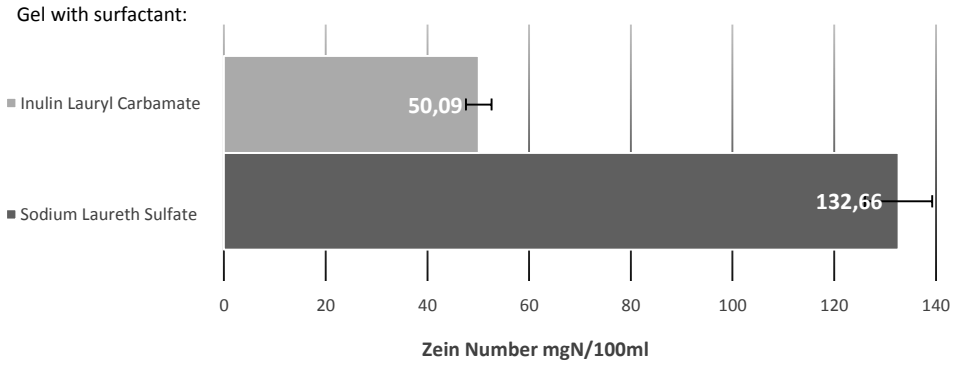

Fig. 1. The irritation potential according to the kind of surfactant used in a shower gel

Rys. 1. Potencjał drażniący w zależności od rodzaju użytego związku powierzchniowo czynnego w żelu myjącym

Source: own research.

Shower gels with the base of *Inulin Lauryl Carbamate* (INCI) surfactant indicates as much as 60% lower irritation potential in comparison to the preparation based on *Sodium Laureth Sulfate* (SLES).

3.2. Measuring the degree of skin dryness

In regard of the conducted examination shown on Chart 2 it may be concluded that the kind of base surfactant influenced the level of skin nutrition significantly, by lowering it. Taking into consideration the lapse being present during examination, it may be stated that shower gel with the inulin base derivative did not influence the raise of the skin dryness level after the washing process. The base element (*Sodium*

Laureth Sulfate – SLES) have caused a raise in skin dryness – the value was more than 8%.

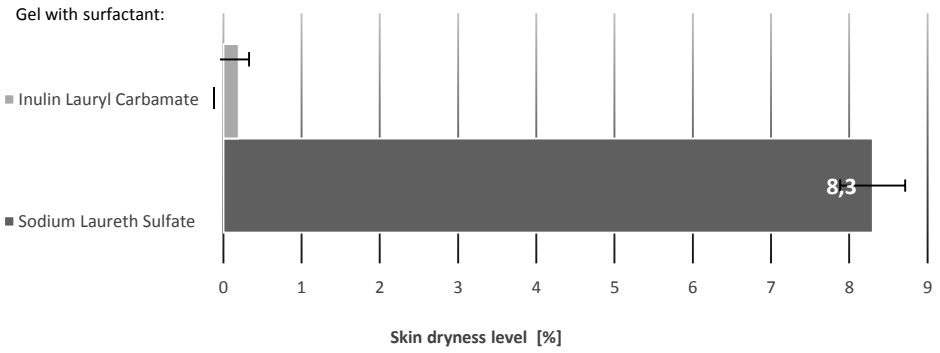

Fig. 2. Level of skin dryness in respect of the kind of surfactant used

Rys. 2. Stopień wysuszenia skóry w zależności od rodzaju zastosowanego surfaktantu

Source: own research.

4. CONCLUSIONS

In conclusion, it may be stated that inulin-based (INCI: *Inulin Lauryl Carbamate)* shower gel is much safer to use than the preparation based on *Sodium Laureth Sulfate* (SLES). Both in the assessment of skin irritation potential and the measurement of skin dryness it may be stated that the surfactant does not have negative effect during the washing process, therefore the aim of the paper was achieved. It may be concluded that biosurfactants may constitute a future substance in the cosmetic industry.

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