A LINE OF SUBMARIMEN AND FERULASHI DERMACOSMETICS - AN EFFECTIVE RESPONSE TO DERMATOLOGICAL CONDITIONS IN PEOPLE WHO ARE EXTENSIVELY EXPOSED TO WATER, PARTICULARLY INTENDED FOR DIVERS AND SURFERS

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ABSTRACT

People who come into frequent and prolonged contact with water, divers and surfers in particular, are prone to dermatological conditions resulting from a discontinuation of the skin barrier, or a disorder of its continuity. The paper presents those disease entities which occur most frequently in people who are extensively exposed to water. It also describes the main ingredients of the dermatological products tested, and demonstrates a case study. The study has undertaken to determine whether the line of SUBMARMEN cosmetics possess properties that inhibit the growth of microbes. To this end, scientists have used a method of surface culture on an agar medium which was enriched by a cream sample representative of the line of cosmetics under scrutiny. The results yielded allow to accurately determine what optimum concentration ensures properties that inhibit growth of the microbes, while setting a direction for future research over the SUBMARIMEN line to analyse moisture, lubrication, elasticity and the pH of the skin.

Key words: dermatoses in divers, diving, surfing, cosmetics for divers, prophylaxis of aquatic dermatoses.

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INTRODUCTION

The line of dermacosmetics demonstrated in the present study has been developed for people frequently or extensively exposed to water, such as divers or surfers, as a prophylaxis against the occurrence of dermatological conditions. The cornified layer of skin is composed of keratinocytes, which are integrated by lipids (ceramides, cholesterol and fatty acids). Lipids are the building blocks of the epidermal barrier, which, among many things, prevents extensive water loss, which in turn leads to the condition of dry skin.

GENERAL GUIDELINES FOR THE PROJECT

Under normal conditions, a stabilized and balanced human skin barrier is composed of the microbiological barrier and the cornified layer.

Natural saprophytic bacterial flora protects skin against pathogenic microbes. Bacterial microflora thus contributes to an efficient maintenance of many basic changes such as protection of the skin against infections, as well as the maintenance of enzymatic processes, or the stimulation of resistance reactions. Saprophytic bacterial flora in an adult is comprised of the Staphylococcus, Cornyebacterium and Propionibacrium kinds of bacteria.

Skin barrier continuity disorders are the result of frequently occurring injuries and traumas, as well as internal (disease) and external factors, e.g. prolonged or frequent exposure to water.

In order to determine what should characterise the line of SUBMARIMEN cosmetics, two properties that are deemed to be absolutely essential have been singled out:

- the ability to instantly replenish lost components in the cornified layer and its regeneration,
- the ability to retrieve balance in the microbiological barrier, as well as preventive antibacterial protection.

MOST COMMON DERMATOLOGICAL CONDI-TIONS IN PEOPLE EXTENSIVELY EXPOSED TO WATER

The most common dermatological conditions in people who are extensively exposed to water are [1,2,3]:

Chronic folliculitis, occurring most frequently in the area of the neck, buttocks, scalp or limbs (Fig. 1). Responsible for folliculitis are Gram-positive bacteria: staphylococci (*Staphylococcus aureus*), streptococci (*Streptococcus pyogenes*), Gram-negative bacteria: *Pseudomonas aeruginosa, Escherichia coli*.

Tinea pedis (Athlete's foot) - the most common manifestation is the interdigital athlete's foot (Fig. 2, 3) caused by: *Trichophyton rubrum* and *mentagrophytes*, as well as *Candida albicans*. There is also a possibility of the Tinea inguinalis (ringworm of the groin) (Fig. 4) mainly caused by *Epidermophyton floccosum*, as well as the otitis externa (Fig. 5) caused by the retention of water in the external auditory canal. These may be caused by mould or yeast-like fungi. Divers are more at risk to suffer from tinea versicolor caused by *Malessezia furfur.*

Irritant contact dermatitis caused by component products of a diver's clothing. The symptoms of irritant contact dermatitis are lichenification, blended foci of extensive cornification, linear fissures or ragads. Periodically acute symptoms appear: erythema, swelling, exudative papule, pruritic blisters (Fig. 6, 7). The abovementioned lesions

appear chiefly on the face and limbs. Typically occurring is the so-called "diver's hand syndrome" (Fig. 8) [4].

Dryness of skin - caused by permanent exposition to water. Repeated contact with water causes the protective barrier of the skin, the cornified layer, to break. This in turn causes a chronic inflammation of the skin which manifests itself first as redness and later as flaking and dryness of the skin.

Fig. 1. Chronic folliculitis.

Fig. 2. Interdigital athlete's foot.

Fig. 3. Interdigital athlete's foot.

Fig. 4. Tinea inguinalis.

Fig. 5. Otitis externa.

Fig.6. Irritant contact dermatitis.

Fig. 7. Irritant contact dermatitis.

Fig. 8."Diver's hand syndrome".

When faced with such disorders, proper skincare maintenance should consist in moisturising of the epidermis, which restores physiology and elasticity to the skin, as well as replenishing ceramide and lipid-forming factors in the skin barrier. It is also essential for such skincare to restore and maintain a balanced microbiological barrier of the skin, act promptly with a view to reducing the visible traces of inflammation on the skin, as well as to counteract pruritus. Basically, this may be facilitated by well-selected active ingredients of dermacosmetics. Accurate localisation of the most frequently occurring dermatoses on the body, in sync with the knowledge of environmental conditions that are

typical for underwater works or divers'/surfers' hobbies, have helped to match correctly the SUBMARIMEN products, which ensure
complex and active care in people with dermatological skin conditions resulting from flawed continuity of the skin barrier.

LINE OF SUBMARIMEN DERMACOSMETICS

For the sake of the project, an original composition of natural ingredients has been developed, which has been optimised in terms of regenerating, restructuring, and prebiotic as well as antibacterial qualities:
Extract from tea tree leaves. High antibacterial and antifungal effectiveness, as well as regenerative activeness for the structural barrier of the skin, with minimal tendency to irritate skin, have unambiguously facilitated the choice in favour of the extract over tea tree oil (anti-pathogen effect, responsible for the correct regeneration of physical damage to the skin) [5,6,7].
Fraction of terpinen-4-ol, isolated by means of special rectification from tea tree oil. This fraction has been by far the most active in all antibacterial and antifungal tests against pathogens most frequently occurring in the skin. In addition, it has anti-inflammatory properties (anti-pathogen and anti-inflammatory effect) [8,9].
Synergic composition of two botanical components: manuka concentrate and white willow bark extract. Active plant substance with prebiotic properties, confirmed efficacy and ability to guarantee balance of skin's microflora, typical in healthy skin (cosmetic prebiotic, regeneration) [10,11].
Concentrated extract from a Himalayan plant called Curculigo, whose efficacy at regenerating the skin barrier has been confirmed, especially on contact with aggressive external factors which upset homeostasis of the skin. It enables a much quicker restoration of the proper pH, the barrier, and the cohesion/integrity of the cornified layer ("tightness") (regeneration, restructuring) [12]. immediately and directly moisturizes skin.
Oil fraction obtained from a coastal halophyte plant *Salicornia herbacea* which (research showed growth of +6,000%!), increases the production of lipids in the epidermis, enhances cellular cohesion through vascularization of the aquaporin channels and the reduction of TEWL and TEUL (regeneration, restructuring) [9].
Each dermacosmetic of the SUBARIMEN line features an active complex of 5 ingredients.

Basic line of SUBMARIMEN dermacosmetics includes:
Special Hair&Body Shower Gel 3in1 **-** entirely based on natural ingredients, which also include natural surfactants/
Prebiotic Hair Growth Stimulator - a scalp conditioner which shows an antibacterial effect and prevents hair loss.
Special Sense Feeling Body MEN Balm with UVA/UVB Filter**-** moisturising and regenerating body balm with a natural activator of male pheromone production responsible for male sexual attractiveness. It contains a body-modelling ingredient and the UVA/UVB filter.
Special Prebiotic Body Balm Muscle Enhancer with Odour filter **-** moisturising, regenerating and soothing body balm with muscle-enhancing and odour-neutralizing properties**.**
Anti-inflammatory Face&Topical Body DAY Cream SPF25 UVA/UVB - regenerating and restructuring face and topical body cream with the SPF25 high-protection filter, helps to control redness.
Antibacterial Hand&Foot Prebiotic Special Cream - antibacterial and restructuring hand and foot cream has an instantaneous softening effect and alleviates post-inflammatory sensations.

Dermacosmetics of the SUBMARIMEN line (Fig. 9) - on account of a male-dominated profession/hobby target group - have been developed for adult males with consideration of a different nature of male skin as compared with female skin.

However, for female skin - very dry, sensitive, with symptoms of atopic dermatitis, prone to allergies - we recommend a selection of FERULASHI (Fig. 10) cosmetics - a line specially developed for beauty parlours. Some of its products might become useful in addressing skin conditions developed after prolonged exposure to water while surfing or diving.

Fig.9. SUBMARIMEN line.

Fig. 10. FERULASHI line.

Conclusion: since the responsibility for all dermatological and aesthetic problems of the skin in surfers or divers lies with the damage of the epidermal barrier, its regeneration and the entire repair procedure, which involves the SUBMARIMEN dermacosmetics ingredients, have been guided on the recovery of microbiological homeostasis and the balancing the metabolic mechanisms occurring in the skin.

A new element, however, is a simultaneous application of active ingredients with antibacterial, prebiotic, regenerating and restructuring properties with a proven effect on pathogens that are most frequently responsible for the occurrence of dermatosis in divers/surfers and people exposed to a prolonged contact with water.

IN VITRO RESEARCH ON ANTIBACTERIAL PERFORMANCE OF SUBMARIMEN DERMACOSMETICS

As mentioned earlier, in order to determine what should characterize the line of SUBMARIMEN cosmetics, two properties that
are deemed to be absolutely essential have been singled out:

- the ability to instantly replenish and "tighten" the lost components in the cornified layer and its regeneration,
- the ability to retrieve balance in the microbiological barrier, as well as preventive antibacterial protection.

Work that has been undertaken over
SUBMARIMEN dermacosmetics thus far has involved *in vitro* research guided on the confirmation of antibacterial efficacy in the preparations that contain a complex of 5 active prebiotic, antibacterial, regenerative and restructuring ingredients which have been developed for the purpose of the present study.

Research objective

The objective of the test herein conducted was to determine whether the **Antibacterial Hand & Foot Prebiotic Special Cream** (later referred to as Hand & Foot),

being representative for the SUBMARIMEN line, possess properties that inhibit the growth of microbes.

Methodology of the research

The antibacterial effect of the material tested was determined using the method of surface culture on an agar medium enriched by a cream sample.

Test strain **-** the test featured a strain of Gram-positive *Staphylococcus aureus* ATCC 27853 bacteria

Materials and reagents

A)Growth mediums:
- Agar (TSA),
- Nutrient Broth (TSB),
- Sodium Chloride Buffered Peptone Broth.

B)Research materials:
- control sample: "H&F O" - Hand and Foot cream without antibacterial ingredients
- test sample: ”H&F” – Hand and Foot cream

Test description

Day 1.

Overnight the culture was started: 50 µl of rejuvenated *Staphylococcus aureus* culture was inoculated with 20 ml of TSB broth and then placed in a shaking water bath at 35ºC overnight.

Preparation of the medium: each Petri dish was filled with about 10 ml of agar (TSA) and left to jellify.

Day 2.

In order to determine the lowest concentration of the antibacterial cream per surface of 1 cm^2, different quantities of tested creams were added to sterile agar (TSA) cooled to 45ºC. Each pre-prepared Petri dish was filled with 5 ml of the thus prepared and well-homogenized medium, so that a 1 mm layer of agar with cream was formed, which imitated skin moisturized by cream, and then left to jellify.

In order to prepare the abovementioned dish with agar and the tested cream, 100 µl of 10^{-5} and 10^{-6} serial dilutions of overnight culture have been inoculated, and then incubated for 24 hours in 35ºC.

Day 3.

After 24 hours of incubation, an amount of cream that inhibits the growth of microbes per 1 cm^2 was determined. The evaluation consisted in counting the number of bacterial colonies on the dishes and comparing control samples with test samples

The said test was repeated three times.

Research results

Impact of the tested "Hand & Foot" cream concentrations on the strength of growth of the *Staphylococcus aureus* ATCC 27853 bacterial strain

Tab. 1.

Results of the antibacterial effect of the tested dish on Staphylococcus aureus.

Amount of cream per 1 cm² of the dish area	Number of bacterial colonies on the dishes*			
	HN *S.aureus* 10^{-5}		HN *S.aureus* 10^{-6}	
	H&F O	H&F	H&F O	H&F
3,5 µg	486 jtk	458 jtk	52 jtk	45 jtk
5,2 µg	434 jtk	448 jtk	46 jtk	43 jtk
7,0 µg	440 jtk	470 jtk	48 jtk	48 jtk
8,8 µg	478 jtk	462 jtk	49 jtk	49 jtk
10,5 µg	472 jtk	284 jtk	44 jtk	26 jtk

* average results from 3 measurements.

Conclusion

The experiment conducted on the strain *Staphylococcus aureus* ATCC 27853 has proved the antibacterial effect of the "Hand & Foot" cream sample with the amount of 10,5µg per 1 cm² of the area.

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