Rational Design of Cosmetics with Thermal Water for Atopic Dermatitis

Poster 577

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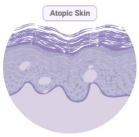
Introduction:

Atopic dermatitis (AD) is a chronic and recurrent inflammatory skin disease, frequently associated with atopy. It is a chronic pruritic and inflammatory dermatosis, which progresses through crises. AD therapy aims to control symptoms, which includes the use of adjuvant products that promote skin hydration and improve its protective barrier function. Numerous studies indicate that moisturizers have beneficial effects on AD clinical symptoms, transepidermal water loss, and stratum corneum hydration [1]–[6].



Bioactive properties of thermal waters have motivated their use in the prevention and treatment of various skin conditions, leading to their commercialization in the form of vaporizers or as ingredients of other cosmetic products [7].

We developed a range of innovative cosmetic products, including a supplemented thermal water spray and a body lotion through a rational design, by selecting ingredients that may promote well-being and barrier function of skin with atopic dermatitis (AD), using São Pedro do Sul Thermal Water as core ingredient.

Materials & Methods:

The principles behind the development of these cosmetic products were based on criteria of minimalism, environmental sustainability, ease of use, innovation in texture or presentation, long duration, and protection of the skin's microbiome to maintain its barrier properties.

Formula	Active ingredients
Supplemented Thermal Water and Body Lotion	○ humectants (Glycerin); ○ skin repairers (Panthenol); ○ antioxidants (Tocopherol); ○ prebiotics (Propylene Glycol, Water, Arctium Lappa Root Extract).
Body Lotion	○ fatty esters of vegetable origin (Capric/Caprylic Triglycerides); ○ actives that repair the skin barrier (Niacinamide); ○ functional ingredients that mimic the natural moisturizing factor and with film-forming action (Water, Pentylene Glycol, Glycerin, Fructose, Urea, Citric Acid, Sodium Hydroxide, Maltose, Sodium PCA, Sodium Chloride, Sodium Lactate, Trehalose, Allantoin, Sodium Hyaluronate, Glucose); ○ vegetable oils (grape seed oil).

Both pH values were adjusted to 4.9 respecting the recommended range of values for skin balance.

Rheological characterization (cone-plate viscometer): measurements were performed under controlled temperature conditions (T=25 °C ± 2 °C) and for 1 minute (>5 cone revolutions).

Cytotoxicity testing of the core ingrediente: was performed through MTT test upon a human keratinocyte cell line (HaCaT).

Student t-test: the effect of each concentration with the respective control. p value <0.05 was accepted as denoting statistical significance.

Results & Discussion:

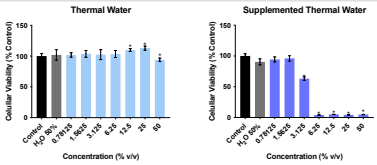
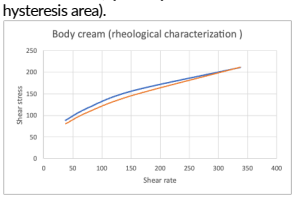


Figure 1 - Cellular viability profile (MTT assay; HaCaT – human keratinocyte cell line) for formulation São Pedro do Sul Thermal Water and the Supplemented Thermal Water formulation, ranging from 0.78% to 50% (w/v). Cell viability is represented as percentage of the control treated only with culture media. Results are presented as the mean values and bars represent standard deviations. Statistical Analysis: t- student test was performed for each concentration compared to control; * p<0.05 was considered a significant variation.

Cytotoxicity testing upon keratinocytes revealed a **very biocompatible profile of the core ingredient**, maintaining cellular viability even at the highest tested concentration of 50% (v/v). For the supplemented thermal water, a dose response was present with a decrease in cellular viability after 6.25% (v/v) **(Figure 1).** The high sensitivity of the method (cellular monolayer) may have contributed to this result since all ingredients were used at recommended concentrations for sensitive skin.

Viscosity of the body lotion was identified as a key parameter for performance. Through rheological characterization it was classified as a **non-newtonian, pseudoplastic fluid with thixotropic behavior** (negative hysteresis area).



Shear rate (1/s)	Viscosity (cP)
37.50	236.7
75.00	156.0
150.0	104.1
337.5	62.64

Both the supplemented thermal water and the body lotion were developed with **appropriate skin feel for application in atopic skin**. Safety of both formulations is further supported by safety assessment calculations, according to the EC Regulation nº 1223/2009 based on each ingredient selected for these formulas and considering a high-risk application (impaired skin barrier function).

Trial results and long clinical experience have proven that emollients are safe and effective in patients with AD and that daily use of emollients on the skin decreases the risk of exacerbation by 30% to 50% in children with AD. In addition, emollients should be used regularly as first-line therapy, even when no obvious skin lesions are observed [1], [6].

As some products already on the market, we chose to introduce actives that soothe itching and that present some anti-inflammatory action, with the aim of protecting the skin, avoiding inflammatory symptoms of AD that often result in reddish lesions and the use of topical corticosteroids. These active agents have been combined with emollients and humectants, providing repair and control of the skin barrier as well as xerosis [8], [9]. The core ingredient, **thermal water proves to be essential for the overall added value of these formulations, being rich in essential minerals and having proven moisturizing and anti-irritant effects**, which position it as a complementary approach in dermatological treatments [10].

Conclusions:

The rational design of a supplemented thermal water and a body lotion with Sao Pedro do Sul Thermal Water for atopic dermatitis was successfully achieved. Textural and in vitro safety properties support further in vivo testing of these products

Acknowledgements:

This work was supported by "AqvaTOPIC – Desenvolvimento de gama de produtos cosméticos com água mineral natural das Termas de S. Pedro do Sul, vocacionados para a dermatite atópica" I&DT Project finantially supported by Portugal 2020 Program (PT 2020) through the Competitiveness and Internationalization Operational Program (POCI) and by the European Union through the European Regional Development Fund (FEDER), with the code POCI-01-0247-FEDER-070908. Financial support was also provided by FCT through PhD fellowship (SFRH//BD/136192/2018) awarded to Ana Sofia Oliveira. The authors acknowledge the Health Sciences Research Center (CICS-UBI) of the University of Beira Inteiror where the work that originated the present poster was developed.

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