53th Annual ESDR Meeting 2024, Lisbon, Portugal

Dr Irena Eris

CENTRE FOR SCIENCE AND RESEARCH

Non-inferiority study of paraffin and paraffin-free barrier emollient creams in individuals with xerosis and AD symptoms

Karolina Lendzion, Bożena Tyszczuk, Joanna Markiewicz, Monika Pasikowska-Piwko, Renata Dębowska, Katarzyna Rogiewicz, Irena Eris

Dr Irena Eris S.A., Department of Research and Innovation, Centre for Science and Research, Technological Department, Piaseczno, Poland

INTRODUCTION

Atopic dermatitis (AD) is estimated to affect 13% of children and 5% of adults worldwide and emollients are the primary treatment of AD. Paraffin-based emollients are safe and effective products of choice among AD patients. Nevertheless, paraffin-free emulsions are continuously gaining interest among consumers.

The aim of the study was evaluation of equivalence of two topical nonsteroidal formulations for sensitive, xerotic skin with AD symptoms (n=35, aged 8 months – 81 years). Additionally, *in vitro* safety evaluation of both medical devices was performed in cell monolayer, as well as reconstructed human epidermis (RHE) model.

MATERIALS AND METHODS

A split-face assessment of paraffin-based (16913) and paraffin-free (16913A) emollient barrier creams was performed after 2 weeks of use on face and body. Both products contained Canola oil, hemp seed oil, and sodium hyaluronate. In 16913A, paraffin was replaced with vegetable oil and caprylic/capric triglyceride. Instrumental assessment of the products' influence on transepidermal water loss (TEWL), hydration, oil content, as well as smoothness (n=11) was performed for both formulations. Volunteers were also asked to fill in a questionnaire evaluating products' tolerability and effectiveness in reducing AD symptoms. Additionally, *in vitro* safety assessments of medical devices were performed. Cytotoxicity was evaluated with agarose overlay assay using L929 murine fibroblast cell line. Briefly, 10 µL of negative control (PBS), positive control (3% SDS), and tested medical emulsions (16913 and 16913A in quadruplicate) were applied on 6 mm celluose discs atop an agarose layer on confluent 6-well cell culture plates, and subsequently incubated for 24 h. Then, discs were removed and 2 mL of 1 mg/mL MTT in PBS were added to each well, and photographs of plates were taken after 2 hours of MTT staining. Skin irritation potential was evaluated using RHE model (Mattek Inc.), according to ISO 10993-23:2021, with 18 h tissue exposure to 100 µL of tested medical devices in triplicate.

RESULTS

Products were equally effective in improving skin hydration (+39% and +40% in 73% of volunteers; **Fig. 1A**) and elasticity (+22% and +23% in 73% of volunteers; **Fig. 1D**). Oil content was more greatly enhanced in 16913 (+77% on average vs. +36% for 16913A; **Fig. 1B**). As a consequence, TEWL decrease was more evident for 16913 (-16.2% vs -3.7% for 16913A; **Fig. 1C**). Epidermal smoothness increase was observed for both products on similar level (data not shown). Both creams were well tolerated by volunteers, including the group of infants. They were similarily effective in reducing symptoms of AD (**Fig. 2C**) and skin dryness (**Fig. 2A** and **2B**).

In safety evaluation, it was shown that neither 16913, nor 16913A exhibit cytotoxic potential in L929 cells (**Fig. 3**). Skin irritation potential with RHE model showed that both 16913 and 16913A were non-irritant (mean tissue viabilities were 94.7 for 16913 and 106.4 for 16913A (**Fig.4**).

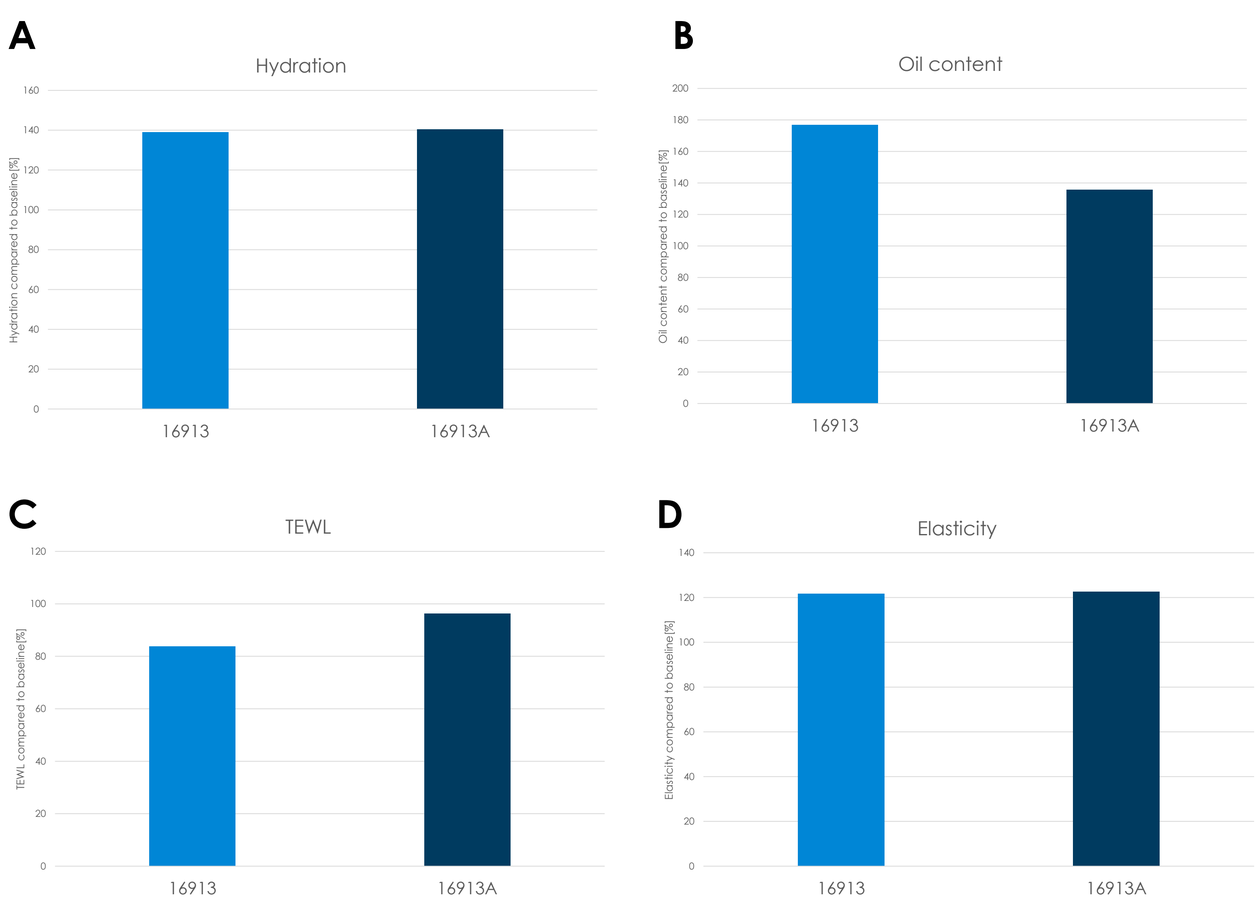

Figure 1. The influence of 16913 (paraffin-based cream) and 16913A (paraffin-free cream) on hydration (**A**), oil content (**B**), TEWL (**C**), and skin elasticity (**D**) after 14 days of product use.

A

16913	1 very dry	2 dry	3 periodically dry	4 moisturized	5 intensely moisturized	mean
Baseline	4 (17)	16 (70)	3 (13)	0 (0)	0 (0)	1.96
After 14 days	0 (0)	1 (4)	2 (9)	18 (78)	2 (9)	**3.91**
						99% increase

Subjective evaluation of skin moisturization
Number of volunteers (%)

B

16913A	1 very dry	2 dry	3 periodically dry	4 moisturized	5 intensely moisturized	mean
Baseline	4 (17)	16 (70)	3 (13)	0 (0)	0 (0)	1.96
After 14 days	0 (0)	1 (4)	1 (4)	20 (87)	1 (4)	**3.91**
						99% increase

Subjective evaluation of skin moisturization
Number of volunteers (%)

C

Effects after 2 weeks	% of volunteers who agreed with statement	
	16913	**16913A**
Reduces irritation	74%	74%
Soothes skin	86%	77%
Reduces itching	80%	80%
Reduces skin scaling	93%	86%
Reduces skin dryness	96%	87%
Prevents exacerbation of lesions (xerosis and skin scaling)	81%	76%
Restores comfort to taut and chronically dry skin	96%	91%
Is delicate to sensitive skin (does not cause irritation)	91%	86%

Figure 2. Subjective evaluation of product efficacy. Level of skin moisturization after 14 days of treatment with 16913 (paraffin-based cream; **A**) and 16913A (paraffin-free cream; **B**) was evaluated in analog 5-point scale. The efficacy of tested medical devices in improving skin condition and reducing AD symptoms was evaluated in split-face assessment (n=23) after 14 days of using (**C**).

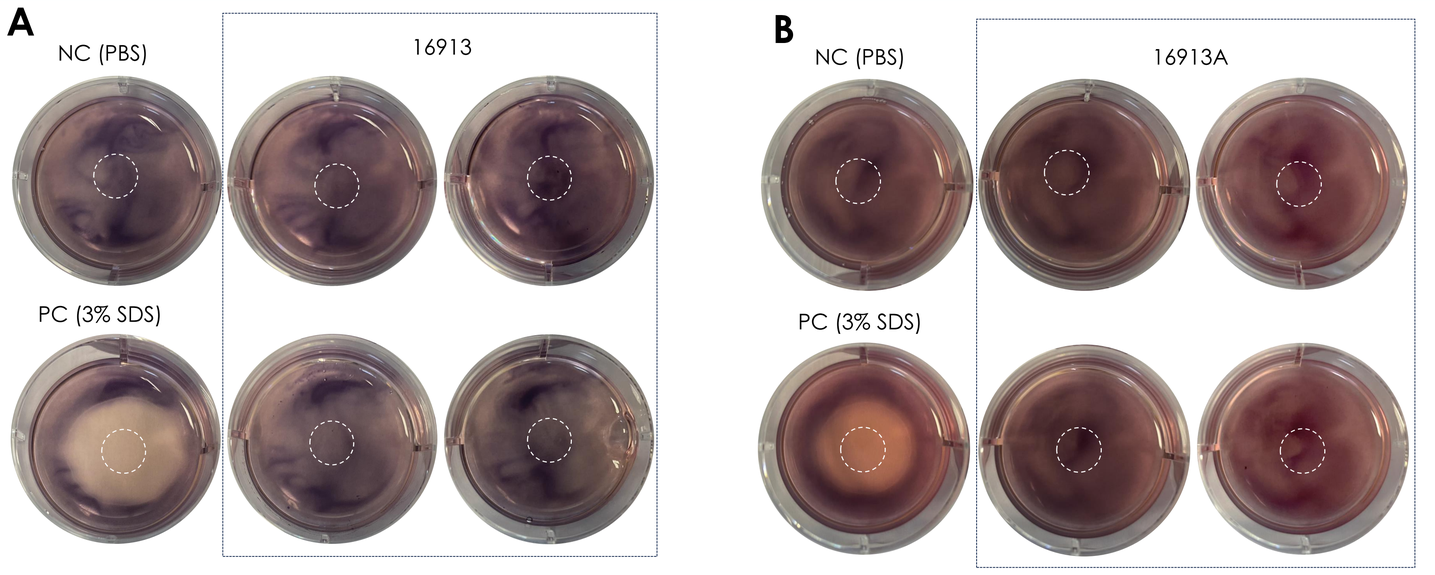

Figure 3. Cytotoxicity of 16913 (paraffin-based version; **A**) and 16913A (paraffin-free version; **B**) tested in agarose overlay assay in L929 cells. Negative control (NC; PBS), positive control (PC; 3% SDS), and tested medical devices (16913, 16913A in quadruplicate) were evaluated after 24-h incubation. Dashed line circles indicate the location of cellulose discs.

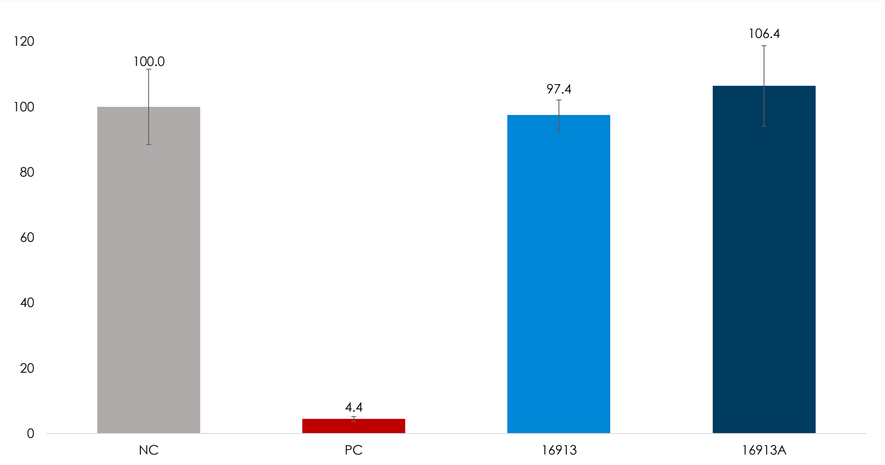

Figure 4. Skin irritation potential of tested medical devices: 16913 (paraffin-based version) and 16913A (paraffin-free version). Negative control (NC; PBS), positive control (PC; 1% SDS), and tested medical devices (16913, 16913A) were evaluated after 18-h incubation. Values are presented as mean ± SD from 3 samples tested in duplicate (n=6).

CONCLUSIONS

Our study has shown that equivalent formulation in which paraffin was replaced by other emollients exhibits comparable skin barrier-enhancing properties. Those results indicate that non-paraffin-based emollients may be a good alternative to traditional ones, especially for patients who have concerns regarding the use of petroleum-derived products or exhibit hypersensitivity to those ingredients in topical formulations.