

Communication

# Assessment of the Impact of a Cosmetic Product with Sheep Colostrum on Acne Skin

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**Abstract:** Colostrum, the first secretion of mammalian breasts after giving birth, contains a wealth of components believed to have a beneficial effect on human skin, including lactoferrin, immunoglobulin (Ig)A, beta-carotene, fat-soluble vitamins, and zinc. The present study examines the effect of a cosmetic preparation containing 15% lyophilisate of sheep colostrum on acne skin. A group of 27 volunteers with mild or moderate acne applied the cream twice a day for eight weeks. Before and after using the cream, the level of skin hydration, sebum level, and TEWL were measured using a standardized Courage–Khazaka Multi Probe Adapter. The participants also completed a survey rating the effects of using the cosmetic preparation. Regular application of the cream with sheep colostrum resulted in an objective improvement in hydration and TEWL and a reduction in sebum; this is extremely desirable for acne-prone skin. Three-quarters of the participants reported that the tested cream reduced acne lesions (blackheads, papules, pustules, and erythema) by around 40%. Moreover, the cosmetic preparation improved hydration by 40% and reduced seborrhea by 29% in 82% of subjects and kept the skin in good condition in 90%. As the cream improves the hydrobarrier and overall condition of the skin, it could serve as an addition to local acne treatment, e.g., with retinoids.

**Keywords:** acne; sheep colostrum; skin; hydration; sebum; TEWL



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## 1. Introduction

Acne is a multifactorial inflammatory disease affecting the pilosebaceous follicles of the skin. It predominantly affects teenagers, but it is not uncommon among adults [1]. The condition not only impacts physical appearance but also significantly lowers self-confidence, both during active outbreaks and post-recovery due to potential scarring [2]. Effective treatment requires regular and gentle care for such sensitive skin.

The pathogenic factors of acne include increased sebum secretion, follicular epidermal hypercornification, *Cutibacterium acnes* colonization, and inflammation; the condition is characterized by the development of blackheads, inflammatory pimples, papules, and scars [3]. Typically, acne treatment includes both topical and systemic approaches, with the decision based on symptom severity. Although acne is not deemed an infectious disease, the regimen often includes antibiotics such as clindamycin, lymecycline, doxycycline, erythromycin, or tetracycline, each with a potential to enhance bacterial resistance [4,5]. The imperative to seek and develop alternative non-antibiotic therapies for acne has escalated due to the growing concerns over antibiotic resistance and adverse effects to treatment. Other prevalent treatments, such as retinoids, benzoyl peroxide, azelaic acid, and salicylic acid, have known systemic effects and can cause local skin irritation [6]. In the most severe cases, oral retinoids are used [7]. Although the skin barrier is affected in the course of acne, the choice of treatment may worsen its function [8].

Colostrum is the first milk produced by humans and other mammals immediately after giving birth. It is rich in various bioactive components, including several growth factors involved in skin regeneration and repair [9,10]. It also contains lactoferrin, which may have an important role in acne treatment because of its antibacterial, antioxidant, and anti-inflammatory properties [11]. Proline-rich polypeptides (PRPs) from colostrum modulate the immune system and have been shown to improve skin barrier function [12]. The author of the patent reports that in patients ( $n = 12$ ) with seborrheic acne who used the cream with 30% equine colostrum, the skin lesions completely disappeared, and their skin recovered entirely [13]. The authors of another invention claim that their antiacne ingredient, a product of bovine colostrum fermentation, has an effect related to its antibacterial activity [14].

The composition of sheep colostrum, particularly in the immediate postpartum period, is markedly richer than that of cow colostrum, with significantly higher concentrations of fat (13.0% vs. 5.1%), protein (11.8% vs. 7.1%), and total solids (28.9% vs. 15.6%). The lactose content in sheep colostrum is slightly lower than in bovine colostrum (3.3% vs. 3.6%), and the amount of minerals is comparable (0.9%) in both types of colostrum [15]. Notably, sheep colostrum contains the highest levels of IgG and IgA when compared to bovine and caprine colostrum, which can play role in regulating the immune response [11,12]. Lysozyme, another component of sheep colostrum, is effective in breaking down the cell walls of acne-causing bacteria. Given that the lysozyme content in sheep's milk is significantly higher than in bovine and caprine milks, it can be inferred that sheep colostrum's lysozyme levels are even more pronounced. Also, lactoperoxidase acts as a natural antibacterial agent as an element of non-specific cellular immunity [11]. Sheep colostrum is also significantly richer in EGF (epidermal growth factor) than bovine colostrum; its topical application was earlier described in acne lesions, as well as in the treatment of scars [16,17].

Hence, the aim of the present study was to assess the effects of a cosmetic cream containing 15% sheep colostrum lyophilisate on acne skin.

## 2. Materials and Methods

### 2.1. Preparation of Colostrum Cream

The colostrum cream was prepared as described previously [18]. The active component in the cream is 15% sheep colostrum lyophilisate.

INCI: Aqua, Sheep Colostrum, Isononyl Isononanoate, Tripelargonin, Cetearyl Olivatate, Sorbitan Olivatate, Pentylene Glycol, Glyceryl Stearate Citrate, Potassium Sorbate, Sodium Benzoate, Citric Acid, Parfum, Sodium Lactate, Acrylates/C10-30 Alkyl Acrylate Crosspolymer, Helianthus Annus Seed Oil, and Tocopherol.

### 2.2. Selection of Participants

The research was carried out on a group of 30 volunteers with mild or moderate acne. The group was formed in accordance with the guidelines of the Helsinki Declaration of 1964, with subsequent additions. The study received the approval of the Bioethics Commission No. RNN/44/23/KE of 14 February 2023.

The exclusion criteria comprised pregnancy and lactation, active viral lesions on facial skin, active fungal and bacterial diseases, or participation in other dermatological therapies during the study period.

The study participants were asked not to use any other cosmetic treatments and not to change cosmetic preparations for daily care during the study, except changing the cream for colostrum cream. The participants were asked to use the cream twice a day, once in the morning and once in the evening, after cleansing their face: all participants pledged to comply with the recommendations. Written informed consent was obtained from each participant before enrolment.

In total, 30 subjects, aged 18–27, participated in the study. Two were lost to follow up due to different reasons, and one did not complete the study due to adverse effects (dryness and irritation of the skin).

### 2.3. Instrumental Measurement of Skin Parameters

Skin condition was assessed before the treatment and after eight weeks of everyday use. The skin parameters were measured three times, i.e., on the forehead, cheek, and chin.

The amount of sebum on the skin, hydration, and changes in transepidermal water loss (TEWL) were measured with an MPA 580 apparatus (Courage and Khazaka Electronic GmbH, Cologne, Germany). The measurements were carried out under constant conditions (temperature of 20 °C and humidity of 45% ± 5%) once the participants had been acclimatized to ambient conditions for 15 min.

Hydration of the skin was measured via a corneometer, which measures the change in dielectric constant due to skin surface hydration. TEWL was measured via Tewameter by assessing the gradient of water evaporation from the skin. Sebum measurement was conducted via Sebumeter; the mat tape of the Sebumeter in contact with the skin becomes transparent because of sebum on the skin; then, the transparency of the tape is measured.

### 2.4. Subjective Assessment

The participants were also asked complete a questionnaire in which they evaluated the effects of the eight-week treatment. They rated skin symptoms such as blackheads, papules, pustules, and erythema, as well as skin hydration, seborrhea, and overall skin condition. They indicated the percentage of either improvement, deterioration, or no change.

### 2.5. Statistical Analysis

The data were processed as mean and standard deviation (mean ± SD) or median and interquartile range (median [25–75%]) as appropriate. The differences occurring in skin parameters over time were evaluated using the Wilcoxon signed-rank test. *p*-values < 0.05 were considered as statistically significant.

## 3. Results

The study was completed by 27 participants.

### 3.1. Instrumental Measurement of Skin Parameters

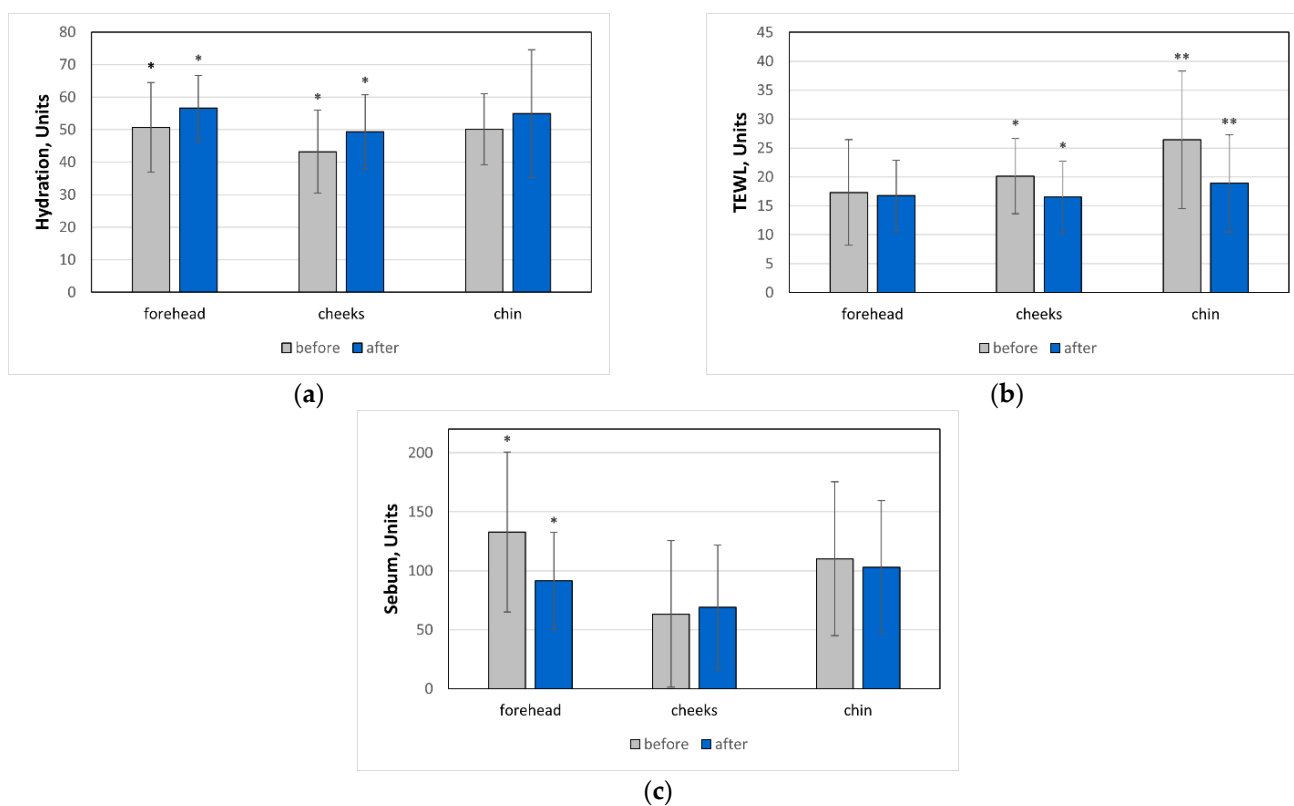
After eight-week application, the cream with colostrum yielded a significant improvement in skin hydration on the forehead and cheeks, improved TEWL values on the cheeks and chin, and caused a reduction in seborrhea on the forehead. These parameters were also found to improve in the remaining parts of the face, but without statistical significance. The tested skin parameters are presented in Table 1 and Figure 1.

**Table 1.** Changes in skin parameters after eight weeks of treatment expressed as mean ± SD and median (25–75%).

Face Area	Measurement I (Week 0)	Measurement II (Week 8)	Statistical Significance ( <i>p</i> )
<b>Hydration</b>			
Forehead	50.7 ± 13.8	56.6 ± 10.0	<i>p</i> = 0.036
	51.0 (42.2–58.2)	58.5 (53.2–61.0)	
Cheeks	43.2 ± 12.8	49.3 ± 11.4	<i>p</i> = 0.013
	41.0 (38.5–52.0)	50.0 (41.5–55.7)	
Chin	50.1 ± 10.9	54.9 ± 19.7	NS ( <i>p</i> = 0.171)
	50.0 (41.5–54.2)	52.0 (40.7–60.0)	
<b>TEWL</b>			
Forehead	17.3 ± 9.1	16.8 ± 6.1	NS ( <i>p</i> = 0.876)
	15.5 (10.0–20.5)	15.0 (13.0–18.5)	
Cheeks	20.1 ± 6.5	16.5 ± 6.2	<i>p</i> = 0.013
	18.5 (14.7–25.0)	15.0 (13.0–16.2)	

Table 1. Cont.

Face Area	Measurement I (Week 0)	Measurement II (Week 8)	Statistical Significance ( <i>p</i> )
Chin	26.4 ± 11.9 22.0 (17.7–33.0)	18.9 ± 8.4 16.0 (14.0–20.0)	<i>p</i> < 0.001
<b>Sebum</b>			
Forehead	132.8 ± 67.8 120.5 (81.5–199.7)	91.7 ± 41.0 84.0 (61.0–101.2)	<i>p</i> = 0.002
Cheeks	63.3 ± 62.1 51.5 (22.2–69.2)	69.2 ± 52.7 64.0 (35.0–83.7)	NS ( <i>p</i> = 0.264)
Chin	110.2 ± 65.3 89.5 (62.7–145.0)	103.1 ± 56.2 90.0 (60.5–134.2)	NS ( <i>p</i> = 0.207)



**Figure 1.** Instrumental measurements of skin hydration (a), TEWL (b), and sebum (c) before and after treatment. \* *p* < 0.05, \*\* *p* < 0.01.

### 3.2. Subjective Assessment of Skin Parameters

The subjects assessed their skin symptoms, e.g., blackheads, papules, pustules, and erythema, as well as skin hydration, seborrhea and overall skin condition after eight weeks of treatment. The results are provided in Tables 2 and 3.

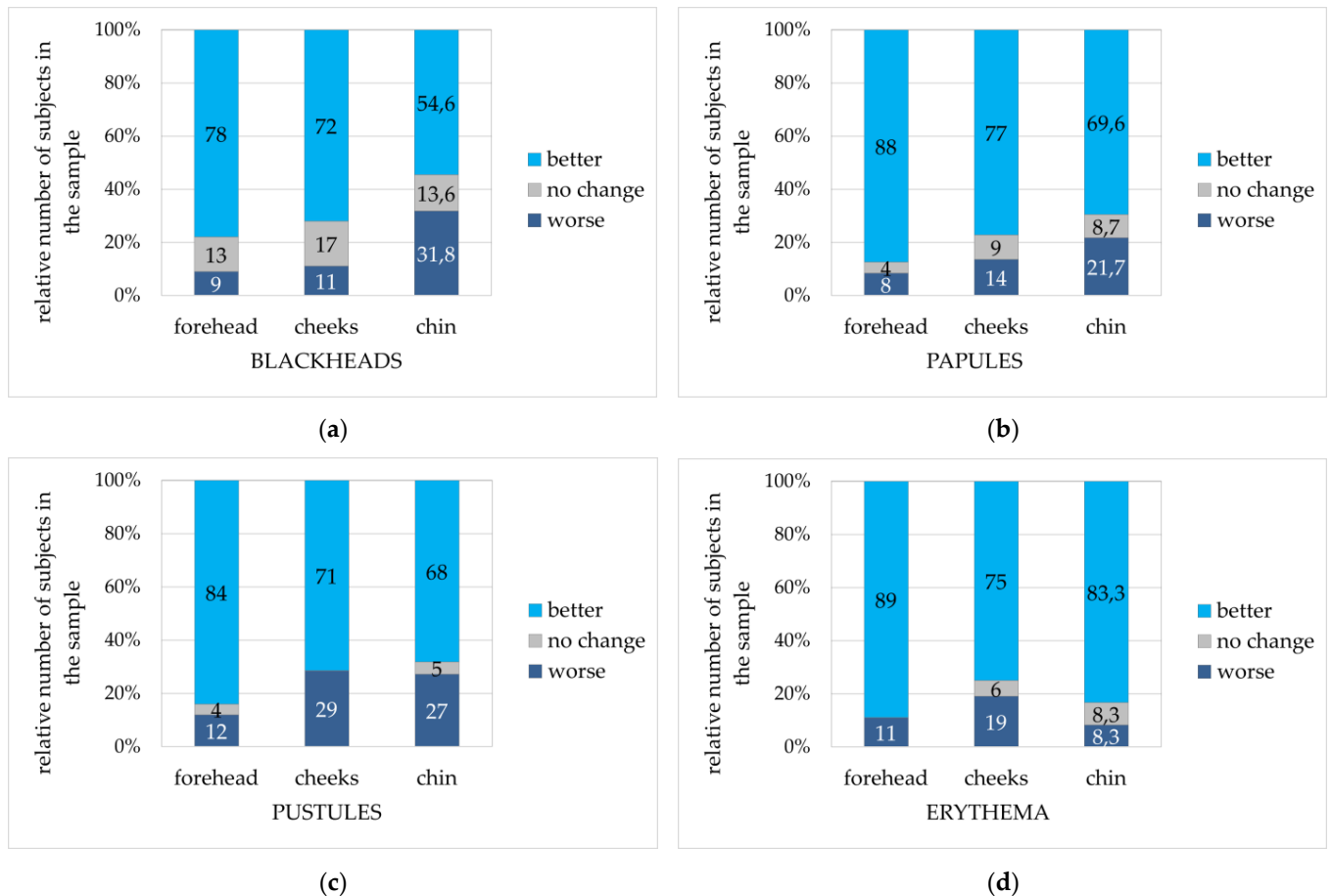
Improvements were noted with regard to the numbers of blackheads (68.3% of participants), papules (78.1%), pustules (74.5%), and erythema (82.4%) for the whole face, i.e., forehead, chin, and cheeks (Figure 2). The mean improvement noted, where present, was 37.5% (reduction of blackheads), 39.2% (reduction of papules), 43.4% (reduction of pustules), and 38.5% (reduction of erythema) for the whole face (forehead, chin, and cheeks) (Table 2).

Improvement was noted in skin hydration (81.5% of participants), seborrhea (82.4%), and overall skin condition (89.7%) for the whole face (forehead, chin, and cheeks) (Figure 3).

The mean improvement, where present, was 39.6% (increase in hydration), 28.7% (reduction of sebum), and 39.1% (overall skin condition) for the whole face (forehead, chin, and cheeks) (Table 3).

**Table 2.** Subjective assessment by participants of their skin symptoms such as blackheads, papules, pustules, and erythema.

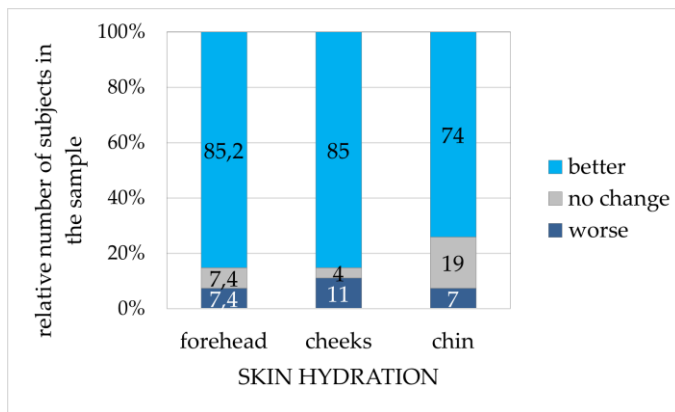
	BLACKHEAD			PAPULES			PUSTULES			ERYTHEMA		
	Forehead	Chin	Cheeks	Forehead	Chin	Cheeks	Forehead	Chin	Cheeks	Forehead	Chin	Cheeks
Mean improvement in the group declaring improvement (group size)	33.3% (N = 18)	38.8% (N = 12)	40.4% (N = 13)	32.6% (N = 21)	43.2% (N = 16)	41.8% (N = 17)	37.6% (N = 21)	44.3% (N = 15)	48.3% (N = 15)	40.4% (N = 16)	31.5% (N = 10)	43.5% (N = 12)
Group size with no changes	N = 3	N = 3	N = 3	N = 1	N = 2	N = 2	N = 1	N = 1	N = 0	N = 0	N = 1	N = 1
Mean deterioration in the group declaring deterioration (group size)	12.5% (N = 2)	10.7% (N = 7)	10.0% (N = 2)	15.0% (N = 2)	16.0% (N = 5)	30.0% (N = 3)	10.0% (N = 3)	19.5% (N = 6)	30.8% (N = 6)	10.0% (N = 2)	10.0% (N = 1)	8.3% (N = 3)
Group size with no symptoms	N = 4	N = 5	N = 9	N = 3	N = 4	N = 5	N = 2	N = 5	N = 6	N = 9	N = 15	N = 11



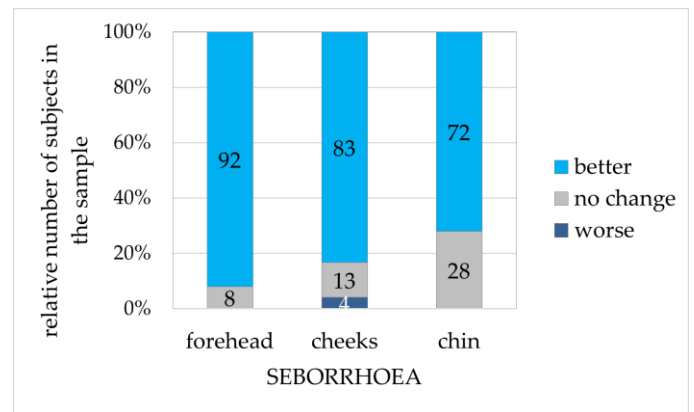
**Figure 2.** Percentage of subjects who declared improvement (blue), no change (grey), and deterioration (navy blue) in terms of skin lesions such as blackheads (a), papules (b), pustules (c), and erythema (d).

**Table 3.** Subjective assessment by participants of their skin hydration, seborrhea, and overall skin condition.

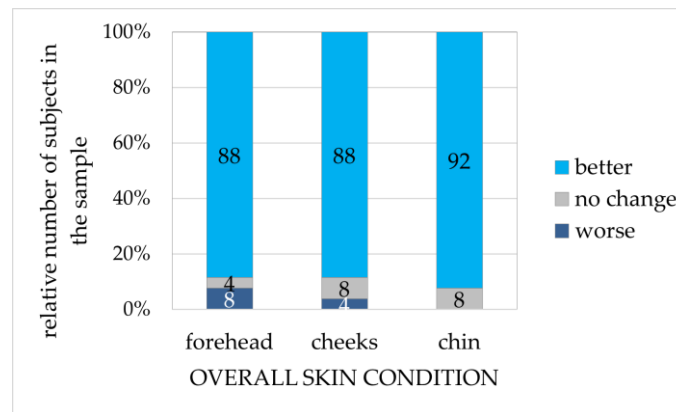
	SKIN HYDRATION			SEBORRHOEA			OVERALL SKIN CONDITION		
	Forehead	Chin	Cheeks	Forehead	Chin	Cheeks	Forehead	Chin	Cheeks
Mean improvement in the group declaring improvement (group size)	37.5% (N = 23)	38.0% (N = 20)	43.2% (N = 23)	32.5% (N = 23)	24.1% (N = 18)	29.6% (N = 20)	39.7% (N = 23)	33.9% (N = 24)	43.8% (N = 23)
Group size with no changes	N = 2	N = 5	N = 1	N = 2	N = 7	N = 3	N = 1	N = 2	N = 2
Mean deterioration in the group declaring deterioration (group size)	20.0% (N = 2)	15.0% (N = 2)	36.7% (N = 3)	0.0% (N = 0)	0.0% (N = 0)	10.0% (N = 1)	22.5% (N = 2)	0.0% (N = 0)	20.0% (N = 1)
Group size with no symptoms	N = 0	N = 0	N = 0	N = 2	N = 2	N = 3	N = 1	N = 1	N = 1



(a)



(b)



(c)

**Figure 3.** Percentage of subjects who declared improvement (blue), no change (grey), and deterioration (navy blue) in terms of skin hydration (a), seborrhea (b), and overall skin condition (c).

**4. Discussion**

This study examines the efficacy of a cosmetic preparation containing sheep colostrum on acne-prone skin, with particular emphasis on the potential dermatological benefits arising from its bioactive components. The outcome of the study was measured by subjective (participants’ opinions) and objective (measurements of epidermal barrier function) methods. Our cream is a cosmetic, and for this category, subjective opinions are especially important. The volunteers assessed the antiacne effects as improving their skin in the light of skin lesion and epidermal barrier function.

Acne can be treated topically with agents such as benzoyl peroxide, retinoids, and oral isotretinoin, as well as with photodynamic therapy, chemical exfoliation therapy, and laser

therapy. However, such treatments, and acne itself, can increase the rate of water loss from the epidermis, resulting in skin dryness and inflammation and greater skin sensitivity [19]. Acne skin samples were found to demonstrate an altered expression of epidermal molecules with a key role in maintaining barrier function [8], and acne patients demonstrated higher TEWL and lower hydration compared to a healthy group [20].

Our findings indicate that treatment resulted in greater skin hydration on the forehead and cheeks, which may indicate that the bioactive colostrum components (including growth factors, vitamins, and lipids) enhance water-retention capacity. Accordingly, the reduction in TEWL observed on the chin and cheeks suggests an improvement in hydrolipid barrier integrity, likely mediated by lipids and proteins that strengthen the stratum corneum [13,21]. Mueller et al. [22] propose that lactoferrin, a key component of colostrum, improves skin health by reducing acne lesions, enhancing hydration, diminishing TEWL, and lowering sebum production.

Sebum plays the key role in the development of acne. Acne begins just before puberty, when the sebaceous glands enlarge, and reaches its maximum occurrence in early adolescence. Although patients with acne demonstrate greater sebum secretion in the whole face than in controls, its level does not correlate with lesion count [23]. In our study, most patients had a normal skin type rather than an oily skin type, according to Sebumeter guidelines [23]. Another study involving over 900 patients found sebum to have a clear influence on inflammatory lesions and that male acne patients are more influenced by sebum content than female acne patients [24]. Our results indicate that treatment was associated with a notable reduction in sebum production on the forehead, a critical factor in acne pathogenesis. This can be attributed to the regulatory effects of the lipid, cytokine, and immunoglobulin components on the sebaceous glands [25–28]. It is important to note that the greatest sebum content was observed on the forehead; as no significant changes were found in other facial regions, this may suggest that sebum production was normalized and that its content was not simply reduced.

The study participants reported improvements in inflammatory acne lesions, which is consistent with the documented anti-inflammatory properties of colostrum, including its constituent immunoglobulins, lactoferrin, lactoperoxidase, and cytokines [22,29]. Skin regeneration and repair was also enhanced by the presence of growth factors such as IGF-1, EGF, and TGF, potentially accelerating the healing of acne-related scarring and erythema [11]. Another component, lactoferrin, known for its anti-inflammatory and antibacterial properties, demonstrates the ability to regulate cytokine secretion, inhibit inflammatory responses, and reduce levels of pro-inflammatory cytokines such as IL-8 [30]. This indicates its potential in alleviating acne-related inflammation and improving overall skin condition. It can also reduce redness, most likely by inhibiting the activity of key inflammatory proteins [30]. The effectiveness of lactoferrin in reducing inflammation induced by *Cutibacterium acnes* is in line with the overall beneficial impact of sheep colostrum on the skin, especially for inflammatory problems like acne [30].

The positive outcomes observed in this study are in line with previous research on horse colostrum and the growth factor-enriched protein fraction from bovine milk, suggesting that colostrum of other origins may also have therapeutic potential [13,31,32]. Indeed, previous research indicating that colostrum-derived products have significant antimicrobial and anti-inflammatory effects further supports their use in managing acne-prone skin [14]. Together, these findings emphasize the role of bioactive proteins, enzymes, and growth factors in modulating the immune response of the skin and its microbial environment.

Although this study presents promising results, it may have some limitations. Considerable variability was noted in the responses among participants. As such, there is a need for further studies based on larger, more diverse cohorts to broaden the applicability of the findings.

## 5. Conclusions

The tested colostrum-based cream appears suitable for the care of acne-prone skin. It maintains the skin in good condition by reducing sebum secretion and providing adequate hydration. Its use resulted in a reduced number of skin lesions typical of acne-affected skin, i.e., blackheads, papules, and pustules.

Colostrum cream may appropriately complete the care of acne skin during dermatological therapies, e.g., with retinoids, through its potential for improving the epidermal barrier function.

## 6. Patents

As a result of the work described in this manuscript, Polish patent application No. P.446801 “Cosmetic composition, method of its production and application” was filed on 22 November 2023.

**Author Contributions:** Conceptualization: K.K. and U.K.-L.; methodology: A.E.-P.; formal analysis: K.K., A.E.-P. and U.K.-L.; investigation: A.E.-P.; data curation: A.E.-P. and U.K.-L.; writing—original draft preparation: K.K., A.E.-P. and U.K.-L.; writing—review and editing: A.E.-P. and U.K.-L.; visualization: U.K.-L.; supervision: U.K.-L.; project administration: U.K.-L. All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** The study was conducted in accordance with the guidelines of the Declaration of Helsinki and approved by the Bioethics Committee of Medical University of Lodz, Poland (protocol No. RNN/44/23/KE of 14 February 2023).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The data are contained within the article.

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**Conflicts of Interest:** The authors K.K. and U.K.-L. are the inventors in Polish patent application No. P.446801. The authors declare conflict of interest.

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