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Review Article

A Taiwanese expert review on the role of dermocosmetics in acne management

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Abstract

A Taiwanese expert review on the role of dermocosmetics in acne management emphasizes an integrated approach to acne treatment. A key focus is on the substantial role of anti-acne dermocosmetic products, which occupy a major position in the global cosmeceutical market. Expert dermatologists have extensively reviewed the literature and established a consensus to integrate dermocosmetics into acne treatment regimens. This signifies the initial systematic review conducted by Taiwanese dermatologists to formulate a consensus on the adjunctive use of anti-acne dermocosmetics. The consensus highlights the benefits of anti-acne dermocosmetics in normalizing follicular keratinocyte turnover, reducing underlying inflammatory responses, regulating skin microbiome balance, strengthening the skin barrier, and reducing the severity of acne scarring, ultimately aiming to improve treatment outcomes and patient quality of life. In addition, the role of the microbiome in acne pathogenesis, with maintenance of cutaneous microbiome diversity rather than eliminating *Cutibacterium acnes,* is explored.

Key words: Acne vulgaris, antiacne, consensus, cosmeceutical, dermocosmetic, skincare

Introduction

Acne, often referred to as pimples, is a major concern in the field of dermatology. With the increasing number of relevant studies and the marketing of various new drugs in recent years, acne treatment has entered a new era. The Taiwanese Dermatological Association updated its Consensus Guidelines for the Management of Acne in 2024 to reflect the gradual shift in acne treatments towards a holistic approach. Although dermatologists manage acne treatment daily, many find it increasingly challenging to achieve long-lasting effects solely with the limited oral and topical medications provided by Taiwan's current National Health Insurance System. Ideal treatment outcomes are believed to be achieved with various

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adjunctive measures, including adjustments to the patient's daily lifestyle, diet, sleeping habits, work environment, emotional stress, and skin care routines.

Skincare is a crucial aspect of acne treatment and anti-acne dermocosmetics occupy a substantial position in the global cosmeceutical market. However, questions as to what constitutes anti-acne dermocosmetics, including the differences and details of the active ingredients, have not been addressed in most treatment guidelines. Thus, pertinent publications were reviewed and collated, and dermatologists specializing in this field were invited to discuss and build a consensus on anti-acne dermocosmetics. These efforts aimed to clarify the integration of anti-acne dermocosmetics into clinical treatment consensus guidelines. Through a consensus meeting, we aimed to formulate statements for the clinical application of anti-acne dermocosmetics that could serve as a reference for physicians and health education materials for the public. During the preparation of the meeting, we have systematically reviewed the literature, discussed the clinical applications of anti-acne dermocosmetics, and formulated a consensus statement on this topic. Our contributions aim to encourage dermatologists to develop a deeper understanding of the role of anti-acne dermocosmetics.

Consensus Methods and Statements

Definitions of anti-acne dermocosmetics are shown in Figure 1. To formulate consensus statements on the application of anti-acne dermocosmetics in acne treatment, nine dermatologists specializing in acne care across Taiwan were invited to participate in a meeting, either remotely or in person. Consensus statements were formulated based on the documents from an internal meeting organized by L'Oréal Active Cosmetics in France with an expert panel comprised eight internationally recognized dermatologists from Argentina, Brazil, China, France, Guinea, Japan, USA, and the United Kingdom.[1] After the chairperson (Chiu PC) reviewed the data, ten bullet points were summarized, and each point was discussed and voted on by the authors who attended. Consensus was achieved when 75% or more agreement was reached among the authors. If anyone raised a question or disagreed with the wording of a statement, revisions were made, followed by a review to reach an agreement. In addition to the consensus statements, we compiled a table containing the categories and lists of active ingredients in anti-acne dermocosmetics based on existing literature.

Table 1 displays the consensus statements on the clinical applications of anti-acne dermocosmetics. Table 2 demonstrates the categories and lists of ingredients in anti-acne dermocosmetics. This consensus statement marks a substantial milestone as the initial document developed by dermatologists in Taiwan addresses the application of anti-acne dermo-cosmetics as an adjunctive therapy in the management of acne.

New Insights into the Relationship between Acne and the Microbiome

The microbiome and pathogenesis of acne

Research on microbiomes has expanded tremendously in recent years. The microbiome, which exists symbiotically

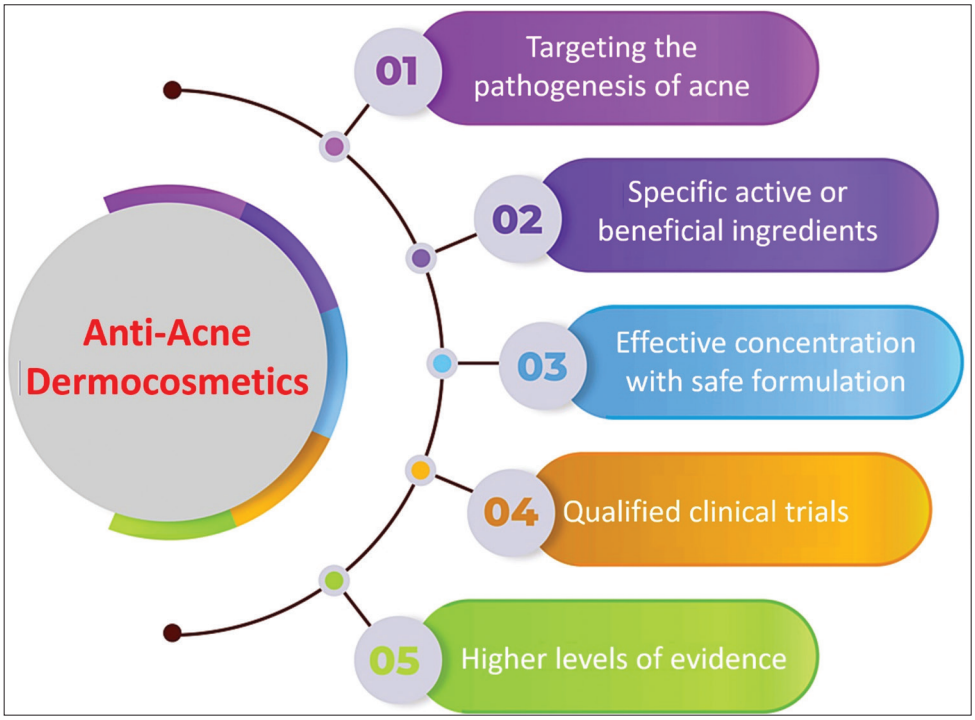

Figure 1: The definition of anti-acne dermocosmetics.

Table 1: Consensus statement on the clinical applications of anti-acne dermocosmetics

Statement content	Percentage of agreement
Can be used alone or as adjunctive or maintenance therapy Relevant anti-acne dermocosmetics can be incorporated into treatment according to the severity of acne and the need for anti-acne treatment	100
Can improve skin quality Appropriate and well-tolerated anti-acne dermocosmetics can reduce skin oiliness, enhance skin hydration, and strengthen skin barrier function	100
Can enhance skin texture The use of dermocosmetics with effective anti-acne ingredients and concentrations can promote the normalization of follicular keratinocyte metabolism and reduce comedones	100
Can be used in combination with medications and can increase tolerability Regular use of gentle cleansing products and appropriate anti-acne and moisturizing products can increase the tolerability of systemic or topical anti-acne medications	100
Can be used in combination with medications and can enhance compliance Regular use of appropriate anti-acne dermocosmetics can reduce the side effects caused by medication, increase clinical flexibility, improve satisfaction levels, and enhance compliance	100
Can be used in combination with medications and can increase effectiveness Dermocosmetics with effective anti-acne ingredients and concentrations can be combined with systemic or topical anti-acne medications to increase effectiveness	100
Can reduce the chances of acne occurrence/recurrence Regular use of dermocosmetics with effective anti-acne ingredients and concentrations can work synergistically with medications to reduce the chances of acne occurrence/recurrence	100
Can reduce the chances of acne scarring Regular use of skin care products with effective anti-acne ingredients and concentrations can reduce the inflammatory response of acne and enhance skin repair ability. They can also work synergistically with medications to reduce the chances of subsequent acne scarring	89
Can enhance the overall quality of life The use of suitable and well-tolerated anti-acne dermocosmetic products in conjunction with medications can expedite acne improvement and increase treatment satisfaction	100
Five major categories of anti-acne ingredients They include normalization of keratinocyte turnover, reduction of the inflammatory response, regulation of skin microbiome, strengthening of skin barrier, and reduction of acne scarring	100

with the human body, is a vital organ. The pathogenesis of acne is related to the overproduction of sebum and the formation of comedones. However, recent research has revealed that the microbiome on the skin surface and within hair follicles, as well as the innate and adaptive immune-inflammatory responses, are closely related to the pathogenesis of acne.

Table 2: Categories and lists of active ingredients in anti-acne dermocosmetics[1-4]

Function of ingredients	List of ingredients
Normalization of keratinocyte turnover	AHA (glycolic acid)[a] Salicylic acid[a] Linoleic acid[b] Retinoids (retinal and retinol)[b] Capryloyl salicylic acid (LHA)[c] Silybum marianum fruit extract, including silymarin[c]
Reduction of the inflammatory response with possible sebum-control effects	Ascorbic acid derivatives[b] Green tea extract, including EGCG[b] Niacinamide[b] Zinc salt[b] Bakuchiol[c] Licochalcone A[c]
Regulation of skin microbiome balance	Sulfur[b] Antimicrobial peptides[c] Decanediol[c] Prebiotics/postbiotics[c] Punica granatum pericarp extract[c] Tea tree oil[c]
Strengthening of skin barrier function	Niacinamide[b] Panthenol[b] Ceramide[c] Hyaluronic acid[c] Shea butter[c]
Reduction of the severity of acne scarring including postinflammatory erythema and hyperpigmentation	Ascorbic acid[b] Azelaic acid[b] Hyaluronic acid[b] Niacinamide[b] Retinoids (retinal and retinol)[b] Tranexamic acid[b] Salicylic acid[c]

Level a: Strong evidence (e.g. two or more RCTs, or a systemic review with positive results), Level b: Moderate evidence (e.g. one RCT, or multiple adequate studies), Level c: Limited evidence (e.g. some pilot studies, or case-control studies). EGCG: Epigallocatechin gallate, RCT: Randomized controlled trials

The skin microbiome is classified into two types: resident and transient. The former comprises the symbiotic microbiota that are ordinarily present on the skin in a balanced state (mainly *Cutibacterium acnes* and *Staphylococcus epidermidis*). In contrast, the latter consists of pathogenic microbes from the external environment that temporarily reside on the skin (e.g. *Staphylococcus aureus*).[5] The amount and composition of secreted sebum can influence the skin microbiome. A recent study discovered that microbial diversity in facial skin changed significantly with sebum production in adolescents entering puberty. This demonstrated that sebum exerts a considerable influence on the skin microbiome.[6] A healthy skin microbiome effectively protects the skin against external pathogenic microbes without triggering an inflammatory response. However, dysbiosis may occur in the skin owing to abnormal

sebum secretion. In addition to compromising the defense against external pathogenic microbes, dysbiosis can provoke inflammatory responses in the skin.

In summary, the pathogenesis of acne may be attributed to changes in the quality or quantity of sebum secreted by the sebaceous glands, abnormal proliferation of follicular keratinocytes, various internal and external factors, and microbiome dysbiosis. This triggers specific innate and adaptive immune responses, resulting in inflammation and transformation of comedones into significantly inflamed lesions [Figure 2].

Cutibacterium acnes diversity and innate immunity

The development of acne was previously believed to be related to massive proliferation of *C. acnes*. However, research over the last two decades has shown that this is incorrect.[7,8] Instead, *C. acnes* is significantly reduced in the skin of patients with acne. Compared to healthy skin, where various *C. acnes* phylotypes exist, acne lesions appear to be dominated by the phylotype IA1. This has led researchers to believe that a reduction in the diversity of microbial strains causes the microbiome dysbiosis observed in acne.[9] Another study confirmed that the severity of acne is associated with the proportion of phylotype IA1 in *C. acnes*.[10] Experimental results obtained by culturing *C. acnes* from skin biopsies further confirmed that the secretion of pro-inflammatory cytokines was significantly decreased in environments with high microbial strain diversity. Conversely, when phylotype IA1 of *C. acnes* was predominant, the concentrations of various interleukins (IL) exhibited a significant increase.[11] Notably, a lack of microbiome diversity triggers innate and adaptive immune-inflammatory responses. Conversely, restoration of cutaneous microbial diversity in patients with acne is a beneficial strategy.

The activation of immune-inflammatory responses is mainly associated with IL-1β and IL-17 A/F. Moreover, differences in the expression of these two cytokines have been observed between normal and acne-bearing skin biopsies.[12,13] Given that IL-17 is related to inflammation in acne, patients with extremely severe acne may benefit from biological therapies targeting IL-17; however, this is relatively rare. Janus kinase inhibitors, a class of orally administered small-molecule drugs that have been recently marketed, can also modulate the inflammatory responses of IL-1β and IL-17 A/F.

Following the establishment of the importance of *C. acnes* diversity in the pathogenesis of acne, the next question is whether the genes of *C. acnes* strains belonging to phylotype IA1 differ between normal and acne-bearing skin, and the answer is affirmative. The IA1 phylotype of *C. acnes* in acne-bearing skin carries genes with relatively high toxicity. This increases the possibility of activating keratinocytes to produce various pro-inflammatory factors, including reactive oxygen species, cytokines, lipase, Christie-Atkins-Munch-Petersen (CAMP) factor, and matrix metalloproteinases.[14,15] In another study, non-acnegenic (phylotype II) and acnegenic (phylotype IA1) *C. acnes* strains were cultured in different media. The results demonstrated that acnegenic *C. acnes* strains in the culture media induced significant secretion of inflammatory substances (IL-8 and human β-defensin 2) in spontaneously transformed human keratinocyte (HaCaT) cells. Various culture media environments also result in differences in the toxicity of *C. acnes* strains. This provides evidence that differences in the strain type and sebum composition can influence acne pathogenesis.[16]

The balance between *Staphylococcus. epidermidis* and *Cutibacterium acnes*

The interplay between *C. acnes* and other commensals such as *Staphylococcus epidermidis* also plays a substantial role in acne. *C. acnes* can produce propanoic acid through the hydrolysis of triglycerides in sebum. This aids in the maintenance of an acidic environment in the skin and inhibits the growth of *S. epidermidis*.[6,17] Conversely, *S. epidermidis* inhibits the growth of *C. acnes* by producing succinic acid.

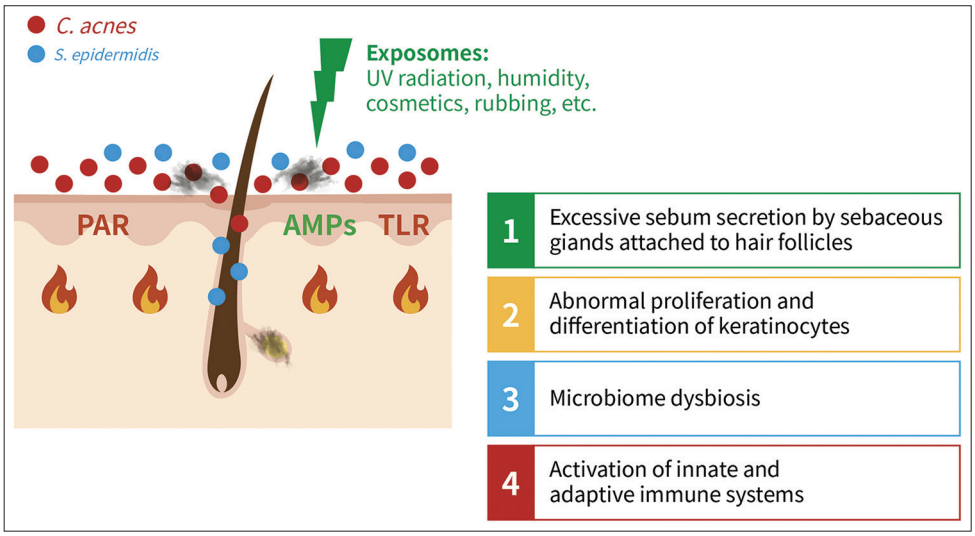

Figure 2: Relationship between acne and microbiome dysbiosis.

Experiments have revealed that pro-inflammatory cytokines are not released when there is a balance between *C. acnes* and *S. epidermidis*. Conversely, an imbalance in the populations of these two bacteria triggers an immune-inflammatory response.[18] Consequently, contemporary acne treatment strategies no longer prioritize the eradication of *C. acnes* but are aimed at preserving the microbiome balance.

Interestingly, recent studies have reported that in addition to the skin microbiome, the gut microbiome differs between patients with acne and healthy controls. In addition, a decrease in the gut microbiome diversity has been observed.[19,20]

Novel treatment methods targeting the cutaneous microbiome

Theories and evidence regarding the skin microbiome have opened new avenues for the treatment of acne. Researchers have proposed novel therapies, including vaccines targeting the proinflammatory CAMP factor,[21] bacteriophages targeting *C. acnes* phylotype IA1,[22,23] probiotics, prebiotics, and postbiotics, which are promising for regulating skin microbiome dysbiosis. Topical and oral probiotics are now under development as anti-acne medical therapies, and topical prebiotics and postbiotics are also used in anti-acne dermocosmetics. An earlier study has reported that antimicrobial peptides inhibit certain bacterial strains without inducing drug resistance.[24]

Summary of key points and outlook

With the support provided by the evidence and theories we have described, we have gradually abandoned the traditional concept that antimicrobial therapy should be the primary focus of acne treatment. Given that past treatments relying on antibiotic prescriptions yielded poor long-term effects and were predisposed to induce drug resistance, current acne treatment guidelines no longer recommend the long-term use of antibiotics, either alone or in combination with oral and topical antibiotics. Notably, changes in the amount and composition of sebum play essential roles in the pathogenesis of acne; therefore, advising patients with acne to make reasonable diet adjustments is important. The gut microbiome may also play a substantial role in the etiology of acne, further demonstrating that skin diseases are not merely cutaneous issues, but may also have systemic implications. Various exogenous factors such as ultraviolet radiation, high temperature, high humidity, makeup, and skin care products can also induce acne. Therefore, the management of acne using integrated concepts is essential.

Skin diseases often involve complex pathogenic mechanisms. Acne may not be life-threatening; however, its severity and consequences differ among individuals. In addition, the influence of acne-triggering factors varies greatly according to skin type and personal susceptibility. Therefore, analyzing the disease course, elucidating the effects of triggers, and providing integrated treatment are the most important core concepts in acne management to ensure long-term safety and efficacy.

Global Literature Review and Summary

Evolution of concepts

After 2015, dermatologists increased their focus on the daily skin care routines of patients with acne. A 2015 review by a group of Southeast Asian dermatologists provided recommendations for selecting and using facial cleansers, moisturizers, and sunscreens for patients with acne of varying severity.[25] Another review, published in 2016 by a group of dermatologists who attended a summit in Thailand, investigated the application of anti-acne dermocosmetics in managing acne. This article summarizes the adjunctive therapeutic effects of various dermocosmetic anti-acne ingredients and supports the incorporation of anti-acne dermocosmetics as part of acne treatment.[26] In another review published the same year, Araviiskaia and Dréno classified dermocosmetic anti-acne ingredients based on their pathophysiological mechanisms. In addition, the authors proposed that anti-acne dermocosmetics could be used as monotherapy, maintenance therapy, and adjunctive therapy in combination with medications.[27] As of 2023, researchers worldwide were investigating various ingredients in anti-acne dermocosmetics.[2,28] and updated dermatologists' consensus on holistic skin care for patients with acne.[29]

Summary of key points and future perspectives

Anti-acne dermocosmetic ingredients can be classified based on their physiotherapeutic effects. Previous efforts have focused solely on reducing secretion levels for sebum control. However, the alteration of sebum composition through specific ingredients is anticipated to become a substantial trend in acne treatment. Generally speaking, sebum-controlling ingredients can be classified into sebum-absorbing agents and sebum-regulating agents. As for anti-acne dermocosmetic ingredients, only sebum-regulating agents are highlighted. After reviewing the literature, niacinamide, zinc salts, and epigallocatechin gallate were found to be among the most likely ingredients to have sebum-regulating effects. They are highly water-soluble molecules with anti-inflammatory activity against cutaneous oxidative stress. When applied to the skin, it is difficult to penetrate deeper into the sebaceous glands and thus directly influence sebum production. Some *in vitro* studies showed their potential roles for sebum reduction, but *in vivo* studies still have inconsistent results and limited evidence. All these ingredients have higher evidence of anti-inflammation efficacy and their sebum-regulating effects may be due to additional or secondary actions. Therefore, we classified these ingredients as a reduction of the inflammatory response. In the management of acne, the antimicrobial concept will gradually shift towards the maintenance of a balanced microbiome. Because the skin barrier is easily damaged during acne treatment, emphasis should be placed on maintaining skin hydration and enhancing skin barrier function.

Anti-acne dermocosmetics are still under cosmetic regulations, which are substantially different from medicines and medical devices approved for clinical applications. However, when evaluating the actual effects of anti-acne agents,

clinicians should consider the strength of the evidence in the pertinent literature. Most information regarding anti-acne dermocosmetic ingredients has been derived from *in vitro* experiments or low-quality *in vivo* studies instead of robust randomized controlled trials (RCTs).

Substantial evidence supports the incorporation of anti-acne dermocosmetics into acne treatment regimens as an adjunct to medical treatments [Figure 3].[2] When used independently, these products can effectively target mild acne as an alternative to topical medications or serve as a proactive measure for acne prevention during the maintenance phase. Synergistic and additive effects may be generated when used as an adjunctive therapy in combination with other medications. In addition, these products can be used to prevent and alleviate side effects associated with oral or topical medications. Our aim in employing anti-acne dermocosmetics in acne management is to enhance patient treatment compliance by leveraging the therapeutic and possible side effects. This will lead to improved and long-lasting treatment outcomes, enhancing the quality of life of patients with acne, and ultimately reducing the severity of acne scars.

Conclusions

We compiled a list of key cosmetic anti-acne ingredients available on the market and categorized them into five groups according to their primary modes of action, as presented in Table 2. To maintain fairness and objectivity, the listed ingredients do not favor specific products. This table includes common anti-acne ingredients, which are supported by strong evidence in the market. Considering that the active ingredients in skincare products, unlike medications, usually do not undergo rigorous testing in RCTs, this table can only provide an overview of the current information. Ingredients with promising potential, such as prebiotics and postbiotics, are included in this table. However, topical probiotics were excluded because of insufficient evidence or unclear regulation. Even if topical probiotics are permitted for clinical use, these products are unlikely to be classified as cosmetics. Finally, because the table is not comprehensive, future revisions will be necessary.

The triggers of acne and acne severity can vary greatly among individuals, and there are substantial variations in the composition of anti-acne dermocosmetics. Therefore, consultation with a board-certified dermatologist is imperative before selecting these products. Professional expertise is necessary for the proper combination of medical treatments and anti-acne dermocosmetics. Integrated treatment of acne has become an emerging trend [Figure 4]. With the combination of proactive acne prevention and maintenance, the treatment outcome will be better, and acne-free period can be longer.

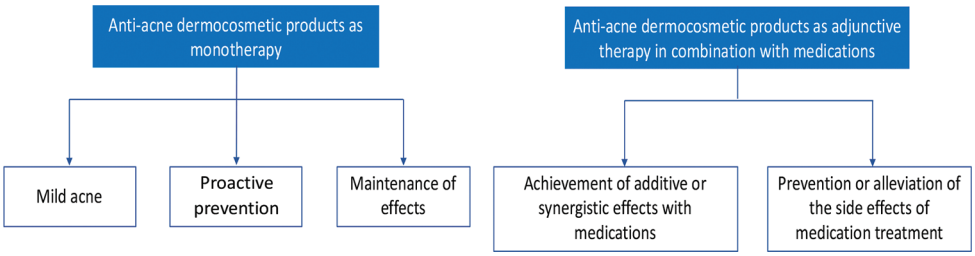

Figure 3: Roles of anti-acne dermocosmetics in acne treatment.

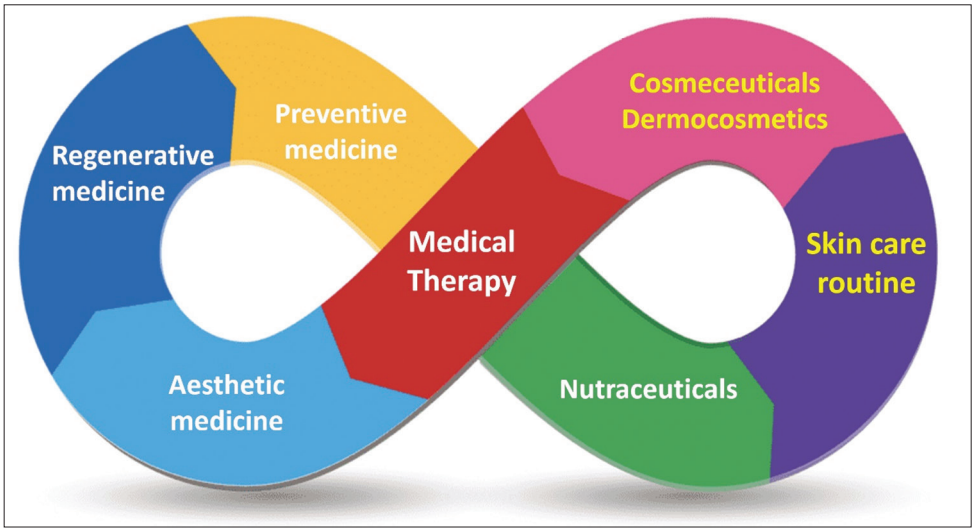

Figure 4: Holistic infinite loop concept in acne treatment.

Data availability statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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Nil.

Conflicts of interest

COMPASS Co. Ltd. provided medical writing assistance. La Roche-Posay funded expert consensus meetings and editorial services from COMPASS Co., Ltd. The company was not involved in the development, review, or editing of the manuscript.

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