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Mini review

Alkaline Water in Skin Care: A Mini Review of Dermatological Benefits and Mechanisms

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ABSTRACT

Alkaline water has recently gained attention in dermatology due to its potential benefits in skin care, including pH modulation, antioxidant activity, and hydration support. The skin's natural acidic mantle plays a crucial role in barrier function and microbial balance, and alkaline water may help restore pH homeostasis disrupted by environmental stressors. Additionally, alkaline water exhibits antioxidant properties that can neutralize reactive oxygen species, thereby reducing oxidative damage and inflammation associated with skin aging and various dermatoses. While preliminary studies indicate positive effects on skin hydration, barrier repair, and inflammation control, clinical evidence remains limited and heterogeneous. Safety concerns related to excessive alkalinity highlight the need for balanced formulations to avoid barrier disruption. This mini review summarizes current knowledge on the dermatological mechanisms, benefits, and limitations of alkaline water, emphasizing the importance of future research to establish standardized protocols and confirm clinical efficacy. The integration of alkaline water in cosmeceuticals and therapeutic regimens holds promise for advancing skin care.

Keywords: Alkaline water, skin pH, antioxidant, skin barrier, dermatology

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1. Introduction

The global skincare industry is witnessing a paradigm shift toward naturally inspired, biocompatible solutions aimed at restoring skin health without the use of harsh chemicals. One such emerging trend is the application of alkaline water, both topically and systemically, as a supportive agent in dermatological care. Alkaline water, typically defined as water with a pH greater than 7, is often produced via electrolysis or naturally sourced from mineral-rich springs. It is believed to possess multiple health benefits, including antioxidant properties, improved hydration, and detoxification potential [1-3].

The skin's surface maintains a mildly acidic pH (around 4.5–5.5), which is essential for maintaining the acid mantle—a protective layer responsible for antimicrobial defense, barrier integrity, and enzymatic activity. However, frequent exposure to pollutants, UV radiation, and alkaline-based products can disturb this balance, leading to dryness, sensitivity, inflammation, and accelerated aging. Advocates of alkaline water suggest that it may help neutralize oxidative stress, reduce inflammation, and enhance hydration, making it a potential adjunct in skin care regimens.

Although its use is well documented in wellness and nutrition circles, scientific exploration into the dermatological mechanisms and benefits of alkaline water remains limited but growing. This mini review aims to consolidate current knowledge on the biological rationale, proposed mechanisms, and clinical relevance of alkaline water in the context of skin care and dermal health, highlighting gaps and potential directions for future research [4-7].

2. Influence of Alkaline Water on Skin pH and Barrier Function

The skin maintains a slightly acidic surface (pH 4.5–5.5), known as the acid mantle, which plays a critical role in maintaining microbiome homeostasis, inhibiting pathogen growth, and regulating enzymatic activity related to barrier function. When the skin is exposed to irritants, soaps, or pollution, this acidic environment can become alkaline, leading to dysfunction of the epidermal barrier and increased transepidermal water loss (TEWL) [8].

Alkaline water has been proposed as a therapeutic agent to moderate pH fluctuations and facilitate a return to physiological balance. However, it must be applied with care, as overly alkaline solutions (>pH 8) can strip natural lipids and damage corneocyte cohesion [9] (Table 1).

Table 1: Relationship Between Skin pH Levels and Dermatological Health

Skin pH Range	Skin Condition	Barrier Integrity	Remarks
4.5–5.5	Healthy skin	Optimal	Balanced microbiome, intact barrier
5.6–6.5	Mild imbalance	Slightly impaired	Increased bacterial activity (e.g., acne)
6.6–7.5	Barrier disruption	Compromised	TEWL, dryness, irritation
>7.5	Chronic alkalinity	Severely compromised	Inflammation, prone to dermatitis

3. Antioxidant Mechanisms and Free Radical Neutralization

One of the major proposed benefits of alkaline water lies in its antioxidant potential, largely due to the presence of active hydrogen (H^-) and hydroxide ions (OH^-), which may help in scavenging reactive oxygen species (ROS). ROS are known contributors to skin aging, collagen degradation, and inflammatory dermatoses such as psoriasis and eczema [10] (Table 2).

Laboratory and limited clinical studies have reported reductions in oxidative stress markers, improvements in dermal hydration, and enhanced wound healing when alkaline water is used either topically or orally. However, these benefits depend on consistent concentration, source, and delivery method [11, 12].

Table 2: Summary of Dermatological Effects of Alkaline Water through Antioxidant Action

Study Reference	Model/System Used	Route of Use	Observed Dermatological Benefit
Kim et al., 2018 [1]	Human subjects	Oral intake	Improved hydration, decreased oxidative markers
Lee et al., 2021 [2]	Topical mist (cosmetic)	Topical use	Reduced redness, enhanced skin tone
Ohsawa et al., 2011 [14]	UV-damaged animal skin	Oral + topical	Prevention of collagen degradation
Park et al., 2019 [5]	Atopic dermatitis model	Topical therapy	Inflammation control, barrier repair

4. Safety and Limitations of Alkaline Water in Skin Care

While alkaline water shows promising benefits in skin care, it is essential to consider potential safety concerns and limitations associated with its use. The skin's natural acid mantle, with a pH range of 4.5 to 5.5, is crucial for maintaining barrier integrity and preventing microbial overgrowth. Prolonged or excessive exposure to highly alkaline substances (pH > 8) can disrupt this delicate balance, leading to barrier impairment, dryness, irritation, and increased susceptibility to infections [13].

Topical application of alkaline water must therefore be carefully formulated to avoid overshooting the skin's physiological pH. Inappropriate use can result in increased transepidermal water loss (TEWL), exacerbating dryness and sensitivity, especially in individuals with pre-existing skin conditions such as eczema or rosacea [14].

Another limitation is the lack of standardized protocols and robust clinical trials assessing the efficacy and safety of alkaline water for dermatological use. Variability in source, pH level, mineral content, and mode of application makes it challenging to compare outcomes across studies. Additionally, the long-term effects of daily use are largely unknown, necessitating further investigation [15].

Finally, while antioxidant properties are well documented in vitro, translating these effects into consistent clinical benefits remains a challenge due to factors like skin penetration and bioavailability. Thus, alkaline water should be viewed as a complementary adjunct rather than a standalone treatment in skin care [16].

5. Future Perspectives and Clinical Applications

The therapeutic potential of alkaline water in skin care continues to garner scientific interest, offering promising avenues for both cosmetic and clinical dermatology. Future research should aim to standardize alkaline water formulations in terms of pH, mineral composition, and delivery methods to optimize efficacy while minimizing risks.

Clinically, alkaline water could be integrated into adjunctive treatments for inflammatory skin conditions, such as atopic dermatitis and psoriasis, where oxidative stress and barrier dysfunction are prominent. Its incorporation in post-procedural care

— including after laser treatments or chemical peels — may support accelerated healing and reduce inflammation [17].

Advancements in nanotechnology and cosmeceuticals could further enhance the bioavailability of alkaline water's active components, allowing targeted delivery and sustained antioxidant effects. Moreover, combining alkaline water with other beneficial agents, such as hyaluronic acid or botanical extracts, may yield synergistic improvements in skin hydration, elasticity, and overall appearance [18-20].

Despite these potentials, rigorous clinical trials are needed to validate efficacy and safety across diverse populations and skin types. Emerging research should also explore the systemic effects of oral alkaline water consumption on skin health, given the gut-skin axis's role in dermatological conditions [21-23].

In conclusion, alkaline water represents a promising, natural adjunct in skin care with multifaceted benefits. With further research and product innovation, it may become a staple in both preventative and therapeutic dermatology [24,25].

Conclusion

Alkaline water is emerging as a novel and promising agent in skin care due to its potential to modulate skin pH, provide antioxidant protection, and support hydration and barrier function. The ability of alkaline water to neutralize oxidative stress and promote skin regeneration offers valuable benefits for managing various dermatological conditions and enhancing overall skin health. However, careful attention to formulation and pH balance is crucial to avoid disrupting the skin's natural acid mantle and compromising barrier integrity.

Despite encouraging preliminary findings, the current scientific evidence remains limited and heterogeneous, highlighting the need for well-designed clinical trials to establish standardized protocols, efficacy, and long-term safety. Future research integrating advanced delivery technologies and combinatorial approaches may further unlock the therapeutic potential of alkaline water in dermatology.In summary, alkaline water holds significant promise as a complementary adjunct in skin care, bridging natural wellness and modern dermatological science. Its incorporation into cosmetic and clinical practice should proceed with evidence-based caution to maximize benefits while minimizing risks.

Conflict of Interest

The authors declare no conflict of interest.

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