17th ASCS Conference: Empowering Cosmetic Science

Nicotinamide Adenine Dinucleotide: A Promising Nicotinamide Derivative for Potent Skin Brightening Applications

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Introduction

Nicotinamide (vitamin B3) and its derivatives (Figure 1) are well-known in dermatology for improving skin hydration, barrier function, and reducing hyperpigmentation[1]. Among them, Nicotinamide Adenine Dinucleotide (NAD^+) has emerged as a promising brightening agent. As a central coenzyme in energy metabolism and DNA repair, NAD^+ also activates sirtuins, PARPs, and redox enzymes (Figure 1)—key mediators of oxidative stress, inflammation, and epigenetic regulation[2,3].

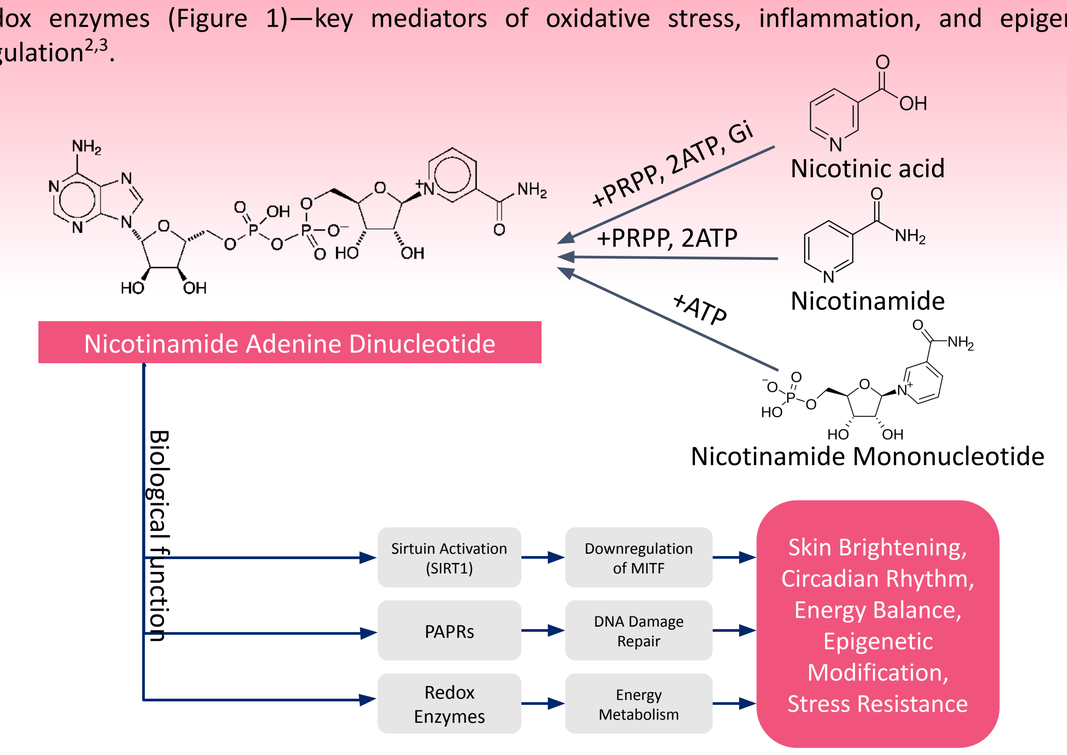


Figure 1. Diagram of NAD^+ formation and the biological function of NAD^+

These NAD^+-dependent processes modulate melanogenesis by influencing circadian rhythm, cellular stress resistance, and transcriptional control of pigment-related genes. Through these pathways, NAD^+ may help suppress melanin synthesis and promote a more even skin tone.

Aim: To assess the effectiveness of Nicotinamide Adenine Dinucleotide (NAD) in enhancing skin brightening

Materials & Methods

Materials

This study utilized a simple water-based serum, one of them containing Nicotinamide Adenine Dinucleotide (NAD):

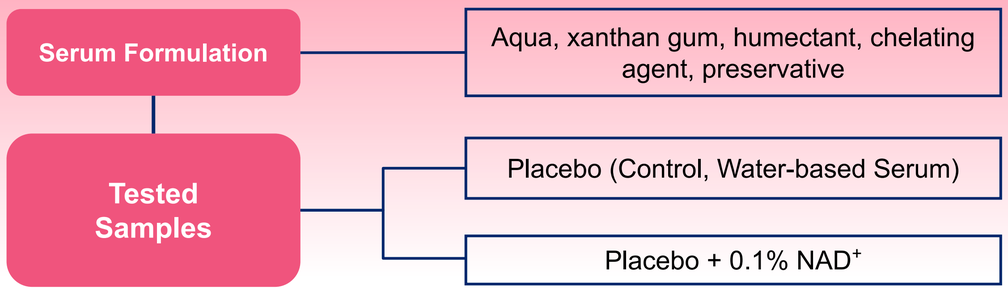


Figure 2. Product details

Method

The efficacy study was designed as a randomized, single-blind, under control of a dermatologist. The study population consisted of thirty healthy male or female aged 18 - 60 with ITA values between 20° and 41° and no pigmentation, inflammation, or scars on the skin of the test site. Each participant was applied two products (1 test product and 1 control product) on the back, twice daily, for 4 consecutive weeks. The study contained visual assessment by dermatologist and instrumental measurements (Spectrophotometer and Mexameter), summarized in Figure 3.

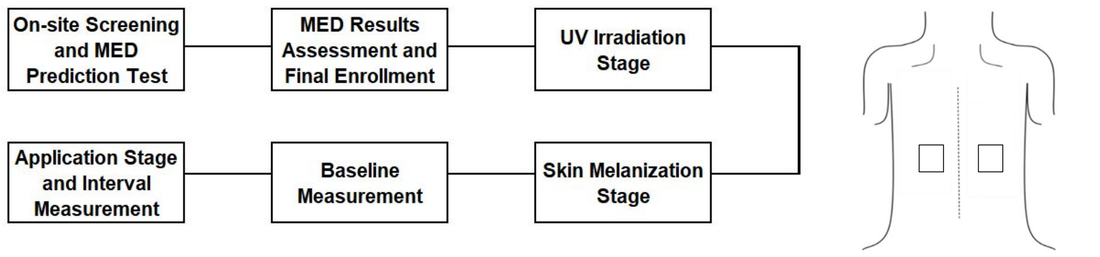


Figure 3. (Right) Diagram scheme of study. **(Left)** Illustration of skin sites for color assessment applied on the back (3cm x 3cm for each).

Results & Discussion

The assessment of ITA* value, melanin index, and skin color grading of 30 subjects were conducted over five timepoints (W0/W1/W2/W3/W4). The study observed significant improvements in skin depigmentation with the serum containing 0.1% NAD after UV irradiation. These improvements were visibly noticeable after 4 weeks of observation, as illustrated in Figure. 4 (right). The evaluation criteria for skin color grading (SCG) further support these observations (Figure. 4, left). Further quantitative analysis revealed a significant decline in skin color grading from W0 to W4 with the placebo + 0.1% NAD treatment, resulting in an 18.1% reduction over 4 weeks. The ITA value increased by 16.1%, and the MI decreased by 11.6% (Table. 1; Figure. 5), all statistically significant ($p<0.001$).

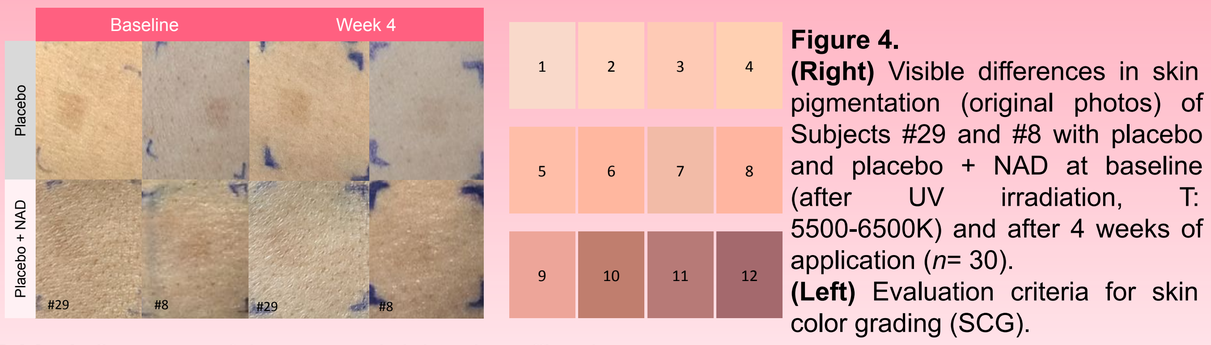


Figure 4.
(Right) Visible differences in skin pigmentation (original photos) of Subjects #29 and #8 with placebo and placebo + NAD at baseline (after UV irradiation, T: 5500-6500K) and after 4 weeks of application (n= 30).
(Left) Evaluation criteria for skin color grading (SCG).

Table 1. Summary of the serums brightening efficacies

Product	ITA value (a.u.)					Melanin Index (a.u.)					Grading dermatologist (a.u.)				
	W0	W1	W2	W3	W4	W0	W1	W2	W3	W4	W0	W1	W2	W3	W4
Placebo	27,09	29,19	29,21	29,72	30,07	166,3	163,9	158,5	152,4	148,7	9,3	9,2	8,8	8,2	8
Placebo + NAD	26,83	29,55	29,58	30,29	31,14	166,6	160,9	155,9	149,7	147,2	9,4	9,3	8,7	8,2	7,7

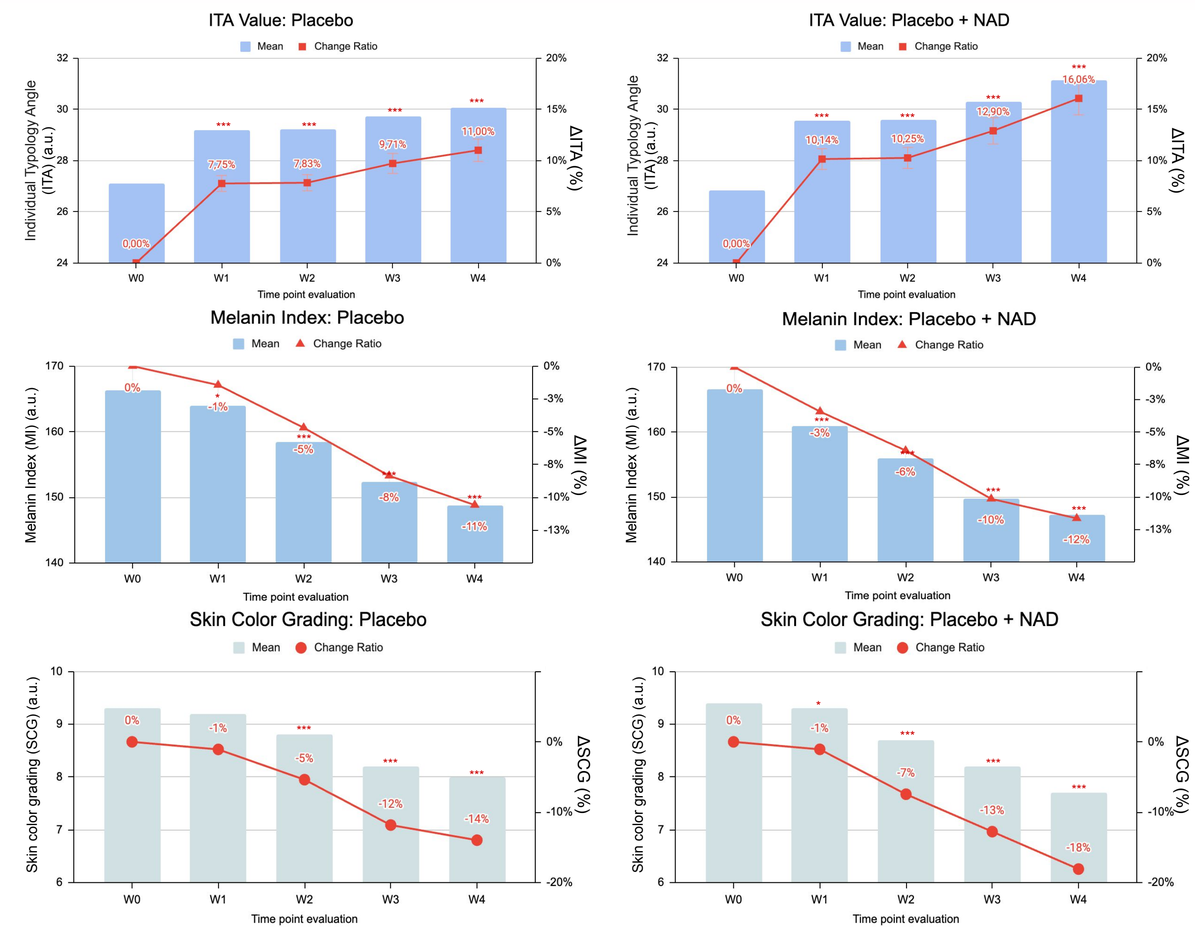


Figure 5: Skin Individual Typology Angle (ITA), Melanin Index (MI), and dermatologist-assessed skin color grading (SCG) of control placebo and placebo + NAD compared to baseline over a 4-week evaluation (n = 30). *p<0.05; **p<0.01; ***p<0.001 indicate a significant difference compared to baseline.

Compared to the placebo-only treatment, the NAD treatment showed superior results, particularly in ITA value and SCG, with improvements of 5.06% and 4.1%, respectively. These findings suggest that the NAD-incorporated serum could be a promising treatment for hyperpigmentation. These promising results underscore the potential of NAD-incorporated serum in treating hyperpigmentation. To further explore the benefits of NAD in brightening efficacy, additional studies are needed to investigate the long-term effects and efficacy across different skin types, as well as the broader implications in dermatology and cosmetic science.

Conclusions

The serum containing NAD led to significant improvements in skin color grading, ITA*, and MI from W0 to W4. Compared to the placebo-only treatment, the NAD treatment had better results, especially in ITA* and SCG. These findings suggest that the additional of NAD may enhances the effectiveness of serum in improving skin brightening.

Acknowledgements

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