MESOTEN

NAD+ *Premium*

A next-generation formula for cellular
renewal and radiant skin

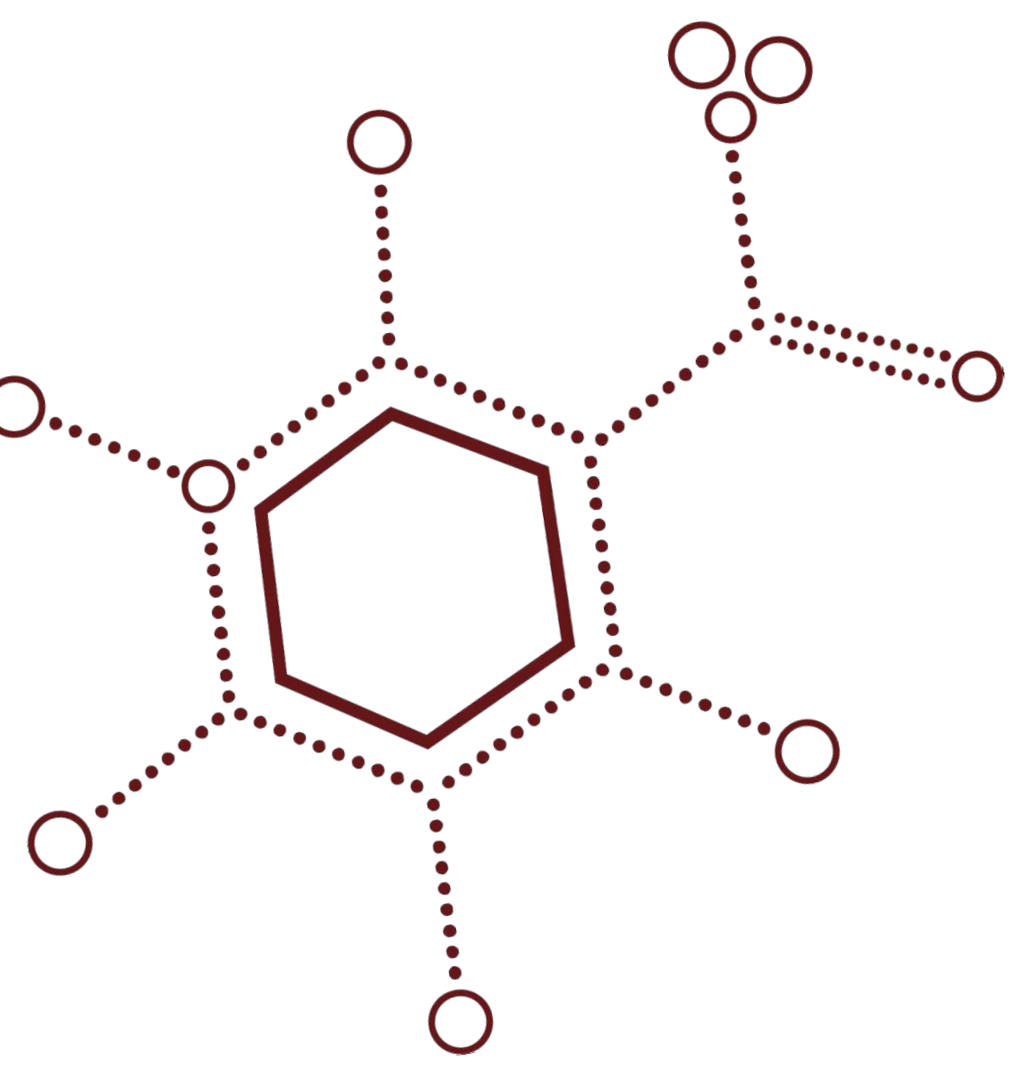
AKRADEX

Modern aesthetic medicine demands solutions that work at the cellular level.

Mesoten NAD+ Premium is a next-generation mesococktail developed using patented technologies for restoring cellular energy.

This formula targets key signs of aging, enhances skin structure and tone, and helps restore the skin’s natural radiance and firmness.

Designed for professional use by aesthetic medicine specialists, clinical observations show a visible improvement in skin tone and quality even after the initial stage of treatment.



Cellular energy is the foundation of youthful skin.

With age, the level of NAD^+ (nicotinamide adenine dinucleotide) in the body decreases — cells lose their ability to regenerate, and the skin loses its firmness, elasticity, and radiance.

Mesoten NAD+ Premium replenishes this deficit by activating restorative processes at

The combination of **NAD+, NMN, and NR** in the formula stimulates cellular metabolism, protects DNA from damage, and improves skin quality from within.

The result is skin that’s energized, smooth, firm, and glowing with health.

The **Mesoten NAD+ Premium** formula targets the key mechanisms of cellular metabolism and skin protection:

⬡ Restoration of cellular energy

The **NAD³ Complex (NAD+, NMN, NR)** activates mitochondrial function and increases the level of NAD^+ — a key coenzyme responsible for cellular energy metabolism and regeneration.

⬡ Antioxidant protection and brightening

Glutathione and stable vitamin C protect cells from oxidative stress, brighten the skin, and give it a fresh, well-maintained appearance.

⬡ Tone and pigmentation correction

Tranexamic acid inhibits melanogenesis, helping to eliminate uneven skin tone, post-inflammatory spots, and redness.

⬡ Strengthening the skin’s barrier function

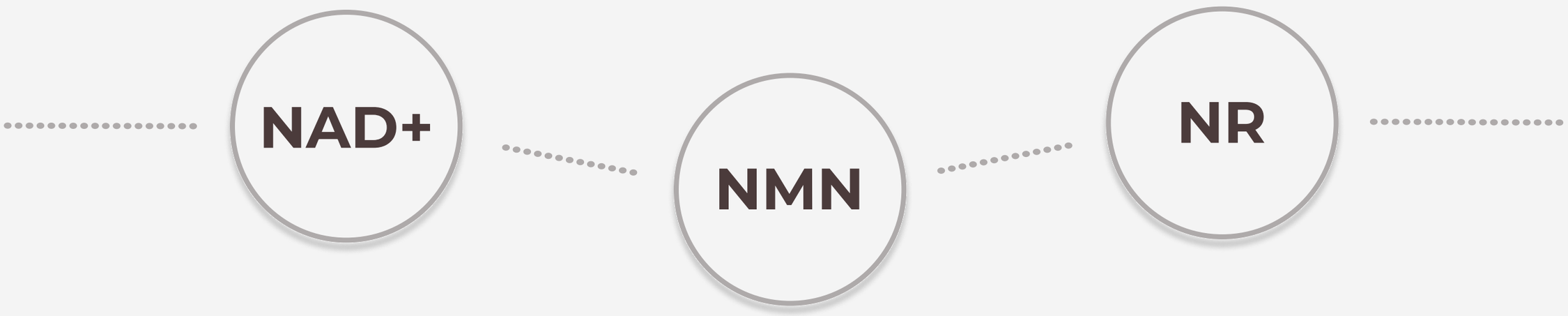
The synergy of active ingredients enhances the skin’s protective properties, making it more resilient to external stressors.

⬡ Long-lasting renewal effect

Maintaining optimal cellular energy levels ensures a prolonged effect of radiant, firm, and elastic skin.

Active ingredients

NAD³ COMPLEX



A patented complex by Akradex, developed based on the latest advancements in cellular biochemistry.

NAD+ — The primary coenzyme that regulates energy metabolism and DNA repair processes.

NMN (nicotinamide mononucleotide) — a precursor of NAD^+, it activates cellular regeneration and slows down the aging process.

NR (nicotinamide riboside) — a form of vitamin B3 that increases NAD^+ levels and supports cellular metabolism.

biomedicines

MDPI

Communication

Distinctive Gene Expression Profiles and Biological Responses of Skin Fibroblasts to Nicotinamide Mononucleotide: Implications for Longevity Effects on Skin

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Abstract

Background/Objectives: Enhancement of cellular NAD^+ mediated by NMN has emerged as a pivotal strategy in modulating the aging process. This study aimed to systematically investigate the anti-aging effects of NMN on human skin fibroblasts, focusing on how the former contributes to the improvement of cellular health and function. This study elucidated the molecular and functional mechanisms by which NMN contributes to the attenuation of skin aging. **Methods:** We performed extensive in vitro and transcriptomic analyses. Human skin fibroblasts were treated with NMN, and the induced biological responses were observed under oxidative stress/photo-aging models. **Results:** Transcriptome analysis revealed distinct gene expression patterns for NAD^+ and its precursors (NMN, NR, and NAM), showing significant differences between NMN and other precursors (NR and NMN). NMN seemed to be significantly involved in cytokine and chemokine activity. It significantly elevated cellular NAD^+ levels, activated sirtuin and autophagy pathways, and enhanced mitochondrial function, collectively maintaining cellular homeostasis under stress. Furthermore, it suppressed cellular senescence, promoted cell proliferation, supported extracellular matrix integrity, and accelerated wound healing. **Conclusions:** The study provided essential mechanistic evidence supporting the anti-aging effects of NMN in skin cells and addressed the current lack of scientific validation of NMN-based topical applications. The findings established a solid academic background for future translational research and the development of NMN-based therapeutics and cosmeceuticals.

Keywords: nicotinamide adenine dinucleotide; nicotinamide mononucleotide; fibroblast; skin aging; longevity

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1. Introduction

Nicotinamide adenine dinucleotide (NAD^+) is a fundamental biomolecule in living organisms and is involved in numerous biological pathways and metabolic processes. It serves predominantly as an essential cofactor for enzymatic activities catalyzed by poly(ADP-ribose) polymerases and sirtuins, thereby exerting a critical regulatory influence on diverse physiological processes [1,2]. Recent research has demonstrated that fluctuations in NAD^+ levels are "both causes and consequences" of various diseases, such as atherosclerosis, obesity, non-alcoholic fatty liver disease (NAFLD), and neurodegenerative conditions, such as Alzheimer's and Parkinson's diseases [2–4].

Transcriptomic analysis revealed that NAD^+ and NMN induce robust and unique gene expression profiles, distinct from those elicited by NR and NAM. Among those, NMN notably promoted cellular responses associated with protein homeostasis, RNA regulation, and anti-apoptotic signaling, all of which are hallmarks of cellular longevity.

Our experiments showed that NMN elevates cellular NAD^+ levels, activates sirtuin and autophagy pathways, and improves mitochondrial function—all of which contribute to maintaining cellular homeostasis under oxidative and chronological stress, as described in previous studies involving other cell lines. Notably, NMN suppressed cellular senescence, enhanced proliferation, supported extracellular matrix integrity, and promoted wound healing, thereby counteracting skin aging across both molecular and phenotypic dimensions.

The strength of this study lies in its multi-angle approach to evaluate how NMN slows down aging at the cellular level, rather than merely reversing age-related phenotypes. By demonstrating that NMN not only mitigates existing damage but also actively decelerates the progression of aging, we highlighted its potential as a long-term skin longevity modulator.

The findings provided a strong foundation for future translational research and supported the development of NMN-based therapeutic or cosmetic interventions aimed at preserving youthful skin and delaying the onset of age-related decline.

This study has several limitations in the context of translational relevance. First, the experiments were conducted in vitro using human neonatal foreskin fibroblasts under artificial aging models. Second, 3D culture and ex vivo experiments were not performed. Based on the findings of this study, further in-depth investigations on ex vivo and in vivo are warranted. Such studies, particularly those investigating how NMN induces biological responses and is effectively delivered and metabolized in skin tissue, will provide more rigorous validation of NMN's anti-aging effects on the skin.

Despite the growing market for NMN-based supplements and skincare products, scientific evidence supporting their efficacy, especially in skincare, remains limited. To date, the effects of NMN on the skin remain incompletely understood. Although a limited number of studies have reported beneficial effects of nicotinamide mononucleotide (NMN) on skin or skin cells, these investigations frequently involve co-administration with other compounds and rarely address the diverse biological responses of skin cells to NMN or its potential for topical application. The current study could provide foundational mechanism-based evidence of the anti-aging effects of NMN in skin cells, thereby offering a critical scientific basis for its application in consumer products. Our findings not only validated the biological potential of NMN but could also serve as a pivotal reference point for the rational development of NMN-containing cosmeceuticals and therapeutics. Looking ahead, NMN is considered to have considerable promise not only in anti-aging skin care but also in broader therapeutic strategies aimed at healthy aging. Its significance lies in enabling innovative interventions that may contribute substantially to improving quality of life, supported by further in-depth translational studies.

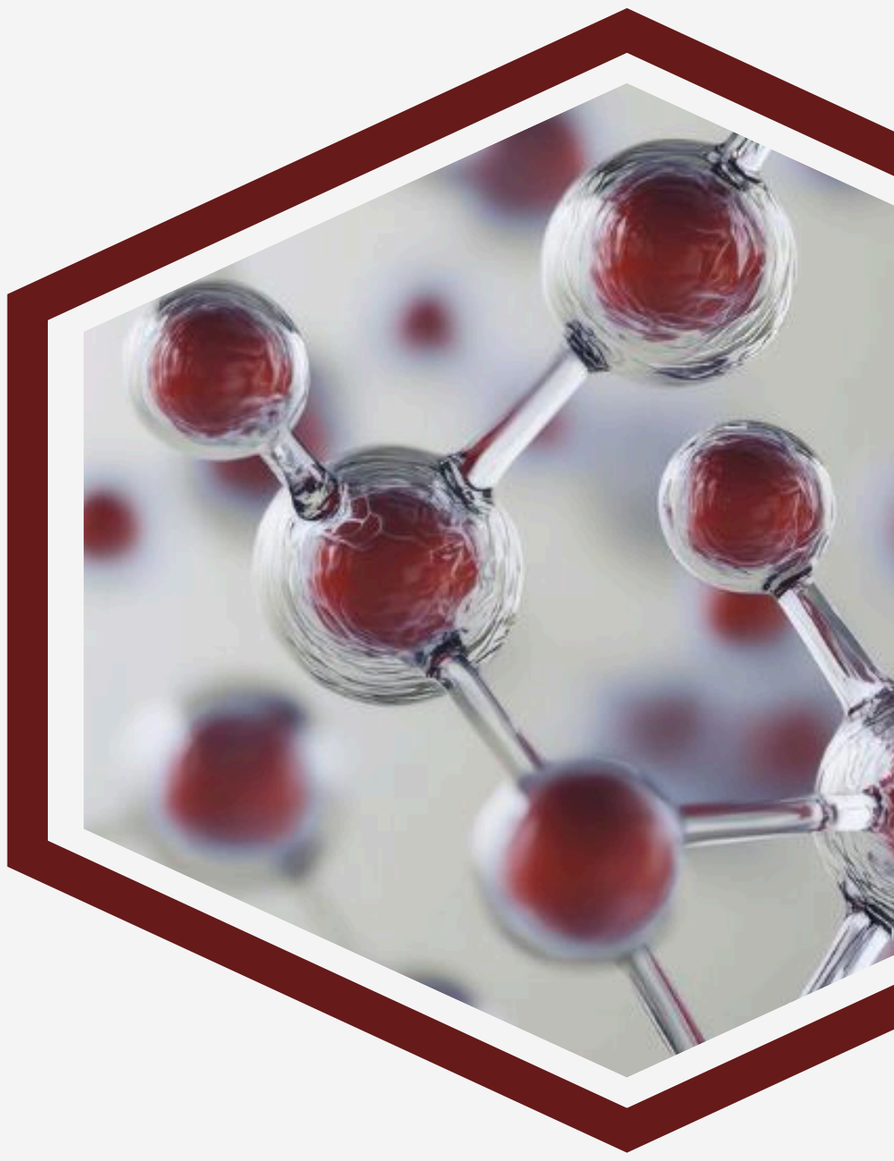
Supplementary Materials: The following supporting information can be downloaded from https://www.mdpi.com/article/10.3390/biomedicines13102395/s1: Figure S1 Quantification of cellular NAD^+ when NAD^+ and its precursors (NAM, NMN, NR) were treated; Figure S2 Cellular senescence assay when autophagy inhibitor was treated; Table S1 GSEA analysis for NAD^+, and NMN treated groups.

Author Contributions: Conceptualization, S.K. and S.-H.J.; methodology, S.K., J.P., E.C., D.K., and S.Y.; software, S.K.; validation, S.K.; formal analysis, S.K.; investigation, S.K., J.P., E.C., D.K., and S.Y.; resources, S.K.; data curation, S.K.; writing—original draft preparation, S.K.; writing—review and editing, S.K. and S.-H.J.; visualization, S.K.; supervision, S.-H.J., E.T.J. and N.-G.K.; project

TRANEXAMIC ACID

An ingredient with proven
depigmenting effects.

- Reduces the visible signs of hyperpigmentation and post-acne marks.
- Reduces redness and inflammatory reactions.
- Evens out skin tone and makes the skin appear clearer and more radiant.



Преимущества Mesoten NAD+ Premium

Comprehensive action

Restoration, Brightening, and Rejuvenation in a single formula

Scientifically proven efficacy

Patented ingredients and clinically proven results

Fast and lasting effect

Visible results after just 1–2 treatments

Optimal biocompatibility

Suitable for all skin types

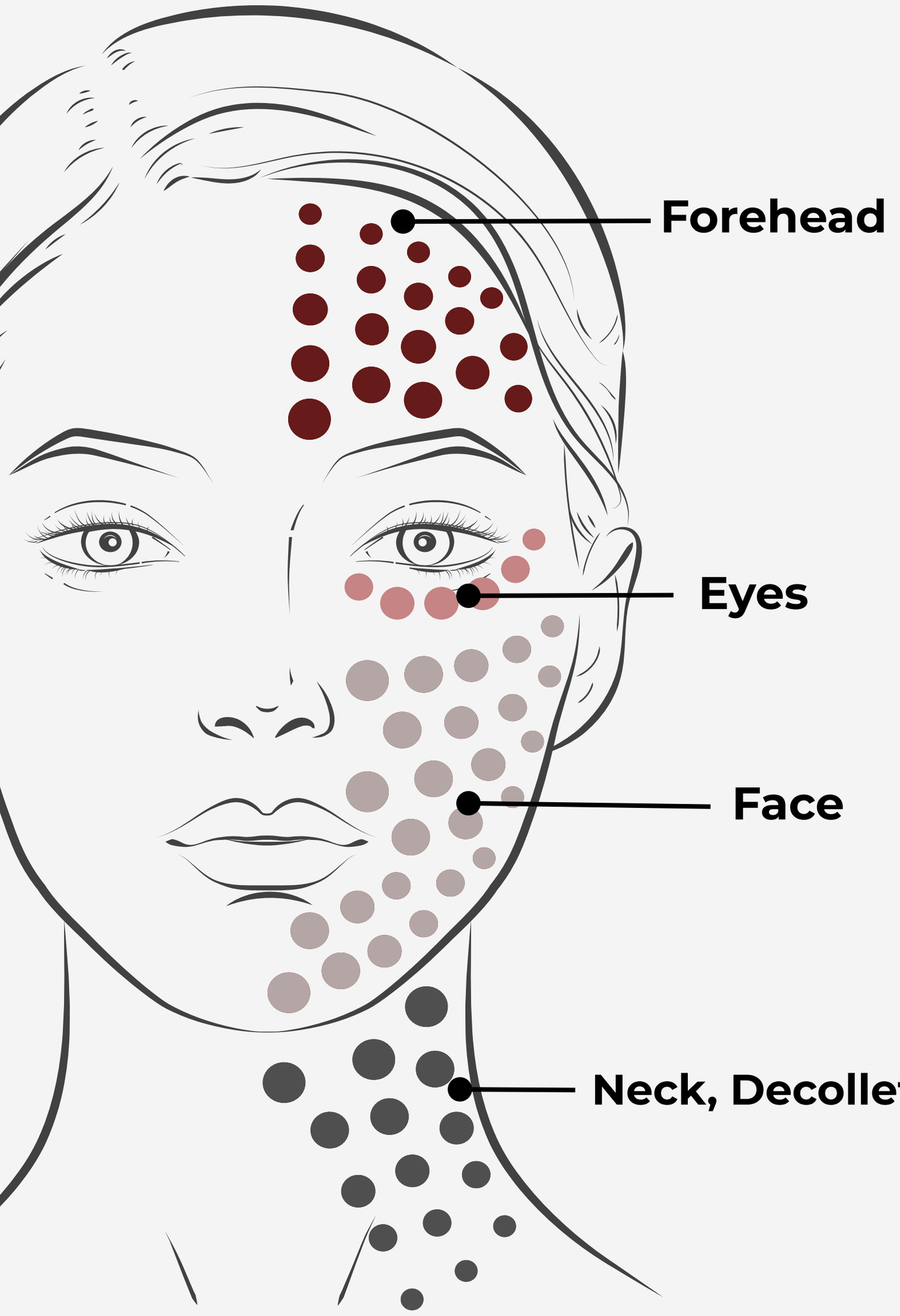
High concentration of active ingredients

Delivers results even with a minimal treatment course

Usage Protocol

Area	Notes
Face, Neck, Decollete Area	○ Needle: 30G–32G (3–5 mm) ○ Superficial papular technique
Eyes	○ Needle: 30G–32G (3–5 mm) ○ Micro-papular technique
Hands	○ Needle: 30G–32G (3–5 mm) ○ Superficial papular technique

RECOMMENDED: 3–5 treatments at 14-day intervals



Clinical Indications

Mesoten NAD+ Premium is recommended for patients with:

- Dull, tired skin lacking firmness
- Irregular skin texture and uneven tone
- Signs of photoaging
- Post-inflammatory pigmentation
- Reduced skin elasticity and dryness

Mesoten NAD+ Premium is specifically designed for cosmetic doctors and professional clinics that value quality, efficacy, and innovation.

It’s a product that builds patient trust and enhances the prestige of treatments in your clinic.

WARNING:

- Do not use after the expiration date indicated on the packaging.
- Do not use if the packaging is opened or damaged.
- Do not mix with other products.
- Do not inject into inflamed areas.
- Do not reuse to avoid the risk of contamination.
- Store at 1°–30°C, away from heat sources.
- Once opened, the product must be used immediately and discarded after use.
- The product is **NOT** recommended for use during pregnancy or lactation, in cases of active cancer, acute skin inflammations, autoimmune diseases, or individual intolerance to the components.

A consultation with a specialist is recommended before the procedure to rule out individual contraindications and assess the overall condition of the skin.

Would like to order?
Have any questions?

sales@akradex.com

Mesoten NAD+ Premium — Cellular-Level Energy.
Restoration. Radiance. Youth.

AKRADEX