



## The Utilization of a Topical Nitric Oxide Generating Serum in the Aging Skin Population: A Pilot Study

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### Abstract

Nitric oxide is necessary for optimal cellular health. Topical Nitric oxide can be produced without the generation of nitric dioxide. A novel nitric oxide generating serum is examined in this Pilot Study. Nitric oxide is a free radical gas, produced endogenously from arginine by nitric oxide synthetase. Nitric oxide mediates vasodilation and inhibits platelet aggregation. As a result, Nitric oxide is a potent vasodilator, and increases blood flow *via* capillary recruitment. Topical Nitric oxide Serum enhances the tone, quality and texture of skin, yielding a reduction in the appearance of fine lines, static rhytids, enlarged pores, and unwanted pigment. When used prior to any other product, the vasodilatory property primes the skin to enhance the absorption of other products.

**Keywords:** Nitric Oxide (NO); Regenerative medicine; Topical application

### Introduction

The fields of cellular medicine and regenerative therapy are growing rapidly [1]. There are tens of thousands of papers describing the health benefits of nitric oxide [2]. NO is an important biological messenger in human physiology. NO plays a role in vasodilation [3], and inhibition of platelet aggregation and adhesion to vascular endothelium [4,5]. Skin studies show that NO is involved in the proliferation and differentiation of epidermal cells, regulation of immune and inflammatory responses, control of allergic manifestations, antigen presentation, and microbicidal activity [6,7]. NO is a key molecule in wound healing and tissue regeneration due to its gene regulatory properties, and its influence on the proliferation and differentiation of fibroblasts, keratinocytes, monocytes, and macrophages [8-14].

### Methods

A novel “Patent Pending” NO generating dual chamber mixing serum (Pneuma Nitric Oxide, Austin, TX) was examined for preliminary efficacy and proof of concept. Nitric oxide was detected and quantified using an ozone-based gas phase Chemiluminescent Detector (CLD); (Eco Physics, Michigan, USA). Contents of both chambers of the NO generating serum were dispensed and mixed on the skin. The CLD detector was placed one inch from the skin after the serum application. Initial nitric oxide levels reached over 15,000 ppb during the mixing period, and then demonstrated normal decay kinetics. Nitric oxide could still be detected 30 minutes after the initial application.

Twenty five patients were examined. There were 20 females and 5 males. Ages ranged from 32 years to 81 years old. Patients applied the NO serum morning and evening after washing their skin with a gentle cleanser. Follow-up was at 4 week intervals for 12 weeks. Patients were administered “Linear Analog Scales” examining wrinkles, pores, evenness, oiliness, pigment and vasculature (Figure 1). Overall satisfaction was also measured by Linear Analog scores (Figure 2). Quantification of the aforementioned features was obtained using the 3-dimensional image analysis of Life VIZ App (Quantificare, France). These results were then compared to Quantificare’s reference population database of normal aging skin, adjusted for age, sex and skin type. The 3-dimensional high resolution micro-imaging of the skin surface was taken using a micro-imaging system (Quantificare, France) (Figure 2).

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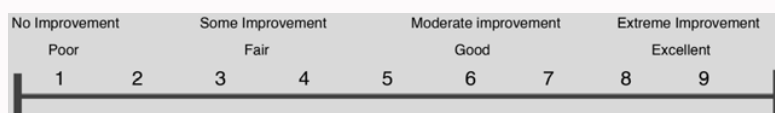


Figure 1: Linear analog scale.

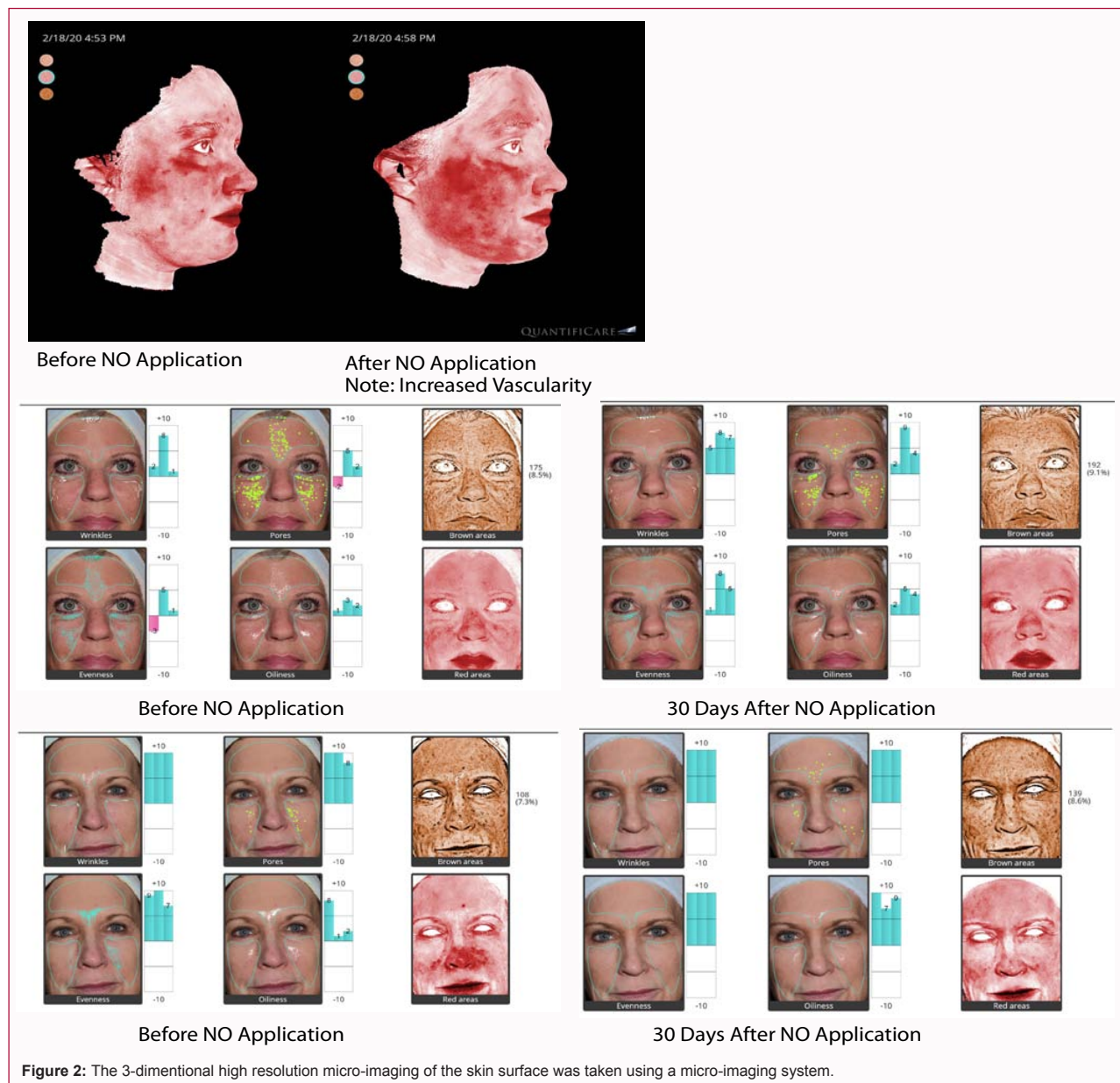


Figure 2: The 3-dimensional high resolution micro-imaging of the skin surface was taken using a micro-imaging system.

## Results

There were no hypersensitivity, allergic, or irritant reactions reported by any patient. Table 1 summarizes the linear analog scores for measured features. The results were consistently favorable with increased usage over time. Sixty-five percent of patients noticed a decrease in visible wrinkles at 4 weeks, 70% by 8 weeks, and 87% by 12 weeks. Decreased pore size was reported by 50% at 4 weeks, 61% at 8 weeks, and 65% by 12 weeks. An increase in skin tone was perceived by 70% at 4 weeks, 82% at 8 weeks, and 85% by 12 weeks. Improved skin texture was noted by 72% at 4 weeks, 81% by 8 weeks, and 88% by 12 weeks. Decreased pigmentation was noticed by 50% at 4 weeks, 62% at 8 weeks, and 75% by 12 weeks. Decreased skin oiliness was noted by 70% at 4 weeks, 75% by 8 weeks, and 83% by 12 weeks. Unwanted vasculature such as telangiectasia or rosacea-related erythema was improved in 18% of patients at 4 weeks, 32% by

Table 1: The linear analog scores for measured features.

Measured Feature	Percentage		
	4 Wks	8 Wks	12 Wks
Decreased wrinkles	65%	70%	87%
Decreased pore size	50%	61%	65%
Increased skin tone	70%	82%	85%
Improved skin texture	72%	81%	88%
Decreased pigmentation	50%	62%	75%
Decreased oiliness	70%	75%	83%
Decreased erythema	18%	32%	51%

8 weeks, and 51% by 12 weeks.

Table 2 summarizes patient overall satisfaction with the product. By 12 weeks, 84% of patients were “Extremely Happy” with their

**Table 2:** Patient overall satisfaction with the product.

Satisfaction	Percentage		
	4 Wks	8 Wks	12 Wks
Unhappy	0	0	0
Satisfied	75	20	10
Very Satisfied	19	72	6
Extremely Happy	6	8	84

results. Other patients were “Very Satisfied” or “Satisfied”. There were no “Unhappy” patients who used the product in the 4, 8, or 12 week populations.

## Conclusion

This “Pilot Study” demonstrated the benefits of a topical NO producing serum in the aging skin population. The improved circulation and pro-fibroblastic enhancing capabilities provide for aesthetic improvement when used alone, and improved absorption dynamics when combined with other products as an “absorption priming” product.

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