A Firming Neck Cream Containing N-Acetyl Glucosamine Significantly Improves Signs of Aging on the Challenging Neck and Décolletage

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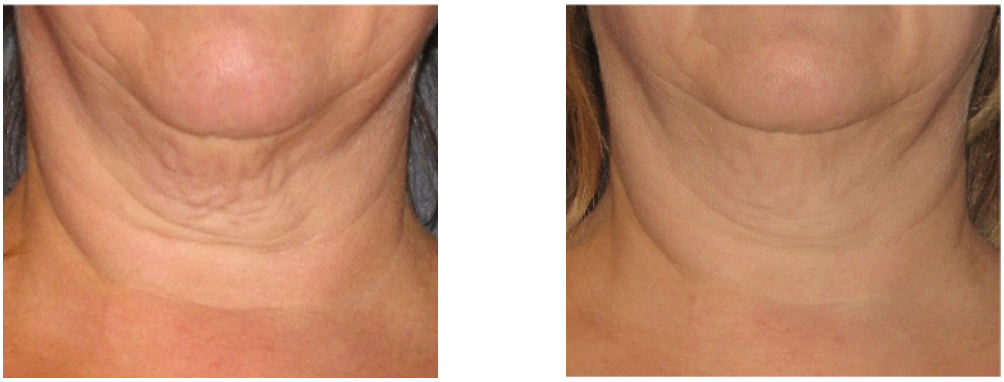
Introduction

Topical, noninvasive, antiaging neck treatments are highly sought after by aging patients who desire improvements to sagging, texture and pigment. Characterized by loss of firmness, which could also be described as laxity and crepiness, as well as the obvious appearance of deep lines and dyspigmentation, the photoaged neck is a distressing concern for many patients. Current neck treatments rely mainly on devices to tighten skin. Radiofrequency and ultrasound offer proven skin tightening effects as FDA-approved devices.[1-2] The décolletage is often treated similarly to facial aging, e.g., with peels and lasers.[3] An effective cosmetic topical product would offer complementary home treatment for these in-office cosmetic treatments.

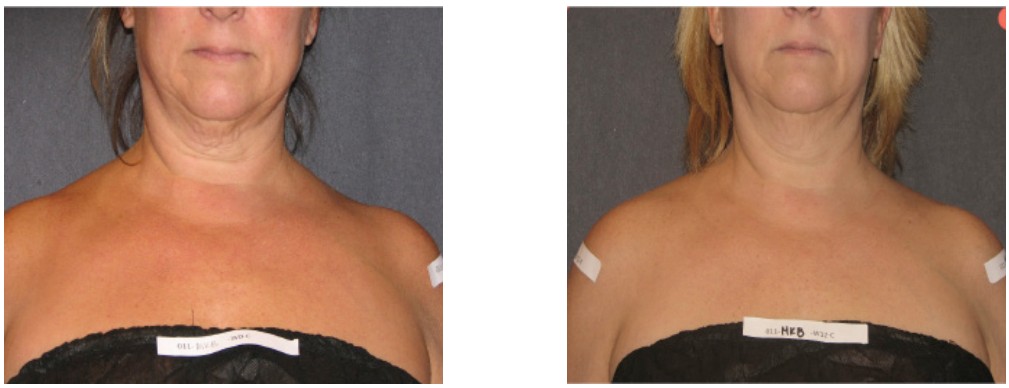
A high-potency neck cream was developed to meet the specific antiaging formulation needs of the neck and décolletage, targeting two primary aging concerns – pigment and texture. The product contains pigmentation evening and dermal matrix building ingredients, N-acetyl glucosamine (8%) and triethyl citrate (4%), both chemically neutral compounds, that have been shown to increase hyaluronic acid and collagen, respectively.

Figure 1. Improvement to Neck Laxity, Crepiness and Firmness in Clinical Photographs



Week 0 **Week 12**

Cropped images



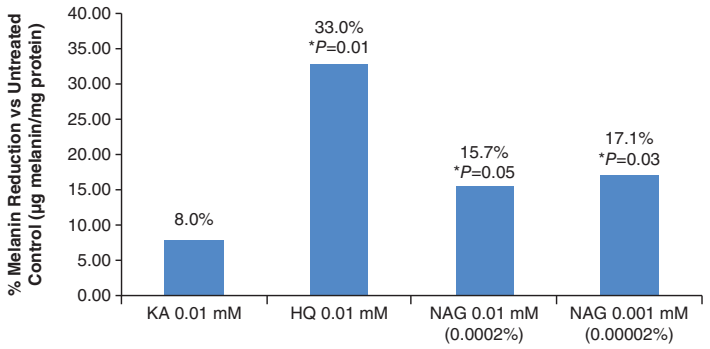
Week 0 **Week 12**

Uncropped images of the above photographs

In Vitro Skin Effects of N-Acetyl Glucosamine: Matrix Building and Reduced Melanin Production

N-acetyl glucosamine (NAG), an amino sugar compound, has been clinically proven to plump and increase skin's thickness via objective assessment using digital calipers; an effect that has been linked to its ability to increase hyaluronic acid synthesis in fibroblast cell culture models.[4] Since it is one of the repeating units in the hyaluronic acid molecule, it is not surprising that NAG supplementation to dermal fibroblast cells provokes hyaluronic acid synthesis. Additionally, NAG provides pigment evening effects. It has been shown to reduce hyperpigmentation in skin via tyrosinase inhibition.[5] Separate *in vitro* cell biology experiments further support its melanin-reducing effects (Figure 2).

Figure 2. NAG Significantly Reduces Melanin Production



*Significant reduction in melanin expression versus untreated control.
Experiment conducted in neonatal darkly pigmented melanocytes (Passage 6, 3.5X10^5 cells/2mL) versus an untreated control with Kojic Acid (KA) and Hydroquinone (HQ) as positive controls. Note, hydroquinone's significant cytotoxic effect limits its usefulness in this *in vitro* model.

Objective

A 16-week clinical study was conducted to assess the efficacy, tolerability and aesthetics of this antiaging formulation on the neck and décolletage.

Study Methodology

Design	• A 16 week, Institutional Review Board approved, single center, prospective study with direct comparison to baseline condition
Population/Inclusion	• 45 Caucasian women (Fitzpatrick types I, II, III), ages 40–65 years, with moderate texture (including wrinkles, fine lines, laxity, and/or crepiness) on the neck (score of 2.5–3.0) and presence of at least mild to moderate-severe hyperpigmentation on the décolletage (score of 2.0–3.5)
Exclusion	• Known allergies to skincare products; history of disease or use of medication that could interfere with evaluations; routine use of antiaging topical products, including prescription retinoids within 3 months; hydroxyacids, retinol and other antiaging cosmetics within 2 months; cosmetic procedures within 6 months; and pregnancy/lactation
Evaluation Tools	
• **Clinical Measures** Visual grading was conducted by the Board certified dermatologist	• Neck texture, décolletage texture and décolletage pigmentation were graded using a 0–5 scale with half-point increments (weeks 0, 8, 12,16); predefined descriptors were anchored at whole point values (Table 1) • Irritation/tolerability parameters such as dryness, erythema, itching, stinging/burning were graded using a 0–3 scale (none, mild, moderate, severe) (weeks 0, 8, 12, 16)
• **Objective Measures**	• Colorimetric measurements were collected using the Minolta Chromameter standardized 2 inches below the suprasternal notch and 1 inch left of center. The average of 3 measurements was reported (weeks 0, 8, 16)
• **Subjective Measures**	• Self-assessment questionnaires were completed by subjects (weeks 0, 8, 12, 16)
• **Photography**	• Standardized digital photographs were taken of the neck and décolletage using a Canon PowerShot S3 IS camera mounted on a tripod (weeks 0, 8, 12, 16) • Painstaking efforts were taken to ensure reproducibility and consistency of photos, including a dedicated, windowless room with solid backdrop; partial immobilization of subjects with their backs and head against a wall and feet on taped foot templates, eyes positioned forward on a focused target. Standardized camera positions for left, right and front relied on predetermined floor markings. Subject appearance was standardized with hair pulled back, jewelry removed, and a solid clothing drape. Photos were cropped to enlarge the treatment area; photos were not retouched in any way.
Statistics	• Visual grading, instrumental measurements, and self-assessment questionnaires were compared to baseline at each visit using the Student's t-test ($P \leq 0.05$)
Safety	• Adverse Events were recorded and tabulated

Table 1. Dermatologist-Assessed Efficacy Parameters for Neck and Décolletage

Score	Severity	Texture Descriptors (for neck & décolletage)	Pigmentation Descriptors (for décolletage)
0	None	No texture, smooth	No hyperpigmentation; skin is even toned
1.0	Minimal	Noticeable texture (may include lines, wrinkles, laxity, crepiness)	Hyperpigmentation or ruddy erythema is emerging but faint
2.0	Mild	Texture (may include lines, wrinkles, laxity, crepiness) is distinctly noticeable, but not widespread	Hyperpigmentation is distinctly noticeable but spots are scattered; and/or ruddy appearance/erythema is distinctly noticeable but scattered
3.0	Moderate	Texture (may include lines, wrinkles, laxity, crepiness) is obvious, becoming pervasive, but still able to be affected by a topical cream	Hyperpigmentation is obvious, pervasive, with small, diffuse spots, and/or skin presents with ruddiness/mild erythema. Seborrheic and/or actinic keratoses may be sparsely present, but are not included in the assessment. Condition is still able to be affected by a topical cream.
4.0	Severe	Texture (may include lines, wrinkles, laxity, crepiness) is pervasive and unlikely to be noticeably improved with a topical cream	Hyperpigmentation is diffuse with large spots, seborrheic and/or actinic keratoses may be present. Overt poikiloderma.
5.0	Very Severe	Texture (may include lines, wrinkles, laxity, crepiness) is unlikely to show enough improvement to be clinically meaningful without surgical/procedural intervention	Hyperpigmentation and/or ruddiness/poikiloderma is unlikely to show enough improvement to be clinically meaningful without procedural intervention

Half-point increments were allowed.

Test Products

An oil-free, moisturizing, high-potency neck cream (Skin Active Triple Firming Neck Cream, NeoStrata Company, Inc.) was developed using nonirritating, nonacid antiaging benefit ingredients to enable pH-adjustment to skin's natural pH (target pH 5.0–6.0). Special attention was taken to formulate an aesthetically pleasing and nonirritating product that would be ideal for use on the occlusion-prone neck area. (Table 2)

Table 2. Key Benefit Ingredients in Neck Cream

Cosmetic Benefit for Skin	Ingredient	Mechanism of Action
Matrix Building/Firming (GAGs) Pigment Evening	N-acetyl glucosamine (NeoGlucosamine®) 8%	Increases hyaluronic acid; reduces tyrosinase (pigment evening)
Matrix Building/Firming (collagen)	Triethyl citrate (NeoCitriate®) 4%	Increases collagen, plumps matrix to lift and firm
Collagen Booster, Anti-inflammatory	Palmitoyl glycine (Pro-Amino Acid)	Increases pro-collagen, reduces inflammation
Protection against cellular aging	Swiss apple stem cell extract (PhytoCellTec™ Malus Domestica, Mibelle Biochemistry)	Protects and maintains function of human skin cells; delays cellular senescence
Antioxidant/free radical scavenger	Vitamin E acetate	Free radical scavenger
Immediate visual smoothing/toning	Tospearl & Nylon	Blurring agents reduce skin reflectivity
Vehicle	Oil free, paraben free, moisturizing vehicle, contains shea butter	Cream formulation with fragrant blend of light green/floral (fragrance free, allergen free blend); *non-acid formulation (pH 5.0–6.0)*

Results

Forty-two women completed the study.

Clinical Grading

- All dermatologist-graded aging parameters including neck texture, décolletage texture and décolletage pigmentation were significantly improved at each time point, $P<0.001$.
- After 16 weeks, neck texture improved 25%, décolletage texture improved 29% and décolletage pigmentation improved 23%. (Figure 3)

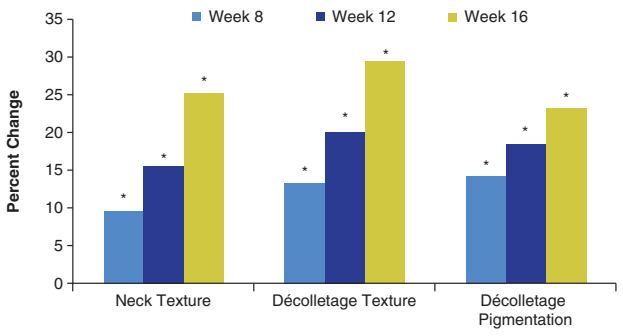
Chromameter

- Chromameter measurements revealed significant improvements at weeks 8 and 16 in brightness (L*), $P<0.001$, and erythema (a*), $P<0.05$.

Self-Assessment

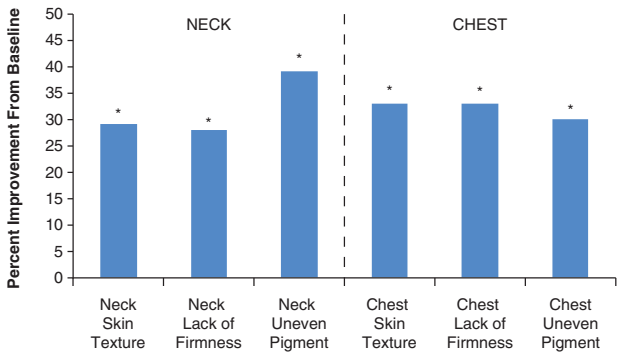
- Self-assessed aging parameters were significantly improved on the décolletage and neck, $P<0.05$, providing subjective support of clinical data (Figure 4).

Figure 3. Dermatologist Grading



*Significant improvement from baseline, $P<0.001$.

Figure 4. Self-Assessment



*All parameters were significantly improved from baseline at each time point $P<0.05$. (Week 16 data are shown)

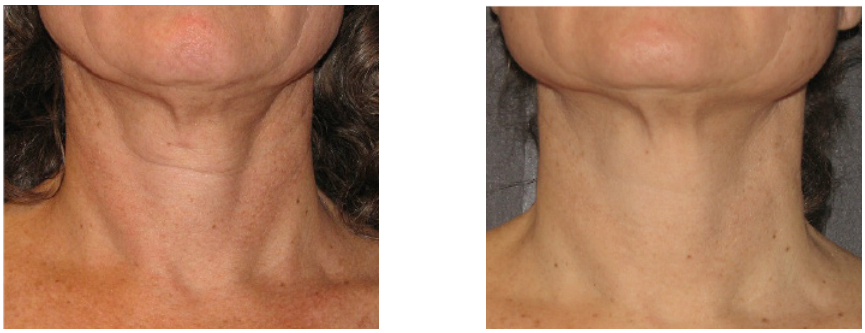
Clinical Photography

- Photographs revealed noticeable improvements to neck and décolletage texture, lines, firmness, laxity and pigmentation. (Figures 1, 5, 6)

Tolerability

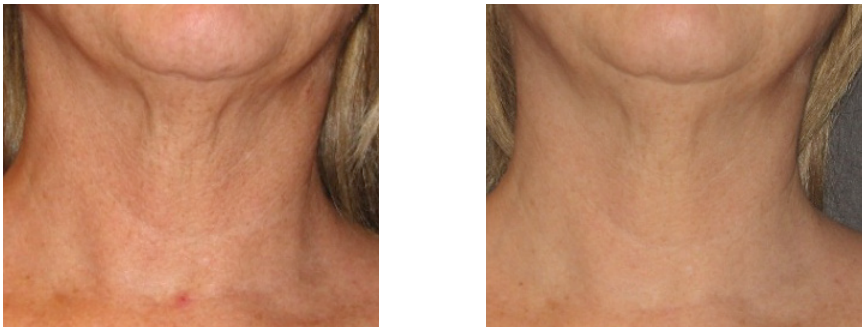
- The test cream was well-tolerated with no significant changes in any of the irritation parameters measured, including dermatologist graded objective irritation, subjective irritation, self-assessed dryness, irritation/sensitivity, and skin compatibility; preexisting erythema was reduced via chromameter measurements (a*).
- One subject experienced an adverse event of contact dermatitis on 2 separate occasions that was considered "possibly related" to test product usage. Product usage was modified for a brief period and the subject completed the study. There were no other product related adverse events.

Figure 5. Improvement to Neck Texture, Deep Lines and Pigmentation



Week 0 Week 16

Figure 6. Improvement to Neck Crepiness, Texture and Chest/Neck Pigmentation



Week 0 Week 16

Conclusions

- **The cosmetic antiaging neck cream, containing N-acetyl glucosamine and triethyl citrate as matrix building, firming and pigment-reducing ingredients, was well-tolerated and demonstrated benefits on the challenging neck and décolletage.**
- **Neck and décolletage texture improved significantly with reduced appearance of crepiness, laxity and deep lines.**
- **Pigmentation characteristics (brightness and erythema) improved both visually, based on dermatologist grading, and instrumentally via Chromameter.**
- **Self-assessment questionnaires supported clinical grading as subjects noted positive changes in texture, firmness and pigment.**
- **A profound influence on the character of neck wrinkles was shown in this study using only the topical treatment. The high-potency cream provides a non-invasive treatment for the aging neck and décolletage that can be used alone or combined with office procedures to deliver significant antiaging benefits.**

References

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