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.¹² 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 shown 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. 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. Separate in vitro cell biology experiments further support its melanin-reducing effects (Figure 2).

**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**
  - **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 drapes. 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 (Ps0.05)

- **Safety**
  - Adverse Events were recorded and tabulated

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

Half-point increments were allowed.
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)

### Test Products

A neck cream was developed with key benefit ingredients as listed in Table 2.

### 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).

### Table 2. Key Benefit Ingredients in Neck Cream

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

*Significant improvement from baseline, \( P<0.001 \).
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