Skin aging is a function of both chronological aging and photo-aging. Both chronological and photo-aging are cumulative processes. However, photo-aging is primarily a function of sun exposure and pigmentation, whereas chronological aging is primarily a function of time.

**5 Signs of Aging Skin**

1. *Lines & Wrinkles*
2. *Dark Spots and Uneven Skin Tone*
3. *Sagging and Thin/Translucent Skin*
4. *Dry Skin*
5. *Open Visible Pores*
Typical Measuring and Designs to Evaluate and Support Claims for Facial Skin Lines/Wrinkle Reduction Products and Ingredients
Facial Lines/Wrinkles comprise several specific regions of interest. Typically anti-aging products aimed at reducing lines wrinkles are measured on the crows feet areas. However, region specific products can be measured anywhere on the face for any improvements in particular regions of interest.
Measuring Facial Skin Lines/Wrinkles

Bioinstrumentation

Silicone Replicas

Subject Perception

Image Analysis

Expert Visual Grading
Types of Lines/Wrinkles

Fine Lines, Deep Lines, Emerging Lines

Facial Lines/Wrinkles

Improvement in the appearance of lines/wrinkles typically encompasses all three types of wrinkles. However, our expert graders and unique image analysis allows for differentiation between the types and severity of each category of wrinkle.
Facial Lines/Wrinkles

Lines/Wrinkle Severity

Subject 1 has a mix of fine, deep and emerging lines and an overall severity of 36 (0-100)

Subject 2 has the same number of total wrinkles, however they are predominately emerging lines, thus an overall severity score of 24

Improvement in the number of visible deep, fine and emerging lines/wrinkles is important, however, the severity of these lines/wrinkles plays an important role in the appearance and aesthetic performance of a product.
## Crows Feet Wrinkle Analysis

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Week 2</th>
<th>Week 4</th>
<th>Week 8</th>
<th>Week 12</th>
<th>Overall % Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrinkle Severity</td>
<td>5786.11</td>
<td>5609.56</td>
<td>5211.56</td>
<td>4498.45</td>
<td></td>
</tr>
<tr>
<td>Total lines</td>
<td>24</td>
<td>22</td>
<td>20</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Fine Lines</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Deep Lines</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Emerging Lines</td>
<td>12</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>
### Crows Feet Wrinkle Analysis

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Week 2</th>
<th>Week 4</th>
<th>Week 8</th>
<th>Week 12</th>
<th>Overall % Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrinkle Severity</td>
<td>4678.22</td>
<td>4234.12</td>
<td>4098.78</td>
<td>3745.67</td>
<td></td>
</tr>
<tr>
<td>Total lines</td>
<td>27</td>
<td>24</td>
<td>22</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Fine Lines</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Deep Lines</td>
<td>12</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Emerging Lines</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
## Breadth (Depth of Wrinkles) Silicone Replica Image Analysis (Crow’s Feet)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Week 8 % Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breadth</td>
<td>44.21%</td>
</tr>
</tbody>
</table>
Roughness (Skin Texture) Silicone Replica Image Analysis (Crow’s Feet)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Week 8 % Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roughness Score (Ra)</td>
<td>32.01%</td>
</tr>
</tbody>
</table>
Typical Measuring and Designs to Evaluate and Support Claims for Dark Spots – Uneven Skin Tone (Lightening/Whitening/Brightening) Products and Ingredients
Measuring Skin
Lightening/Whitening/Brightening

Bioinstrumentation

Subject Perception

Expert Visual Grading
## Bioinstrumentation for Skin Lightening

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chroma Meter – CR400</td>
<td>Skin Color Evaluation</td>
<td>L*, a*, b* Values and ITA – spot and small area of skin specific</td>
</tr>
<tr>
<td>SIAscope</td>
<td>Melanin Content</td>
<td>Image analysis and Subsurface Penetration</td>
</tr>
<tr>
<td>Clarity Lite</td>
<td>Pigment</td>
<td>Image analysis at 50X</td>
</tr>
<tr>
<td>Clarity Facial Imaging</td>
<td>Regional Skin Color Evaluation</td>
<td>L*, a*, b* values across a large region of skin</td>
</tr>
<tr>
<td></td>
<td>Skin Color Homogeneity</td>
<td>Pigment Intensity across a large region of skin and spot specific</td>
</tr>
</tbody>
</table>
**Chroma Meter**

The Konica Minolta Chroma Meter CR-400

*Measures Lab color space* of skin. Lab is a color-component space with dimension $L$ for lightness (whitening/brightening) and $a$ and $b$ for the color-opponent dimensions.
► Measure hemoglobin, melanin and collagen up to 2mm under the surface of the skin.

► Measure the effects of products that interact with the skin and affect hemoglobin, melanin and collagen.

► Quantify temporal changes between SIAscans capturing an exact image of the skin's appearance, and measuring the effect a product has on the skin over time.
Right Upper Cheek

Baseline

Mean 178 ± 25

Week 2

Mean 162 ± 17

Week 4

Mean 152 ± 32
Homogeneity of Skin Color (Skin Tone Evenness)
<table>
<thead>
<tr>
<th></th>
<th>Spot Count</th>
<th>Surface Area Affected</th>
<th>Pigment Intensity</th>
<th>Pigment Evenness</th>
<th>Size Distribution</th>
<th>Cat.1</th>
<th>Cat.2</th>
<th>Cat.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>62</td>
<td>125.8</td>
<td>118</td>
<td>43.4</td>
<td>1.65</td>
<td>4</td>
<td>34</td>
<td>24</td>
</tr>
<tr>
<td>Week 12</td>
<td>34</td>
<td>69.5</td>
<td>118</td>
<td>63.1</td>
<td>1.40</td>
<td>1</td>
<td>22</td>
<td>11</td>
</tr>
<tr>
<td>% Improvement</td>
<td>45%</td>
<td>53%</td>
<td>00%</td>
<td>45%</td>
<td>15%</td>
<td>75%</td>
<td>35%</td>
<td>54%</td>
</tr>
</tbody>
</table>
Typical Measuring and Designs to Evaluate and Support Claims for Sagging and Thin Translucent Skin Products and Ingredients
Measuring Sagging/Hollowness Skin Thickness (Density) and Translucency

Bioinstrumentation (Experimental and Ultrasound)

Subject Perception

Expert Visual Grading
Measuring Sagging/Hollowness
Skin Thickness (Density) and Translucency

Region of Interest

Hollowness – Measure Fullness and Lift

Image Analysis

Visual Grading
Measuring Sagging/Hollowness
Skin Thickness (Density) and Translucency

ULTRASOUND

Improvement in skin thickness (Density) can be seen after 56 days of treatment, the “hollow” areas are filled in which improves skin plumpness, density, translucency and subsequently resultant sagging within the region of interest.
Typical Measuring and Designs to Evaluate and Support Claims for Dry Skin Products and Ingredients
Measuring Dry Skin (& Skin Barrier)

Bioinstrumentation

Desquamation

Subject Perception

Expert Visual Grading
The typical analysis interpretation in our experience is:

- The **FINE flakes value** may not vary much as it is the general "background" of normal desquamating cells.
- The **COARSE flakes value** will be most sensitive to treatment effects, increasing with irritancy (hyperkeratosis), and decreasing with moisture.
- **D.I.**, the desquamation index provides a good overall measure of dryness and compares well with typical clinical grades:
  - Non-Dry - 0
  - Moderately Dry - 2
  - Severely Dry - 4
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Meter</td>
<td>Skin Hydration</td>
<td>Multi level skin hydration parameters</td>
</tr>
<tr>
<td>Vapo Meter</td>
<td>Trans-Epidermal Water Loss (TEWL)</td>
<td>Water loss and retention on skin (Closed Chamber – most accurate)</td>
</tr>
<tr>
<td>SkiCon – 100 &amp; NOVA Meter -225</td>
<td>Skin Hydration</td>
<td>Upper layer of the stratum corneum (modified for special Lip hydration measurement)</td>
</tr>
<tr>
<td>Corneometer® CM 825</td>
<td>Skin Hydration</td>
<td>stratum corneum at depth of 10-20 µm</td>
</tr>
<tr>
<td>Dermalab</td>
<td>Trans-Epidermal Water Loss (TEWL)</td>
<td>Water loss and retention on skin</td>
</tr>
<tr>
<td>Clarity Lite</td>
<td>Dryness, Flaking, Roughness/Smoothness</td>
<td>Unique image analysis features at 50X</td>
</tr>
</tbody>
</table>
Bioinstrumentation for Dry Skin & Skin Barrier

[Diagram showing normal and dry skin layers with labels for hydro lipid film, stratum corneum, corneocyte, lipid barrier, stratum corneum, moisture, and ceramide.]

- TEWL Measures moisture loss
- Low TEWL value = high barrier function

[Image of a device labeled 'VesicMaster'.]
Bioinstrumentation for Dry Skin
Clarity Lite Imaging & Analysis (50X)

Lower Lateral Leg

Pre/Dry/Irritated

Post/Normal – Well Hydrated
Bioinstrumentation for Dry Skin
Clarity Lite Imaging & Analysis (50X)

Left Dorsal and Distal Region of Hand

Baseline/Texture

Moist/Smooth/No Flaking or Erythema

Dryness Score = 12
Smoothness Score = 89

Post/Texture

Dry/Rough/Flaking/Erythematic

Dryness Score = 92
Smoothness Score = 9
Lower Lateral Leg Analysis – Clarity Lite Measurements

Texture (50x Images)

Baseline/ Pre Lotion Application

Smoothness = 55

30 Minutes/ Post Lotion Application

Smoothness = 14
Pore Analysis Clarity and Clarity Lite Image Analysis

Pre Individual Pore - Size (PXL) = 23.1, Visibility Score (0-100) = 29.1

W8 Individual Pore - Size (PXL) = 20.4, Visibility Score (0-100) = 24.6