Press Release

Research and Development

Shiseido Discovers “Ring Collagen®,” a Collagen Structure That Creates Tension to Maintain Facial Shape

“Digital-Skin Reality®” Developed to Visualize Forces Generated within the Skin in 3D

Shiseido Company, Limited (“Shiseido”), in joint research with Dr. Kyoichi Matsuzaki, Chief of External Plastic Surgery, Faculty of Medicine at the International University of Health and Welfare, together with researchers at Jichi Medical University and the National Institute for Physiological Sciences, has discovered that facial skin contains a characteristic ring-shaped collagen structure called “Ring Collagen®,” which generates tension in the skin that serves to maintain a firm, youthful facial appearance.

Based on these findings, Shiseido revealed that moderate physical stimulation applied to the skin improves the structure of Ring Collagen®, which becomes disrupted with age, and this stimulation contributes to reducing sagging. Shiseido also found that rosehip extract and safflower extract (“benibana extract”) may improve the structure of Ring Collagen®.

To study this, Shiseido developed “Digital-Skin Reality®,” a groundbreaking technology that visualizes forces generated within the skin by rendering them in 3D. This technology has revealed the mechanism by which tension is generated to maintain facial shape and appearance.

Part of this research was presented at the 32nd International Federation of Societies of Cosmetic Chemists (IFSCC) London Congress (September 2022), where it was selected as a top 10 finalist. In addition to this honor, the congress also featured a keynote speech on this research.

Figure 1 Mechanism by which Ring Collagen® helps maintain facial shape: 1. A contraction force is generated within the ring. 2. Based on that, tension is created as the rings pull against each other. 3. As a result, a force that wraps the face is generated.

Research Background

Gravity-induced sagging becomes a major concern as people age. Shiseido has been a pioneer in sagging research, establishing a framework for defining and evaluating sagging skin and developing technology to visualize internal structures of the skin, thereby clarifying the mechanism of gravity-induced sagging. In this study, the research team set out to understand the fundamental causes of sagging.

In young individuals, the skin is firm and taut. When this skin-tightening ability, or tension, is lost with age, the skin becomes loose and sags under gravity. Therefore, Shiseido believed that the underlying cause of sagging is the loss of skin tension with age and conducted research based on this idea.

Ring Collagen® Generates Tension in Skin

The taut facial skin of young individuals contracts rapidly after being removed (Figure 2). Using its newly developed "Digital-Skin Reality®" technology to analyze how excised facial skin contracts, Shiseido found a strong contraction force in specific areas within the skin (Figure 3). In these areas, collagen exists as ring-shaped structures. It was also demonstrated that, within the facial skin, individual rings contract and pull against each other, generating tension throughout the skin (Figure 1). This tension enables the skin to wrap tightly around the face, thereby maintaining a well-defined, youthful facial shape.

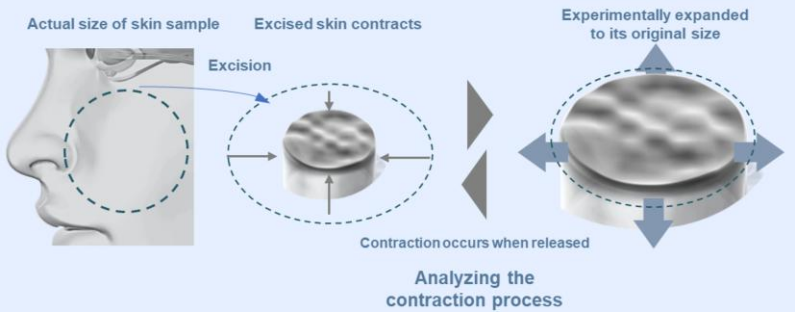

Figure 2 Analysis of skin contraction process

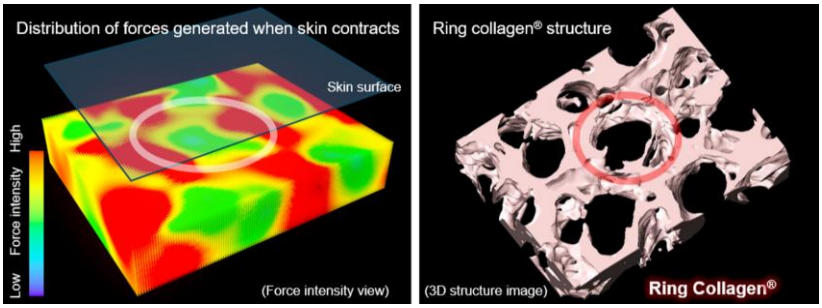

Figure 3 Structure of ring-shaped collagen that generates a skin-tightening force
[Left: When facial skin contracts, a strong, ring-shaped force is generated in specific areas (white circle).
Right: Collagen is present in the ring-shaped areas (red circle)]

Age-Related Structural Changes in Ring Collagen® and Sagging

Ring Collagen® was found around vellus hairs and sebaceous glands, along with surrounding proteoglycans (substances with a high cushioning effect, also present in joints). It was also confirmed that the structure of Ring Collagen® is disrupted as the amount of proteoglycans decreases with age (Figure 4). This age-related deterioration of Ring Collagen® was shown to reduce tension, contributing to sagging.

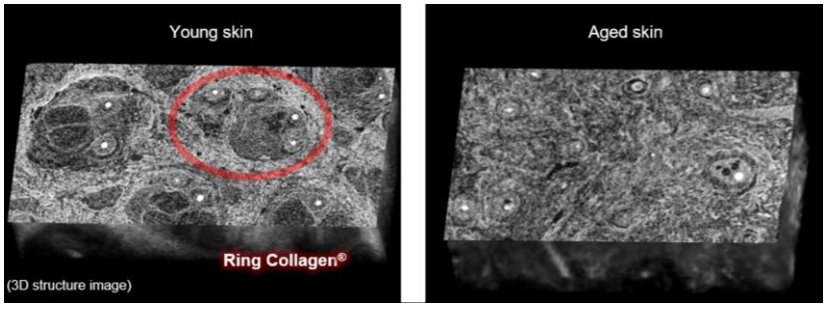

Figure 4 Changes in Ring Collagen® with age
[Horizontal sectional view of facial skin. The clear Ring Collagen® shape (red circle) observed in young skin was not present in aged skin]

Physical Stimulation and Plant Extracts Contribute to Improving Ring Collagen® Structure

To improve the structure of Ring Collagen®, which becomes disrupted with age, various stimuli were applied to cultured skin. Notably, moderate physical stimulation (stretching in all directions) increased the amount of proteoglycans associated with Ring Collagen® (Figure 5). Furthermore, this stimulation improved Ring Collagen® structure and led to reduced sagging. In addition, the research team found that rosehip extract and benibana extract promoted the expression of proteoglycan-related genes.

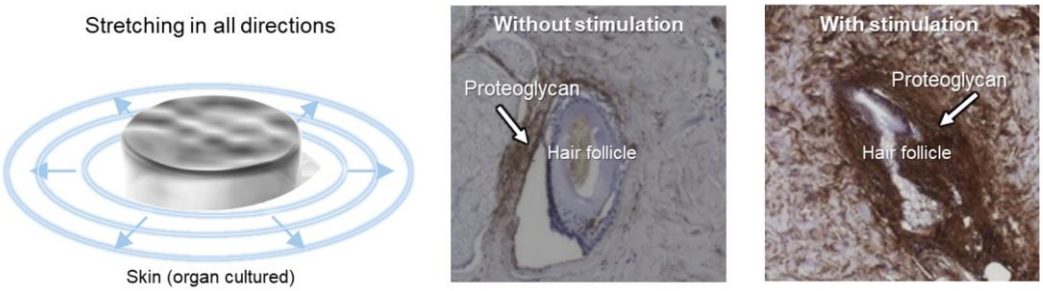

Figure 5 Increase in proteoglycans due to physical stimulation of the skin (stretching in all directions)

Newly Developed "Digital-Skin Reality®" Technology Reveals True Nature of Tension

In this study, the key to unveiling the true nature of tension was a new AI-powered technology that visualizes forces generated within the skin. This technology sets a high density of observation points within the skin and tracks how each point moves as the skin contracts, thus enabling researchers to analyze forces generated within the skin. In addition, by combining autostereoscopy technology* with a high-speed data processing system, the analysis results are reconstructed in 3D and displayed as a digital skin image moving in real space before the user's eyes (Figure 6). This makes it possible to intuitively understand the skin's complex structure and the forces that occur within it.

Shiseido's "Digital-Skin Reality®" provides a paradigm shift in skin visualization from the tangible world (seeing structure and movement) to the intangible world (seeing physical forces generated within the skin). It also moves the visualization environment from the monitor screen into real space.

*Autostereoscopy technology displays images in 3D without special glasses or other devices.

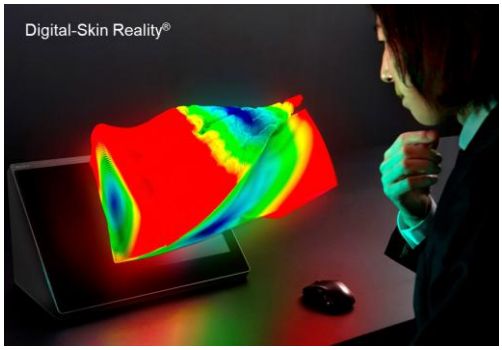

Figure 6 Digital-Skin Reality®
The intensity of the force generated as the skin deforms is indicated by color (the image shows what the observer sees).

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R&D Strategy

Shiseido has established three pillars under its R&D philosophy "DYNAMIC HARMONY" to accelerate innovation: "Skin Beauty Innovation: Equity enhancement of brands," "Sustainability Innovation: Circular value creation," and "Future Beauty Innovation: Challenges in new areas." Additionally, Shiseido promotes open innovation and advances new value creation through research alliances with various external organizations. The innovative research outcomes generated from the fusion of Shiseido's advanced science and the knowledge and technology of world-class research institutions are highly regarded academically on a global scale, including at the IFSCC Congress, the world's largest and most prestigious research conference on cosmetic technology.

About R&D Philosophy “DYNAMIC HARMONY”
https://corp.shiseido.com/en/rd/dynamicharmony

Reference

Organic European rosehip

Mogami-Benibana, a safflower variety traditional to Yamagata, Japan

Over the past quarter century, Shiseido has led research on sagging as a pioneer, establishing a fundamental basis of sagging research that includes definitions and evaluation methods of sagging. Furthermore, it has developed advanced analytical methods that utilize AI to visualize inside of the skin, addressing age-related changes in facial shape, such as nasolabial folds, marionette lines, and jawline irregularities, and elucidating the phenomena and causes of these issues. Shiseido is among the first in the world to have identified the fundamental cause of sagging by analyzing previously unexplained tension within the skin.
Shiseido's research on sagging is evolving into the next generation, and as “Gravity Lift Science V,” it will accelerate the creation of new value to address consumers' aging concerns.

Related Press Releases

・ Shiseido Elucidated Skin Structure Maintains Facial Morphology for the First Time in the World (2015)
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・ Shiseido Discovers That Age-Related Dermal Cavitation Leads to Sagging Skin (2015)
https://corp.shiseido.com/jp/releimg/2512-j.pdf?rt_pr=tr437 (in Japanese)
・ Shiseido Elucidates Mechanism of Age-Related Dermal Cavitation (2016)
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・ Shiseido Elucidates the "Fibroblast Network" of Cells in Dermis (2020)
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・ Shiseido Discovers Skin’s Anti-gravity System ”Dynamic Belt” (2022)
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・ Shiseido Discovers Stretching along the Anti-Gravity System ”Dynamic Belt” Activates Arrector Pili Muscles—Key to Improving ”Sagging” (2023)
https://corp.shiseido.com/en/newsimg/3621_j1z62_en.pdf
・ Shiseido Develops “Digital 3D Skin”, a New Skin Analysis Technology Using AI (2020)
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・ Shiseido Develops “4D-Digital Skin” (Electronic Skin), Finally Reconstructing Skin Movement on Computer (2021)
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・ Shiseido Clarifies 8.1-Year Gap Between Self-Perception and Actual Sagging (2023)
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