

KOSÉ Develops Capsule Technology that Delivers Cosmetic Ingredients to Mitochondria

KOSÉ Corporation has successfully developed a novel capsule technology designed to deliver cosmetic ingredients to the mitochondria within the dermis. This breakthrough was achieved through a joint research initiative with Professor Yuma Yamada of the Faculty of Pharmaceutical Sciences at Hokkaido University.

Mitochondria serve as the energy powerhouses of cells; however, their function declines with age, which is a primary driver of skin aging. Effectively delivering beneficial ingredients straight to the mitochondria can help maintain and enhance their energy production capabilities. Consequently, this technology is expected to revolutionize anti-aging skincare solutions. Part of these research findings was presented at the 146th Annual Meeting of the Pharmaceutical Society of Japan (held from March 26 to 29, 2026, in Osaka).

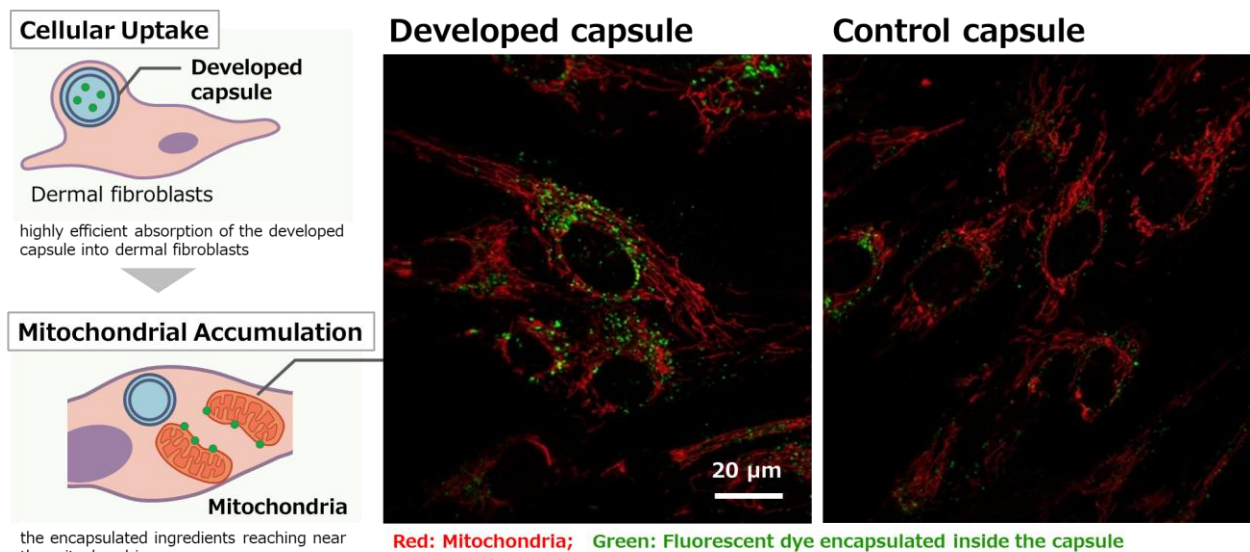


Figure 1. Functional Mechanism and Mitochondrial Localization of the Developed Capsule

Research Background

Wrinkles and sagging that accompany aging are among the most common skin concerns. A major underlying cause of these issues is the decline in the energy-producing function of mitochondria inside dermal fibroblasts. When mitochondrial activity weakens, the production of essential components like collagen—which maintains skin elasticity—slows down, ultimately leading to wrinkles and sagging.

To address this challenge, researchers have long sought an efficient approach to precisely deliver active ingredients to the immediate vicinity of mitochondria. In this study, KOSÉ took on the challenge of developing a mitochondrial-targeted capsule technology to unlock new potential in anti-aging care.

Development of Capsules Reaching the Mitochondria of Dermal Fibroblasts

To deliver ingredients directly to the vicinity of mitochondria, the research team focused on "MITO-Porter™"^{*}, a nanocapsule technology developed by Professor Yuma Yamada's group at the Faculty of Pharmaceutical Sciences, Hokkaido University. This capsule has demonstrated excellent properties for penetrating mitochondrial membranes. By adapting and applying this technology, KOSÉ successfully created a **"Mitochondrial Delivery Capsule for Cosmetics"** as part of its proprietary capsule portfolio.

^{*} Trademark pending (Application No. 2026-32100); Patent Registration No. 5067733

During development, extensive studies were conducted covering a wide range of factors, including the optimal combination of capsule components, precise control of capsule size, and the optimization of manufacturing conditions. By iteratively evaluating parameters such as permeability from the skin surface into the dermis, uptake into dermal fibroblasts, and localization to mitochondria, the team successfully engineered a capsule that reaches mitochondria with maximum efficiency.

High Dermal Permeability of the Developed Capsule

To verify the capsule's ability to penetrate into the dermis, the team analyzed its penetration behavior using human skin models. When the developed capsules, loaded with a fluorescent dye, were applied to the skin surface, a significantly higher amount of the dye was detected in the dermis compared to a control capsule of similar composition that did not utilize this technology (Figure 2). This result strongly suggests that the developed technology holds great potential for delivering encapsulated active ingredients deep into the dermal layer of the skin.

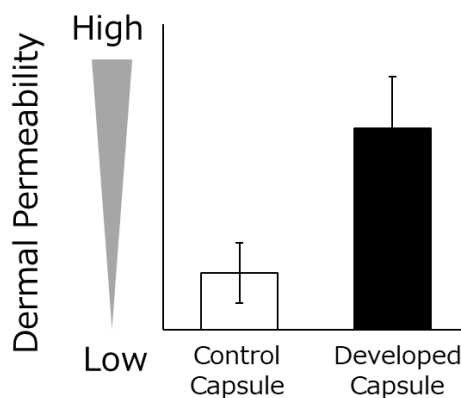


Figure 2. Dermal Permeability of the Developed Capsule

Cellular Uptake and Mitochondrial Targeting

Next, our team evaluated the capsule's uptake into dermal fibroblasts and its subsequent trafficking to the internal mitochondria. When the developed product containing fluorescent dye was introduced to the cells, it was confirmed that a substantially larger number of capsules were taken up into the fibroblasts compared to the control capsules (Figure 3).

Furthermore, detailed observation using a confocal laser microscope revealed that the fluorescent dye encapsulated within the developed capsules successfully accumulated in close proximity to the mitochondria (Figure 1).

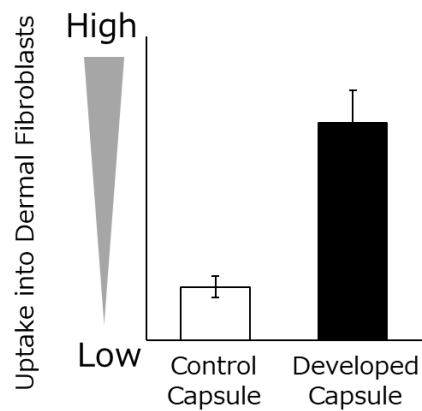


Figure 3. Uptake of the Developed Product into Dermal Fibroblasts

These findings indicate that the newly developed capsule possesses three distinct, powerful capabilities:

- **Deep Dermal Penetration:** Efficiently penetrates into the dermis when applied to the skin surface.
- **Enhanced Cellular Uptake:** Accelerates and promotes absorption into dermal fibroblasts.
- **Mitochondrial Targeting:** Enhances delivery to the vicinity of the mitochondria.

Future Outlook

This technology, which directly targets mitochondria—the very energy source of our cells—is expected to serve as a foundational cornerstone for next-generation anti-aging care. Moving forward, KOSÉ will continue to explore the most effective active ingredients to encapsulate and will verify their multifaceted functional improvements on mitochondria. Through these efforts, KOSÉ aims to break through traditional cosmetic boundaries and realize truly innovative anti-aging skincare solutions.