May 8, 2025

Company name: I-ne Co., Ltd.
Name of representative: Yohei Onishi, President and CEO
(Securities code: 4933; Tokyo Stock Exchange Prime Market)
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Notice Concerning the Results of Joint Research with Saga University on the "Benefits of Carbonic Acid for Skin Penetration of Vitamin C"

I-ne Co., Ltd. (the "Company") entered into and has carried out a joint research agreement in March 2024 with Saga University's Saki Hirakawa and Yoshihiro Tokudome for discovering the benefits and mechanism of transdermal absorption of carbonic acid and vitamins.

This joint research confirmed the benefits of carbonic acid for the skin penetration of vitamin C, and we announce that the results will be presented at the 40th annual meeting of the Academy of Pharmaceutical Science and Technology, Japan, to be held from May 22 (Thursday) to May 24 (Saturday), 2025.

For details, please refer to the separate press release.

INNOVATION NEVER ENDS

PRESS RELEASE

I-ne Co., Ltd.
8F Midosuji Daibiru,
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Chuo-ku, Osaka-shi, Osaka
541-0058 JAPAN

May 8, 2025

Joint Research by Saga University and I-ne
Conference Presentation of "Benefits of Carbonic Acid for Skin Penetration of Vitamin C"

I-ne Co., Ltd. (Headquarters: Chuo-ku, Osaka; Representative: President and CEO Yohei Onishi; Securities code: 4933; hereinafter "I-ne") and Saga University will present the results of their joint research "Benefits of Carbonic Acid for Skin Penetration of Vitamin C" at the 40th annual meeting of the Academy of Pharmaceutical Science and Technology, Japan, to be held from May 22 (Thursday) to May 24 (Saturday), 2025.

Presentation summary

[Presentation]

Benefits of Carbonic Acid for Skin Penetration of Vitamin C

[Presenters and joint researchers]

Saki Hirakawa, Yoshihiro Tokudome

[Affiliated organization]

Saga University

Abstract

Carbonic acid has been confirmed as having such benefits for the skin as maintaining the barrier function of the stratum corneum, preventing dry skin and preventing skin irritability. Additionally, studies using human dermal fibroblasts have confirmed that carbonic acid increases production of collagen and hyaluronic acid in the dermis. However, the skin penetration enhancement of chemical compounds has not been adequately researched. The present study was conducted to evaluate the skin penetration enhancement of chemical compounds at different concentrations of carbonic acid and examine new functionality for carbonic acid.
Using vitamin C as the compound used in combination with carbonic acid, a total five types of test solutions were created as samples by dissolving 2% vitamin C in carbonic acid aqueous solutions with carbonic acid concentrations of 0 ppm (mg/L), 1,000 ppm, 5,000 ppm, 10,000 ppm and 20,000 ppm. First, carbonic acid concentrations for each test solution were measured using a portable carbon dioxide meter, and the pH and electrical conductivity was measured with a pH meter for up to four hours. Next, a penetration test was conducted on a three-dimensional cultured skin model using Franz diffusion cells (25℃, 4 hours) and the effects of carbonic acid on the skin penetration of vitamin C was

evaluated.
The measurement results of carbonic acid concentrations in the sample solutions showed concentrations of approximately 900 ppm for the 1,000 ppm sample solution. The initial reading was approximately 2,200 ppm for each of the 5,000 ppm, 10,000 ppm and 20,000 ppm sample solutions and this declined over time. Additionally, all samples showed pH of 4 and electrical conductivity of 0.5 S/m, demonstrating no significant difference by carbonic acid concentration. In the penetration test conducted with the 3D cultured epidermis model, vitamin C skin penetration quantities increased in accordance with higher carbonic acid concentrations. For concentrations of 5,000 ppm and higher, no differences were observed in carbonic acid concentrations in the aqueous solution, pH and electrical conductivity, indicating the possibility that the amount of carbon dioxide in the samples aids contributes skin penetration of vitamin C.

Background to the joint research and outlook

<Background>

Vitamin C is an active ingredient widely known in the beauty and skincare fields, and is a key ingredient contained in many skincare products as of late. One key issue with vitamin C and other water-soluble ingredients has been their ability to pass the skin barrier and unleash their maximum benefits. I-ne had discovered the possibility that carbonic acid enhances the delivery of vitamin C into the epidermis. However, little is known about the notion of carbonic acid delivering useful ingredients through the skin and enhancing absorption. Therefore, the present study pursues the possibility of carbonic acid as a skin penetration enhancer through scientific discovery of the transdermal absorption mechanism of carbonic acid and studies the maximation of beauty effects through the synergistic effects of vitamins and carbonic acid.

<Outlook>

The results of this research will spur further research and innovation promotion in the beauty science field by sharing knowledge with society through disclosure at academic conferences and in academic journals. Specifically, based on the knowledge obtained in the present study, I-ne will seek to develop new skincare products containing not just vitamin C but also water-soluble ingredients and other useful ingredients that are difficult to penetrate the skin. I-ne aims to contribute to the greater value of the entire industry, not limited to skincare products but also applied to a broad range of beauty technology and services.

Reference) Research results to date

Press release dated February 28, 2024

Discovery of Vitamin C’s Rapid Skin Absorption Using Carbon Dioxide

Absorption of vitamin C by the skin increases approximately 44-fold

https://prtimes.jp/main/html/rd/p/000000638.000012002.html

Company overview

・Company name: I-ne Co., Ltd.
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< For media inquiries, please contact: >
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