

# Biomimetic lipid with skin repair effects

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Consumers are becoming increasingly interested in beauty secrets and regimens from around the world due to curiosity about how people from other cultures attain and maintain their beauty. The demand for global beauty brands has grown as a result of globalization and increased interest in foreign travel and culture, with the 'Made In' stamp now carrying more meaning than ever before.

Thus, the beauty industry is developing brands inspired in each culture for internal consumption while also exporting them globally, with the Japanese beauty industry being one of the stars within this enterprise. Beauty products from Japan have usually been associated with efficacy, high quality and benefit-led features. They are characterized by the simplicity and minimalism of Japanese rituals, powered by extensive research and development.

At Kao Chemicals Europe, moved by our insider knowledge of the Japanese beauty industry, and following our strive for wholehearted satisfaction and enrichment of the lives of people globally while seeking to contribute to the sustainability of society, we wanted to convey the J-Beauty trend to Western lifestyle, offering preventive solutions based on innovative developments and high-quality products with long-term reliability.

Within our J-Beauty ingredients, we present EXCEPARL IS-CE-A (INCI name: Cholesteryl Isostearate). Hereafter known as the Cholesteryl Isostearate ingredient, it is a cholesteryl ester with a skin biomimetic structure and a low melting point that produces minimum irritation of the skin.

Thanks to its good moisturising and recovery



properties, the biomimetic cholesteryl ester compound plays a crucial role in skin hydration, providing a high-quality ingredient aligned with the Japanese beauty philosophy. In this article, we dive deeper into the characteristics of the Cholesteryl Isostearate ingredient.

## The role of a biomimetic cholesteryl ester

Epidermal lipids play an important role in skin hydration, forming a permeability barrier that retains moisture and promotes cell growth and differentiation. Figure 1 shows the composition of the lipids in the horny layer of the skin (stratum corneum).

Cholesteryl ester compounds are widely distributed in nature, especially in animal

tissues. They are found in almost all body systems, including brain cells, and are believed to play an important role in physiological processes. Intercellular lipids in the stratum corneum help keep the skin healthy by regulating its water-retaining capacity and barrier function.<sup>1</sup>

Cholesterol can react with fatty acids to produce the corresponding cholesteryl esters. The use of these lipids as the oil component in cosmetic emulsions is of interest.

The Cholesteryl Isostearate ingredient supplements the physiological function of the skin through the same mechanism as the intercellular lipids in the stratum corneum. (Figure 2). It is a 100% active ingredient, very mild, and with a 100% natural content according to the ISO 16128 standard.

Thanks to its methyl-branched isostearic structure, Cholesteryl Isostearate has a melting point between 28–35°C that allows working at lower temperatures compared to typical natural cholesteryl esters with a high melting point.

## Water-holding capacity

When Cholesteryl Isostearate is used as part of the emollient system in a multilamellar emulsion, the skin surface texture is improved and the water-holding capacity of the stratum corneum is restored (Table 1). It stabilizes the lamellar association structure through intermolecular interaction, thus enhancing the bound water content.

The healthy skin surface is smooth and soft, because it is covered by a properly hydrated stratum corneum – a very thin and soft barrier membrane produced by the underlying normal epidermis.

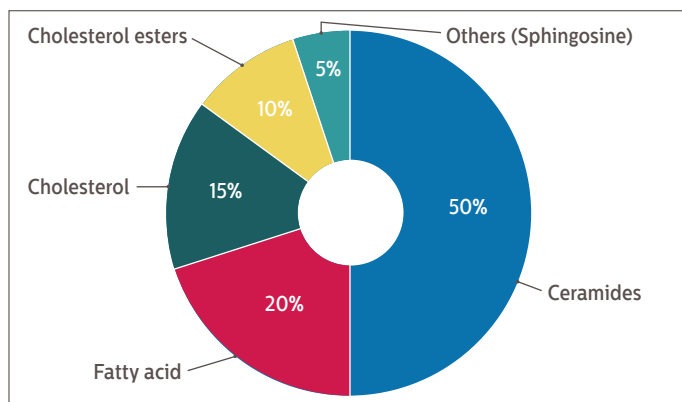


Figure 1: Composition of intercellular lipids in the stratum corneum

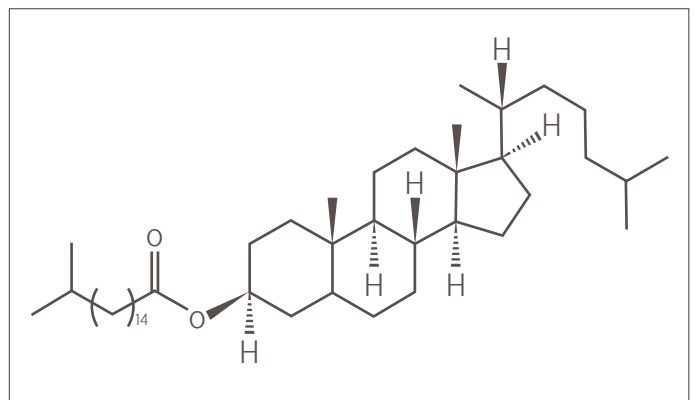


Figure 2: Structure of Cholesteryl Isostearate

**TABLE 1: WATER HOLD PROPERTY IS A MEASURE OF THE TOTAL AMOUNT OF WATER THAT CAN BE ABSORBED PER GRAM OF EMOLLIENT**

Oil type	Material	Water hold %
Ester	EXCEPARL IS-CE-A	>300
	Cholesteryl Isostearate	
	Isopropyl Myristate	14
	Octyldodecyl Myristate	53
Hydrocarbon	Liquid paraffin	13
	Squalane	14
Triglyceride	Thiethylhexanoïn	29
	Captylic/Capric Triglyceride	32
Monoglyceride	Glyceryl Stearate	175

In contrast, skin surfaces with pathological lesions present dry and scaly alterations, and the stratum corneum exhibits poor barrier function. The water-retaining capacity of the stratum corneum is quantitatively evaluated by measuring skin conductance.<sup>2</sup>

Figure 3 illustrates the moisturising efficacy of Cholesteryl Isostearate at two concentration levels compared to a W/O emulsion (blank) without the compound, applying the same amount to the respective skin areas and conducting the measurements at one and two days of application.

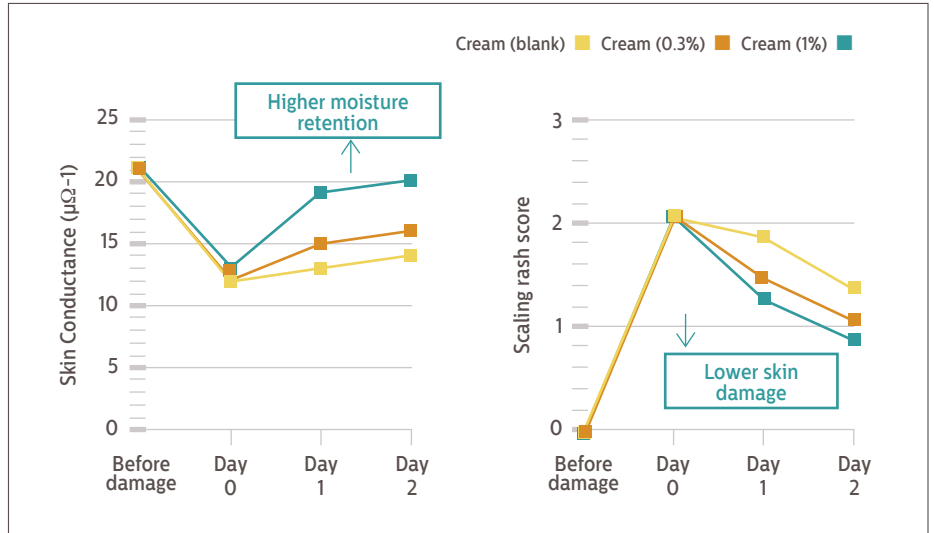
The skin reaction, including scaling, was assessed three days after acetone/ether treatment under the same conditions as the conductance measurements. Scaling was scored as follows: 0 = no scaling, 1 = slight scaling, 2 = moderate scaling, and 3 = marked scaling.

Topical applications of 0.3-1% Cholesteryl Isostearate in a W/O cream to acetone/ether induced dry skin produced significant recovery of the water-retaining properties, associated with improvement in scaling, versus the results obtained with the base cream.

**Repairing effect**

The repairing effect of the Cholesteryl Isostearate ingredient in a cosmetic formula was assessed by the effect upon transepidermal water loss and skin elasticity of a cosmetic product containing 1% Cholesteryl Isostearate versus placebo.

Transepidermal water loss (TEWL) of the products was assessed with a Tewameter device at different experimental times, before and after using the test products. The results were expressed in grams of evaporated water per



**Figure 3:** Recovery of skin moisture and damage after artificial exposure using acetone/ether and application of W/O cream containing Cholesteryl Isostearate cream (blank): 2% Isosterayl Glyceryl Ether, 3% Petrolatum, 5% Squalane and 10% Octyl-Dodecyl Myristate

**TABLE 2: TEST COMPOSITION OF O/W EMULSIONS WITH AND WITHOUT CHOLESTERYL ISOSTEARATE**

		Placebo	1%
Emulsifier system	Polysorbate-60 + Sorbitan Monooleate	5%	5%
Consistency factor	Cetearyl Alcohol	4%	4%
Emollient system	Capric/Caprylic Triglyceride	5%	5%
Active	Cholesteryl Isostearate	0	1%
Others	Preservative	0.5%	0.5%
Water	Deionized water	up to 100%	up to 100%

square metre of surface and per hour (g/m<sup>2</sup>/h).

The principle underlying measurement is based on Fick's diffusion law. The determination of vapour flow in the air indirectly measures flow through the skin: a digital display continuously reflects the quantity of evaporated water expressed in g/m<sup>2</sup>/h.

Skin elasticity was assessed by measuring the extensibility and elasticity of the skin with a Cutometer, before and after treatment.

Skin elasticity is assessed by measuring its capacity to return to its initial state after undergoing deformation under partial vacuum. The results are expressed as the ratio of elastic recovery to total deformation (Ur/Uf). The greater the percentage recovery versus deformation, the better.

The measurements were made on the

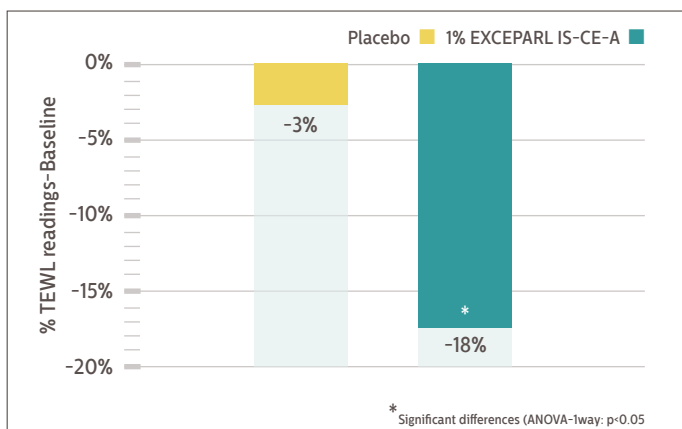
placebo control and treated areas before and after 24 hours (single application), and 14 and 28 days after application of the products.

The cosmetic products tested were O/W emulsions with and without Cholesteryl Isostearate, a biomimetic skin lipid (Table 2). This study was conducted by Eurofins Product Testing, Cosmetics & Personal Care Spain, S.L.U.

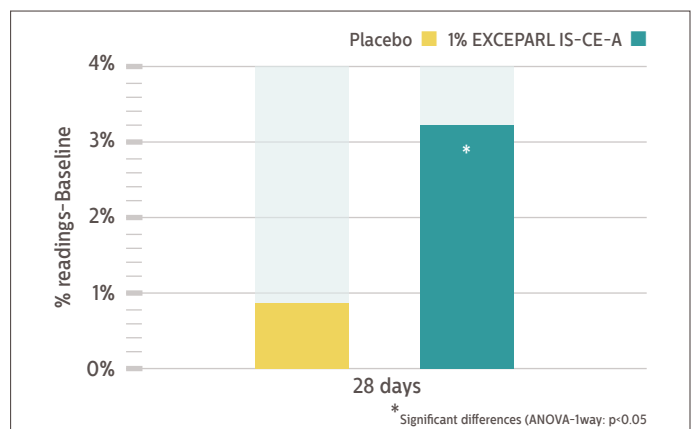
**Effect on transepidermal water loss (TEWL)**

The cosmetic product containing 1% Cholesteryl Isostearate significantly improved skin barrier function up to 24 hours after a first single application (signed rank test for paired samples).

The positive effect of Cholesteryl Isostearate on skin barrier function was also observed after 14 and 28 days of application.



**Figure 4:** Effect on transepidermal water loss



**Figure 5:** Effect on skin elasticity

### Effect on skin elasticity

The cosmetic product containing 1% Cholesteryl Isostearate showed a tendency towards improvement of skin elasticity after 28 days, with statistically significant differences (signed rank test for paired samples) in one of the parameters related to skin elasticity (Ur/Uf).

### Applications

Biomimetic Cholesteryl Isostearate is recommended for the treatment of dry skin. It is suitable for moisturising and anti-ageing creams, lotions, makeup foundations and lipsticks, among others.

### Formulation

Skin care Rich & Fresh Cream, illustrated in Table 3, is a clear example of efficacy and high quality with benefit-led features that represent the J-Beauty trend. It is a W/O emulsion affording a protective barrier, and intensely hydrates dry skin, producing a very pleasant and light feeling.

### Conclusion

The introduction of the biomimetic skin lipid developed by Kao Corporation for Skin Care, EXCEPARL IS-CE-A (Cholesteryl Isostearate), marks a significant stride in the beauty industry, particularly in aligning with the J-Beauty trend. Our initiative stems from a deep understanding of the Japanese beauty industry's efficacy, quality and simplicity – characteristics that resonate globally – and our aim to bring the

**TABLE 3: RICH AND FRESH CREAM GUIDELINE FORMULATION (REF. C-323)**

Ingredients	INCI	w/w (%)
PENETOL GE-IS	Isostearyl Glyceryl Ether	2.0
EXCEPARL IS-CE-A	Cholesteryl Isostearate	1.0
KAOPAN SP-O10	Sorbitan Oleate	0.2
YORU SY169215	KAO Fragrance	0.5
	Glycerin	10.0
	Dimethicone	6.0
	Squalane	4.0
	Isopropyl Myristate	3.0
	Caprylic/Capric Triglyceride	2.0
	Preservative	0.8
	Magnesium Sulphate	0.7
	Tocopheryl Acetate, Helianthus Annus (sunflower) Seed Oil	0.3
	Deionised Water	Up to 100

J-Beauty trend closer to Western lifestyle.

Thanks to its good moisturising and repairing properties, the cholesteryl ester compound plays a crucial role in skin hydration. With a 100% natural content, mild properties, and a low melting point, it introduces a unique approach to skincare formulations: it is the best partner for taking care of the skin, and is ideal for face, hand and body formulas as well as for other cosmetic products when extra caring is needed.

Our incursion into the J-Beauty trend with the Cholesteryl Isostearate ingredient not only embraces cultural influences but also exemplifies our dedication to providing innovative, high-quality skin care solutions that

align with global beauty aspirations.

The multifaceted benefits of this biomimetic skin lipid make it a valuable addition to formulations seeking to enhance skin hydration, repair, and overall well-being. **PC**

### References

1. Suzuki T, Iwai H. Formation of Lipid Emulsions and clear gels by Liquid Crystal Emulsification. *IFSCC Magazine*. Vol.9, No.3/2006
2. Imokawa G, Akasaki S, Kawamata A, Yano S and Takaishi N. Water-retaining function in the stratum corneum and its recovery properties by synthetic pseudoceramides. *J. Soc. Cosmet. Chem.* 1989; 40, 273-285