

ナノスフィアの有効性、その構造と機能

Effect of Nanosphere, Its structure and function

Collection of technical data
Clinical cosmetics Tokyo Japan,
ITO Shuppan, 2018, 10, Oct



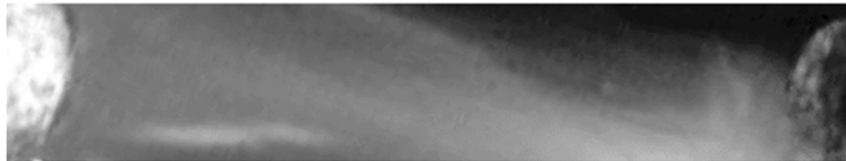
有効性-1 電荷を持たない成分をイオン導入可能にする

Efficacy #1 Nanosphere can allow uncharged compounds to be iontophoresed.

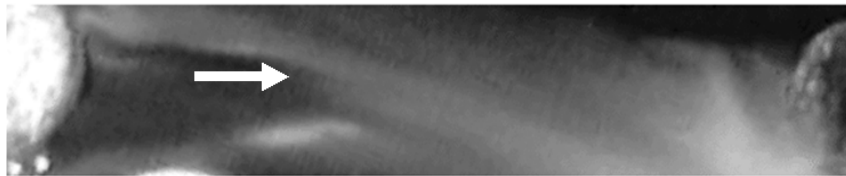
ナノスフィアの電気泳動結果

Results of the iontophoresis of Nanosphere

①
電流なし
Without
electric current

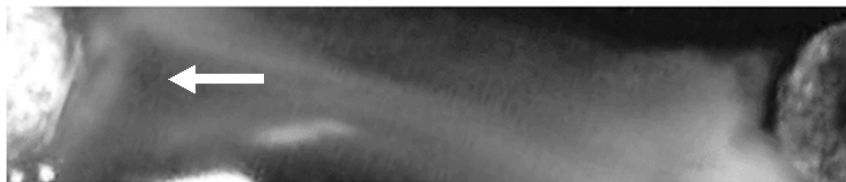


②
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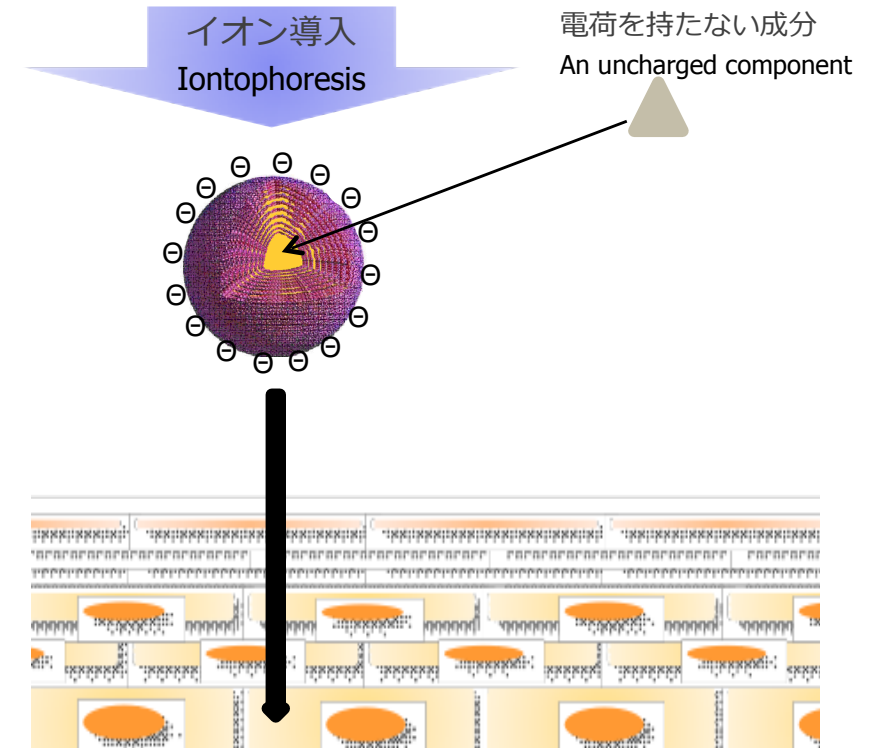


(+)

③
+



(-)



- ◆ ナノスフィアの被膜がビタミンC誘導体APPSもしくはEPCで構成されているため、カプセルがマイナスの電荷を帯びている。

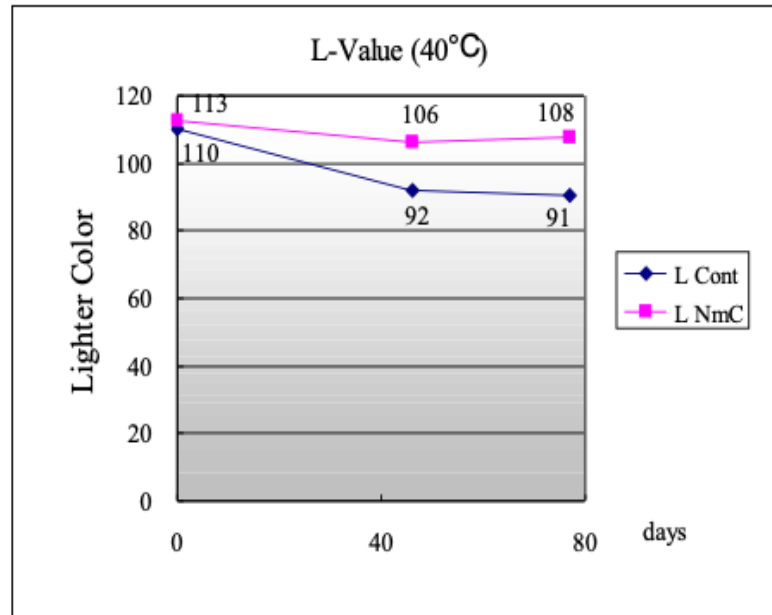
Nanosphere, of which outer shell membrane is composed of vitamin-C derivatives including APPS or EPC, is negatively charged.

- ◆ そのため、電荷を持たない成分をナノスフィアに包接することによりイオン導入が可能になる。

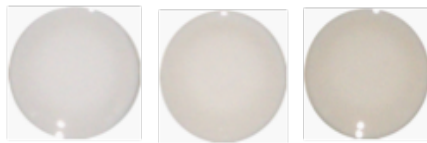
After being included in the core of Nanosphere, an uncharged component can be iontophoresed.

有効性-2 ナノスフィアの被膜を構成するビタミンC誘導体の安定性の向上

Efficacy #2 Enhancement of the stabilities of vitamin-C derivatives composing the outer shell of Nanosphere



ナノスフィア
Nanosphere



コントロール
Control



APPSはビタミンC誘導体特有のアスコルビン酸の分解による経時的褐変がみられる。

APPS is known to brown with the passage of time due to the decomposition of ascorbic acid, and this is a characteristic phenomenon found in vitamin-C derivatives.

この褐変現象を利用し、被膜剤としてナノスフィアに配合したAPPS(NmC)と、分散媒（水）にAPPSを溶解して基剤に単純に混合しただけの場合(Cont)とで、明るさを表す指標であるL値を比較した(APPS 2%)。

For investigating the enhancing effect of Nanosphere on the stability of vitamin-C derivative by using this browning phenomenon, the colors of two dispersions; (1) APPS (2%) incorporated as an outer-layer material in Nanosphere (NmC in the graph), and (2) simple aqueous dispersion having APPS (2%) and base materials (Cont.), were compared for 80 days. The stabilities of both samples were compared by using L-value that indicates the brightness.

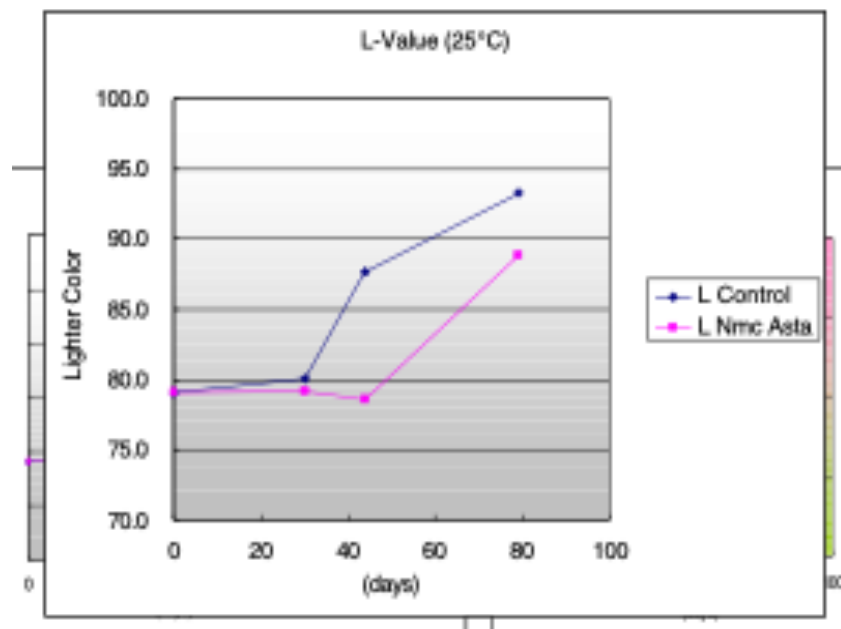
結果 Results

Control : 激しい褐変現象が見られた。
A strong browning was observed.

Nanosphere : 褐変現象が抑制された。
Browning was found to be suppressed.

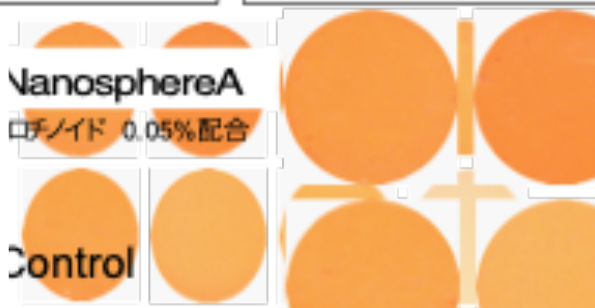
有効性-3-1 ナノスフィア包接成分(分子量1000以下)の安定性の向上

Efficacy #3-1 Enhancement of the stabilities of included components (MW < 1,000) in Nanosphere



Nanosphere A
(カロチノイド 0.05% 配合)
containing 0.05% carotenoid

Control



アスタキサンチン等の一重項酸素消去能力が強いカロチノイドは製剤中の安定性が悪く、比較的容易に抗酸化剤を添加した製剤中においても酸化分解されて退色する。

Carotenoids, having a strong singlet oxygen scavenging ability, such as astaxanthin, are known to be unstable in formula and destructed by oxidation easily even with the presence of antioxidants, resulting in the bleach of their colors.

結果 Results

カロチノイドをナノスフィアに包接させることにより、**その安定性が向上した。**

By encapsulating carotenoids in Nanosphere, their stabilities were improved.

有効性-3-2 ナノスフィア包接成分(高分子量)の安定性の向上

-包接成分：塩基性繊維芽細胞成長因子(bFGF) (分子量: 約18,000)

Efficacy #3-2 Enhancement of the stabilities of included high-molecular weight components in Nanosphere
-Included component: basic fibroblast growth factor (bFGF) (MW: approximately 18,000)-



実験方法 Materials and Methods

◆ 分析サンプル Samples

標品: basic fibroblast growth factor (bFGF) – 分子量 約18,000

フィブラスト®スプレー500 (bFGF 500mg含有), 科研製薬を超純水1.0mLに溶解し、0.2mLフィルターに通導(5.0mg/1.0mL)。これを下記溶媒に溶解後、0.2mmフィルターに通導したものを試料として用いた。

Standard sample: basic fibroblast growth factor (bFGF) (MW: approximately 18,000)

Fibralst®Spray500 containing 500 mg bFGF was dissolved in highly purified water 1.0 mL, and the solution was filtered through 0.2 µm filter, resulting in bFGF stock solution (the final concentration: 5.0 mg/mL). Upon experiment, the stock solution was dissolved in the following solvent, and the solution was filtered through 0.2 µm filter, resulting in experimental solution of which bFGF (general name: Trafemin) was fixed to be 250µg/10 mL.

◆ 溶媒 Solvents

ナノスフィア

Nanosphere

ヒアルロン酸Na

Sodium hyaluronate

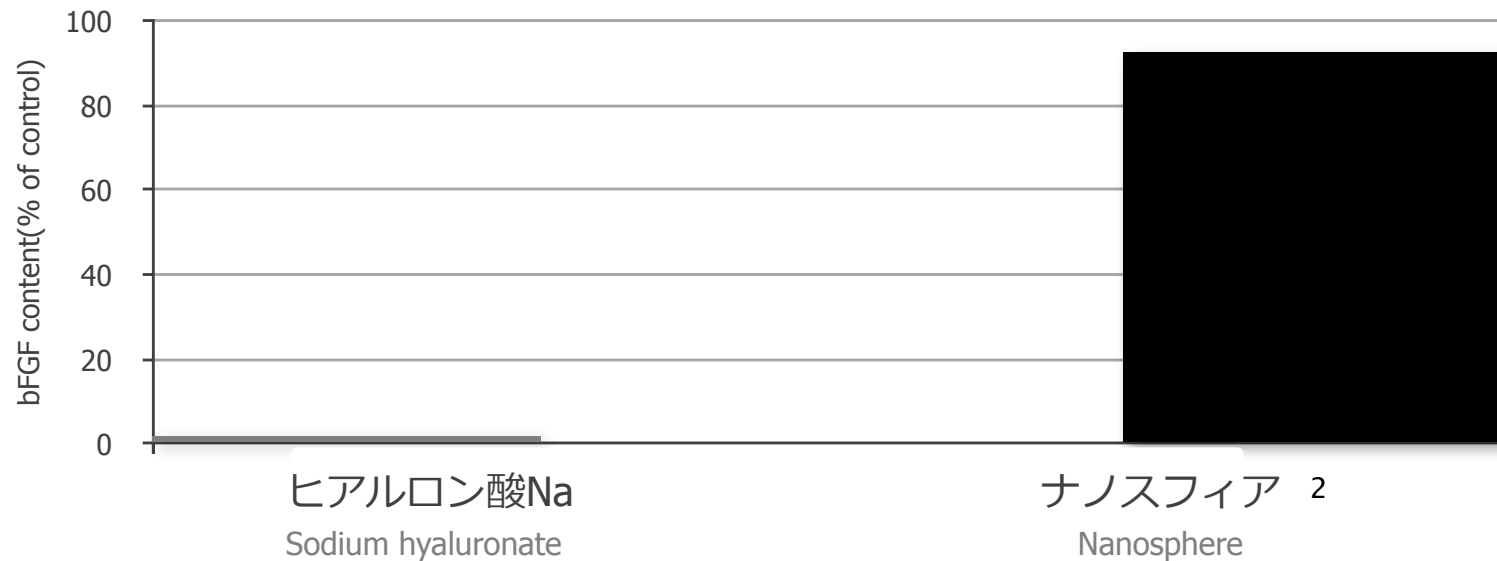
◆ 条件 Store condition

20°Cで1ヶ月間

At 20 °C for 1 month

HPLC分析法を用いたbFGF製剤の安定性試験結果(1ヶ月後のbFGFの力価)

Results of the stability test of bFGF formulae(The potency of bFGF at one month)



ヒアルロン酸製剤と比較して、ナノスフィアではおよそ90%と高いbFGF力価が確認された。

Compared with hyaluronic-acid formula, Nanosphere formula was found to keep high bFGF potency value.

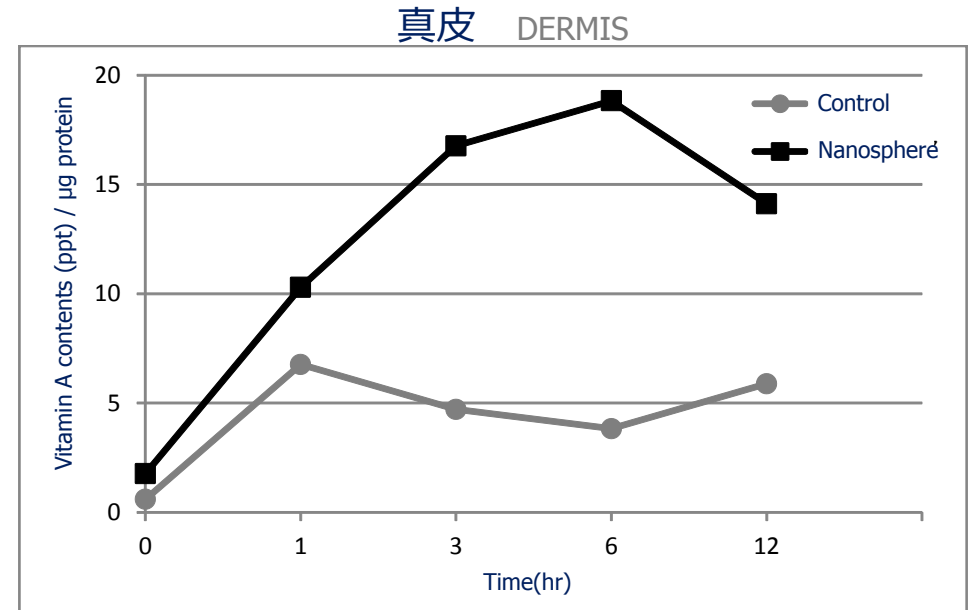
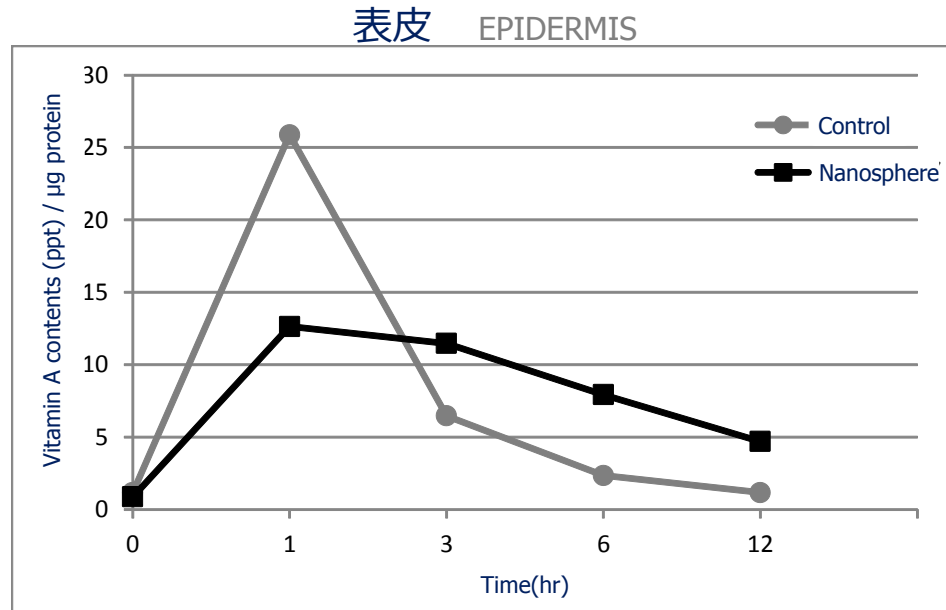


ナノスフィアは、bFGFの安定性の向上に非常に有益なものであることが示された。

The results indicated that Nanosphere was quite valuable for enhancing the stability of bFGF.

有効性-4-1 ナノスフィア包接成分(分子量500以下)の浸透性の向上

Efficacy #4-1 Enhancement of the permeations of Nanosphere included components (MW < 500)



3次元培養皮膚へのナノスフィア包接レチノール誘導体製剤(RT-APP-NC)の透過性試験を行った。
The permeation test of retinol derivative formula included in Nanosphere to three-dimensionally cultured cutaneous tissue model was performed.

RT-APP-NCの皮膚内RT濃度は、製剤除去後1時間では、非包接体より有意に低く($p > 0.01$)、逆に3~12時間では、RT-APP-NCモデル皮膚RT濃度は、非包接体より有意に高く、また、皮膚での滞留時間はより長く検出された。

As a result, retinol (RT) concentration in the tissue cultured with retinol derivative formula included in Nanosphere was found to be significantly lower than that of non-included sample at 1 h after removing formula($p < 0.01$).

In contrast, at 3~12 h, RT concentration in the cultured with retinol derivative formula included in Nanosphere was found to be significantly higher than that of non-included sample, and the longevity of RT in the tissue model was elongated further.

徐放性

A sustained release function

有効性-4-2 ナノスフィア包接成分(高分子量)の浸透性の向上

-培養皮膚へのGFP(分子量約27,000)製剤の透過性試験-

Efficacy #4-2 Enhancement of the permeations of Nanosphere included high molecular-weight components

-The permeation tests of GFP (MW: approximately 27,000) formulae to cultured skin-

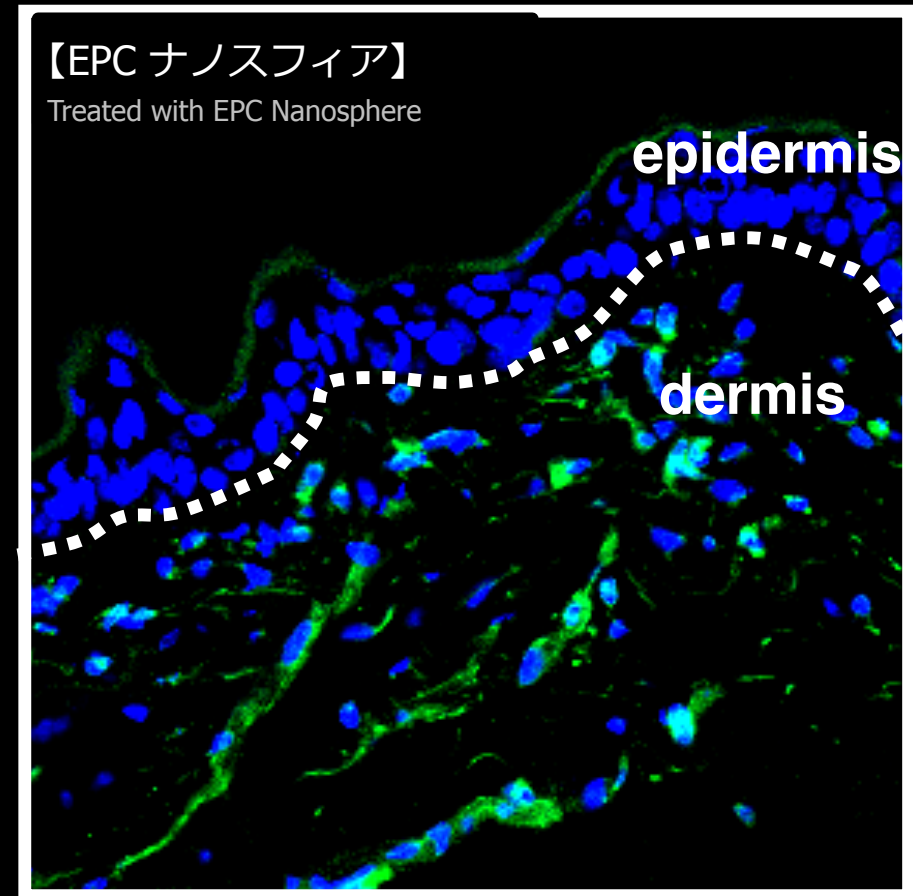
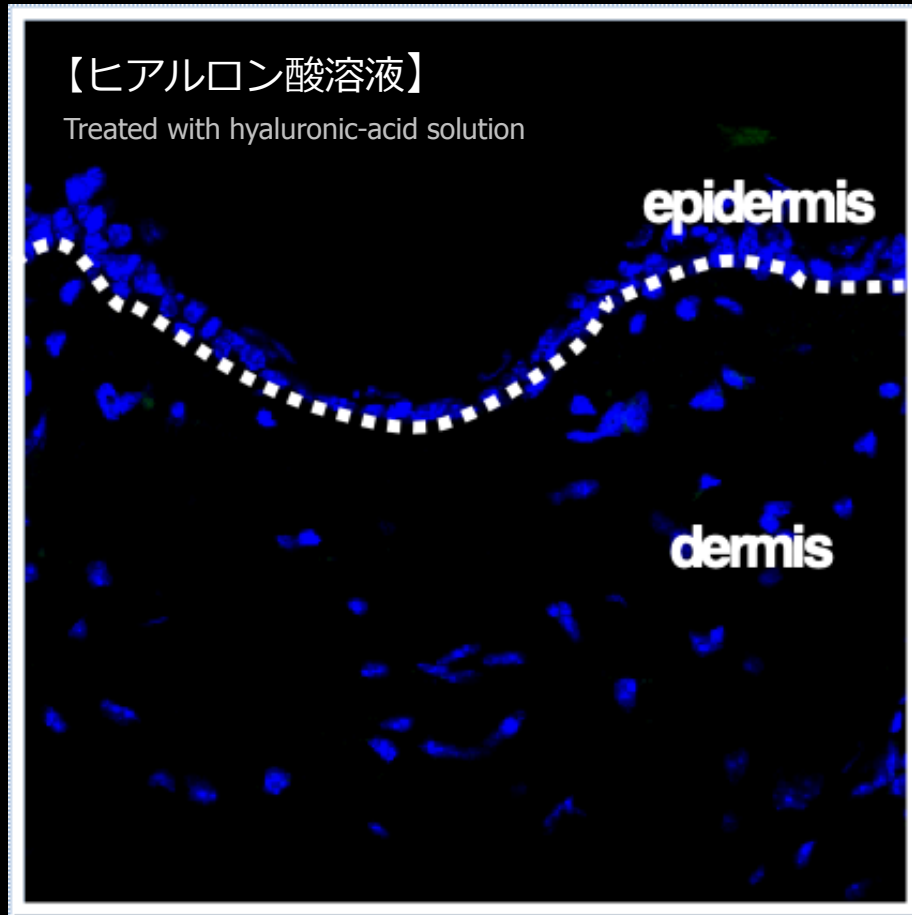
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共焦点レーザー顕微鏡によるGFPの分布

The observation of the distribution status of GFP with a confocal laser scanning microscope

緑色はGFPを、青色は細胞の核を示す

In the photographs, the green and blue colors indicate GFP and cell nuclei, respectively.



ナノスフィアにより高分子量のGFPが真皮まで浸透していた。

Nanosphere can allow high molecular-weight GFP to permeate into dermis.

臨床試験 抗シワ効果

Clinical Test the anti-wrinkle effect

ナノスフィア配合ローションおよびクリームを朝晩1日2回塗布

Topical application of lotion and cream containing Nanosphere.

使用前 Before

右ほほ
Right cheek



1ヶ月後 After 1 months



左ほほ
Right cheek



ナノスフィアの有効性

Effect of Nanosphere

VC安定性↑

ナノスフィアの被膜を構成する
ビタミンC誘導体の安定性の向上
Improving effect on the stability of Vitamin-C
derivative composing Nanosphere

包接成分浸透性↑

ナノスフィアに包接した成分
(低分子量～高分子量)の浸透性の向上(徐放性)
Enhancing effect on the permeation and sustained release of
encapsulated component regardless of their molecular weight:
(from low to high molecular-weight compounds)

包接成分安定性↑

ナノスフィアに包接した成分の安定性の向上
Improving effect on the stabilities of encapsulated
components in the core of Nanosphere.



NANOSPHERE

イオン導入可能

電荷を持たない成分をイオン導入可能にする
Allowing non-electrical charged compounds to be
iontophoresed.

ナノスフィア単独としての効果(線維芽細胞増殖効果など)

Various effects of Nanosphere alone. e.g. the proliferation enhancing effect on
fibroblast,etc.

VC効果

Outline

➤ 100%天然ミネラルクレイパウダー

100% Natural Mineral Clay Powder

➤ 新世代ビューティマスク素材 “バイオセルロースマスクシート”

Next generation beauty-mask material “Bio-cellulose mask sheet”

➤ ビタミンC誘導体ナノカプセル原料 “ナノスフィア”

“Nanosphere”, anti-oxidative vitamin-C/E derivatives for nano-capsule materials

➤ アラントインビタミンCの両方の効果が期待される “アラントインVC”

Allantoin VC, which expect the effect of both of allantoin and vitamin C

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Thank you very much for your kind attention.

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