

Biocompatible Material Lipidure®



Corporate Data

“From the Biosphere to Outer Space”



Founded: Jun 1st 1937

Capital: JPY 177million

Employees: 3,857

SALES -CONSOLIDATED- :

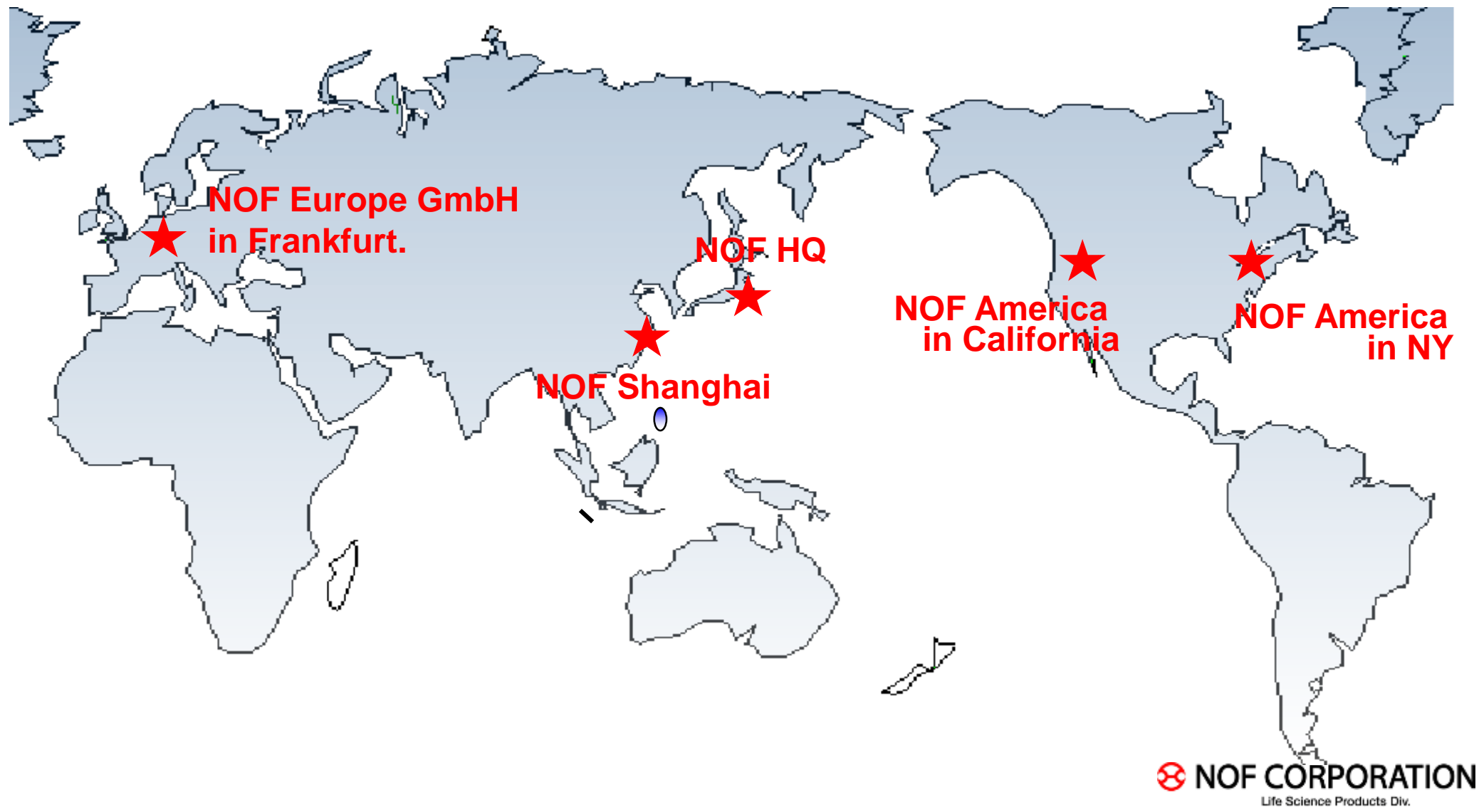
JPY 1,610 million

(as of Mar. 31, 2014) Currency rate 105JPY/USD

NOF Group Business Outline

Oleo & Specialty Chemicals	Fatty acids and glycerin, fatty acid derivatives, surfactants, polyglycol products
Functional Chemicals & Polymers	Organic peroxides, petrochemicals, functional polymers
Explosives & Propulsion	Solid propellant, industrial explosives
Functional Foods	Edible oils, margarine, nutritional foods
Life Science Products	Biocompatible materials, diagnostics reagents
DDS Development	Activated PEGs, phospholipids, liposome, ultrapure polysorbate 80
Display materials	Functional films
Anti-corrosion treatment agents , logistics, real estate business	

NOF Life Science Global Network



NOF Life Science Products Division

Manufacturing



MPC/Lipidure®
Plant (Oita City)

Sales



Headquarters
(Tokyo)

R&D



Research Laboratory
(Kawasaki City)

Today's Outline

- 1. What are MPC and Lipidure®?***
- 2. Lipidure® in Skin Care Field***

Lipidure[®], the Biocompatible Material

Eye Care Field

- ✓ Reduce Dry-eye Symptom
- ✓ Improve Wearing Feeling of Contact lenses (CL)
- ✓ Prevent CL from Protein Soil

Skin Care Field

- ✓ Moisturizing Effect
- ✓ Reduce Irritancy
- ✓ Keep Skin Healthy

High Hydrophilicity

High Safety



Biomedical Field

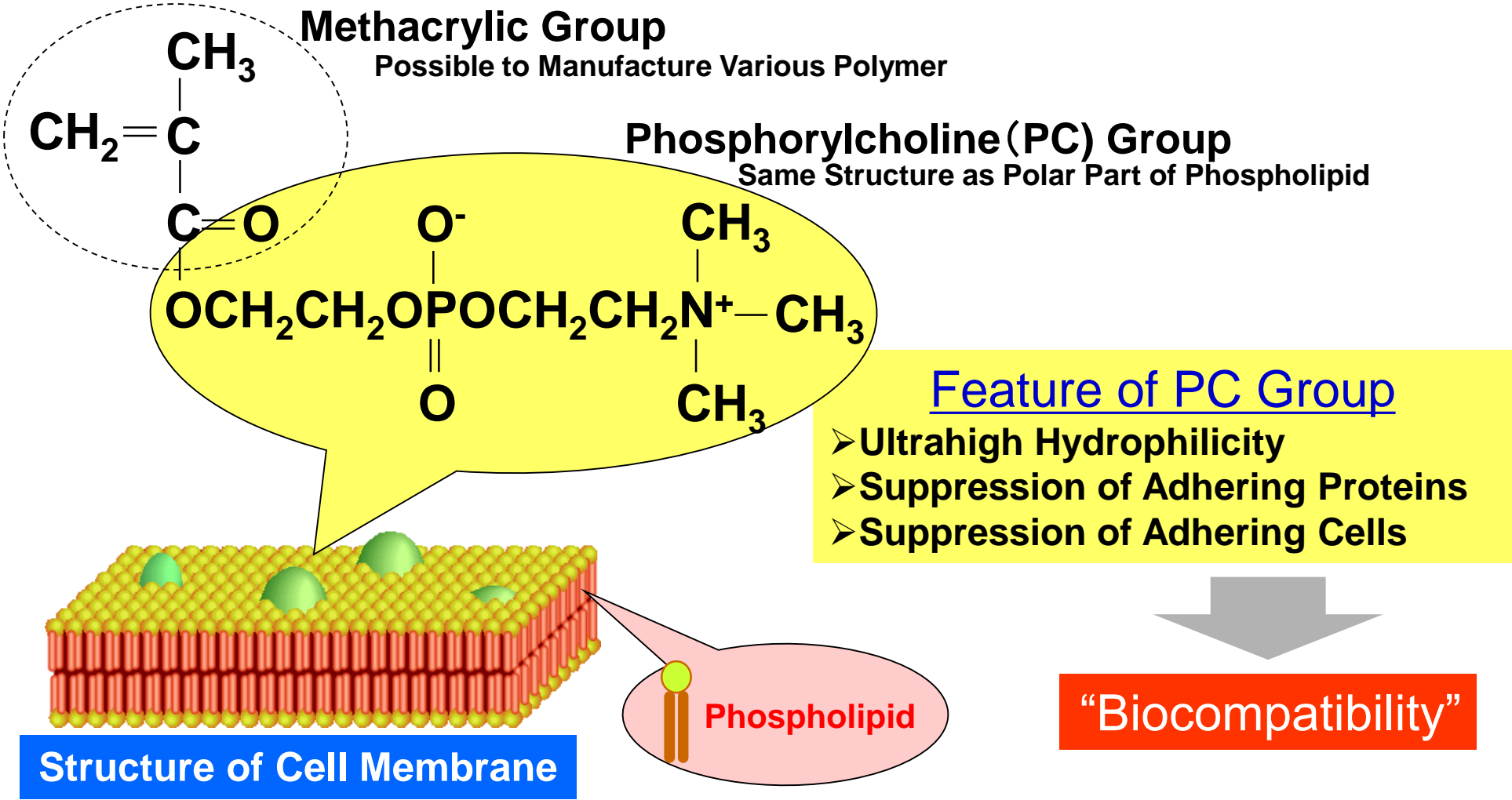
- ✓ Anti-thrombogenic
- ✓ Anti-protein Adsorption
- ✓ Surface Coatability

Oral Care Field

- ✓ Bacteria-repellent
- ✓ Moisturizing Effect
- ✓ Taste Corrigent
- ✓ Reduce Irritancy

What is “MPC”?

MPC = 2-Methacryloyloxyethyl PhosphorylCholine

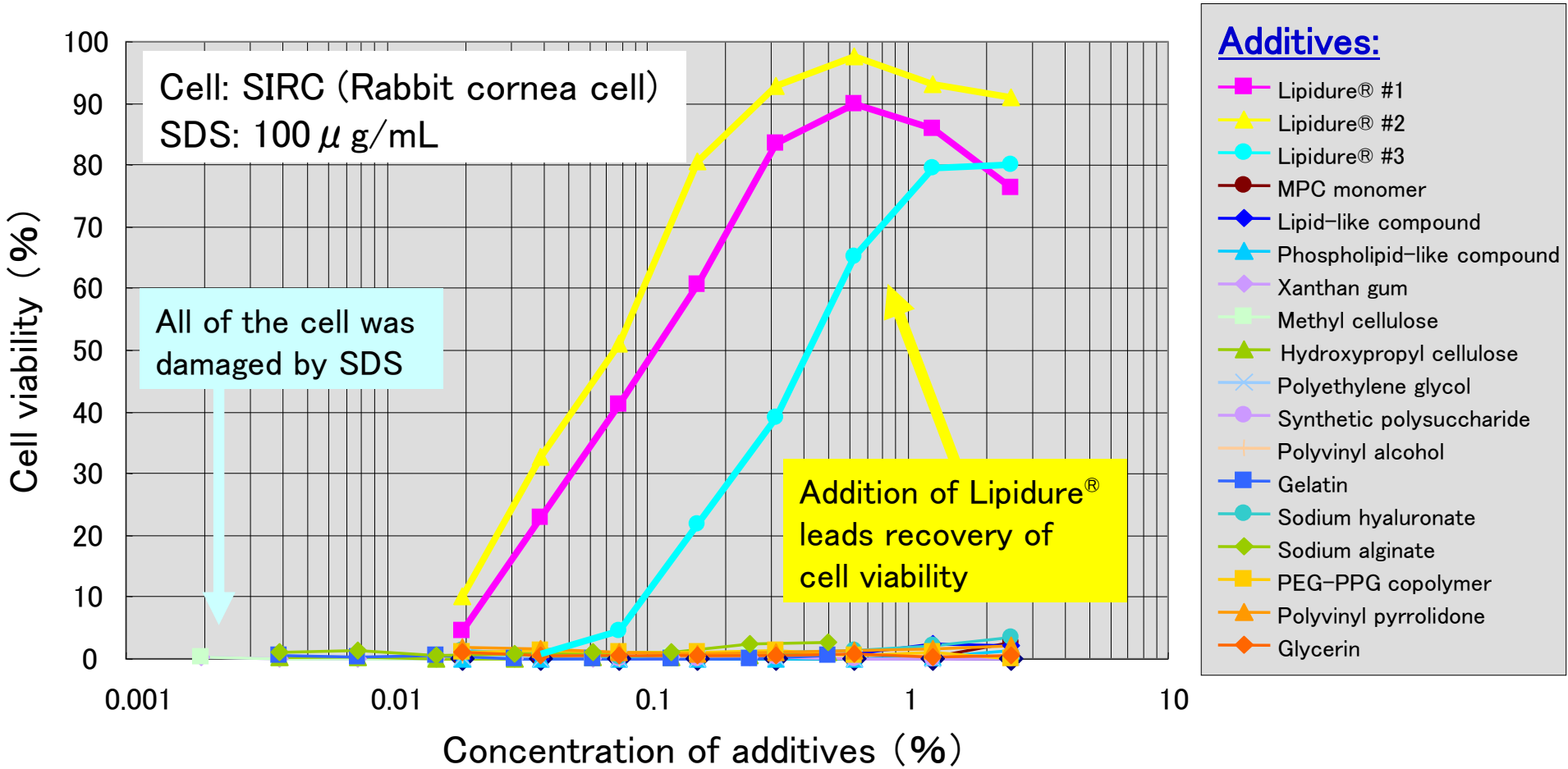


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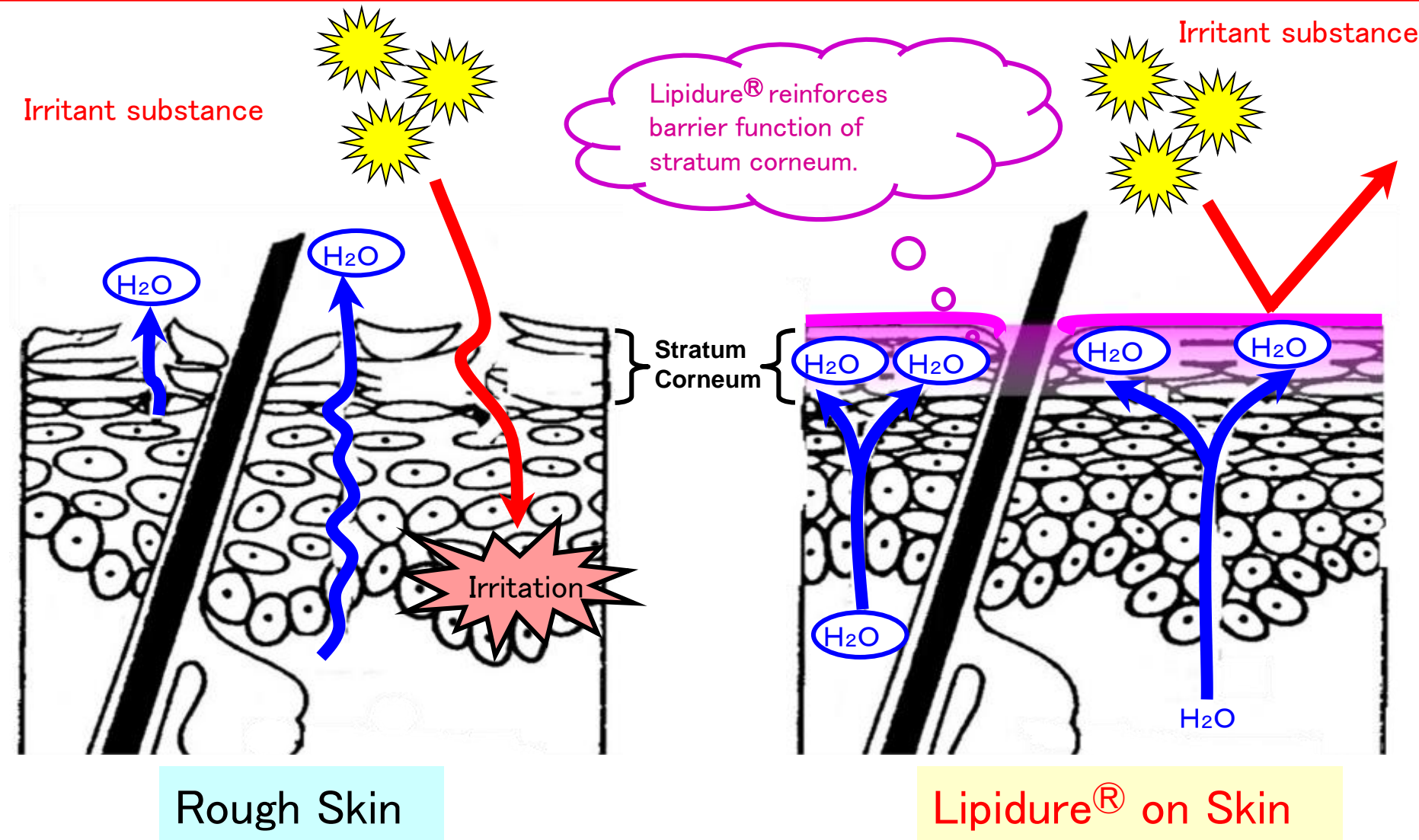
Reduction of Cytotoxicity

Lipidure[®] can reduce the cytotoxicity of chemical compound, such as SDS (Sodium dodecyl sulfate: anionic surfactant).



Lipidure[®] in Skin Care Field

Effect of Lipidure[®] on Skin



Multifunctional Ingredients, Lipidure®

Lipidure® feaures following points.

(1) Reduction of Skin Irritation (2) Barrier function (3) Moisture retention

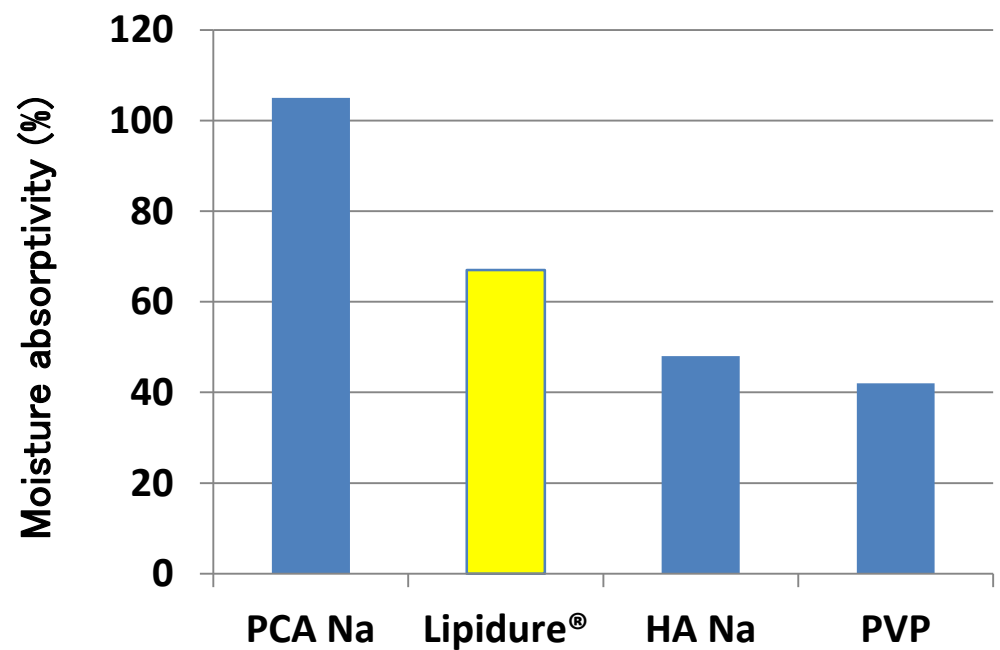
Can supplements overall stratum corneum function unlike a normal skin care agent. Lipidure® has extremely high skin protection effect.

	Function			Whitening	Antibacterial
	Reduction of Lrritation	Moisuture Retention	Barrier Function		
Lipidure®	○	○	○	×	×
Vitamin C	×	×	×	○	×
Silk Protein	×	○	△	×	×
Squalane	×	○	×	×	×
Chitin / Chitosan	×	○	△	×	○
Ceramide	△	○	×	×	×
Arginine	×	○	×	×	×
Sodium Hyaluronate	×	○	△	×	×
Kojic acid	×	×	×	○	×

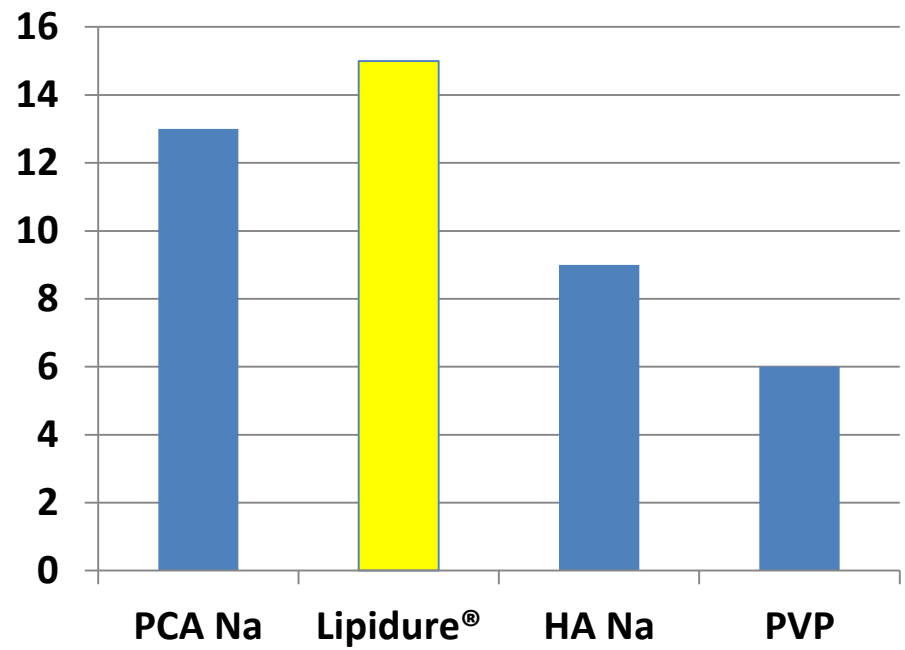
Moisture Absorptivity



RH 80%



RH 35%



PCA Na: Sodium pyrrolidone carboxylate

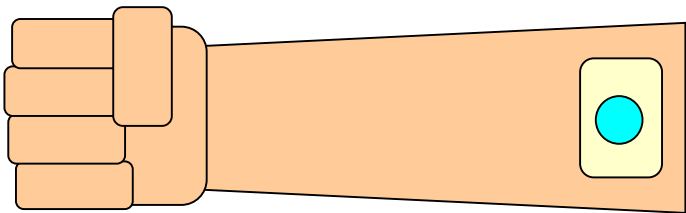
HA Na: Sodium hyaluronate

PVP: Polyvinylpyrrolidone

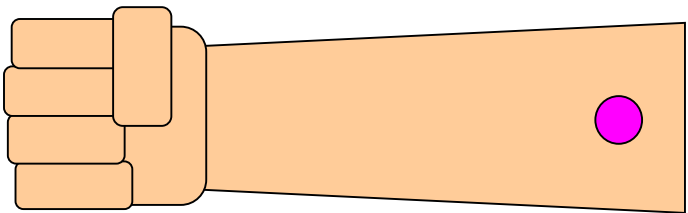
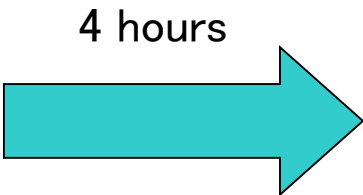
Moisture absorptivity (%) = $(W - W_0) / W_0 \times 100$

Reduction of Skin Irritation

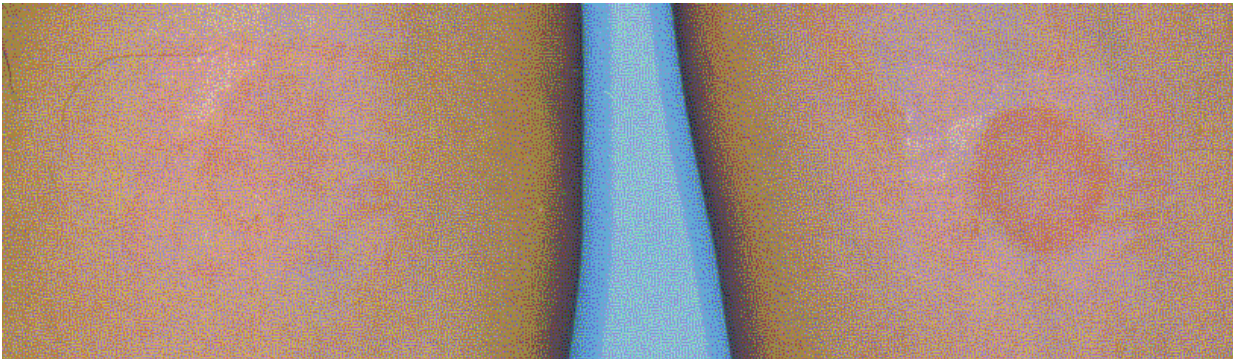
< Experiment >



Apply sample (closed patch test)



Remove sample and observe



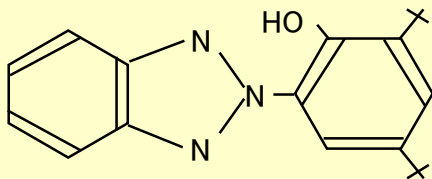
**30% Alpha Hydroxy Acid (AHA)
+ 5% Lipidure®-PMB**

30% AHA

Lipidure® can reduce the irritation from the other irritants such as phenylenediamine, urea and octyl-*p*-methoxycinnamate.

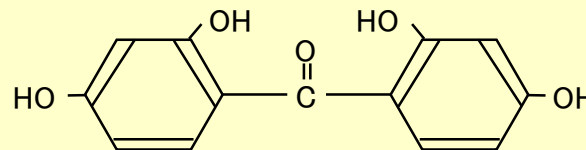
Reduction of Cytotoxicity by Ultraviolet Absorber

● Ultraviolet absorber ①



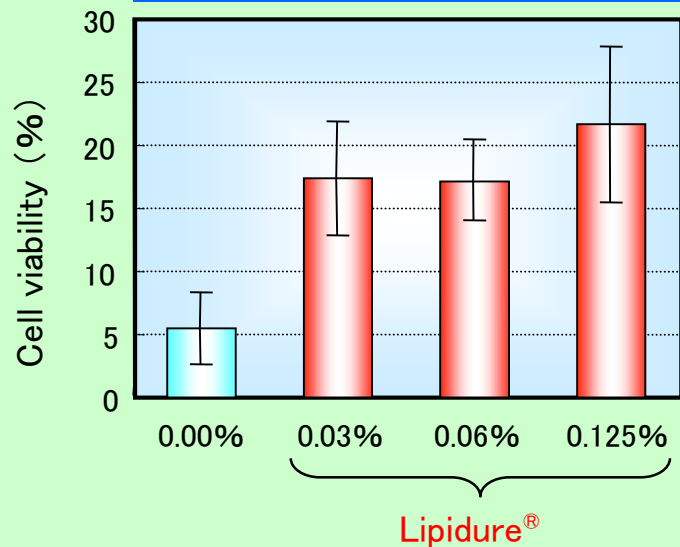
2-(3,5-Di-t-buthyl-2-hydroxyphenyl) benzotriazol

● Ultraviolet absorber ②

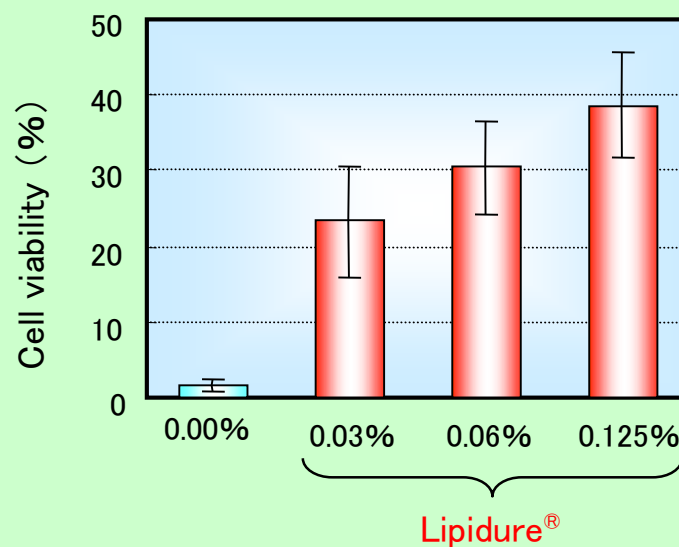


2,2,4,4-Tetrahydroxybenzophenone

UV①: Concentration of additives = 0.063%

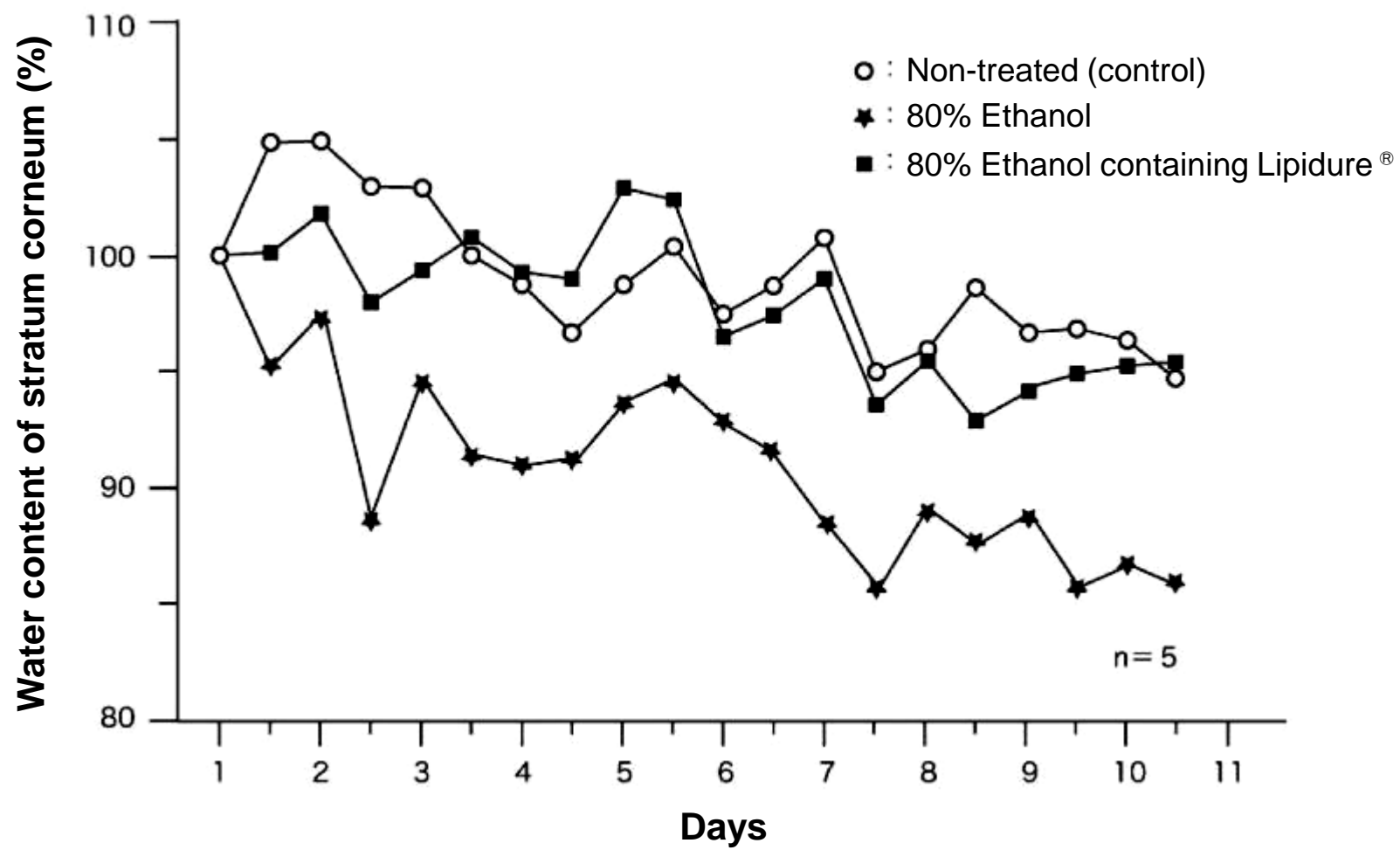


UV②: Concentration of additives = 0.063%



Lipidure® reduces the cytotoxicity of ultraviolet absorber.

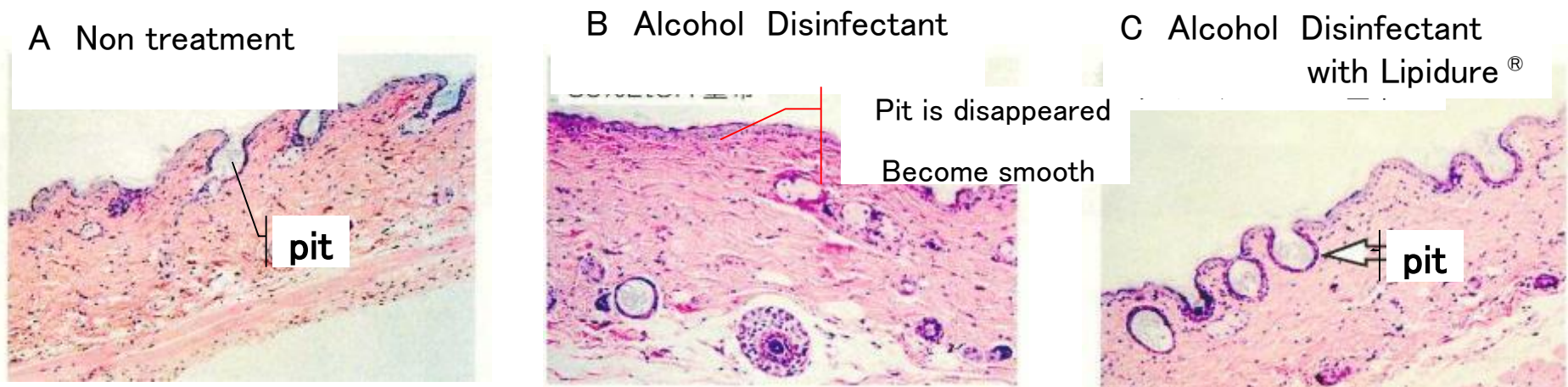
Prevention of Skin Roughness by Alcohol



Water content in the stratum corneum of hairless mice. A 100 μ L solution (80% ethanol or 80% ethanol + Lipidure®) was applied on the back skin of hairless mice twice a day for 10 days.

N.Andoh, *et al.*, *Japanese Journal of Environmental Infections*, 23, p.35 (2008)

Protect from Alcoholic Stimulants

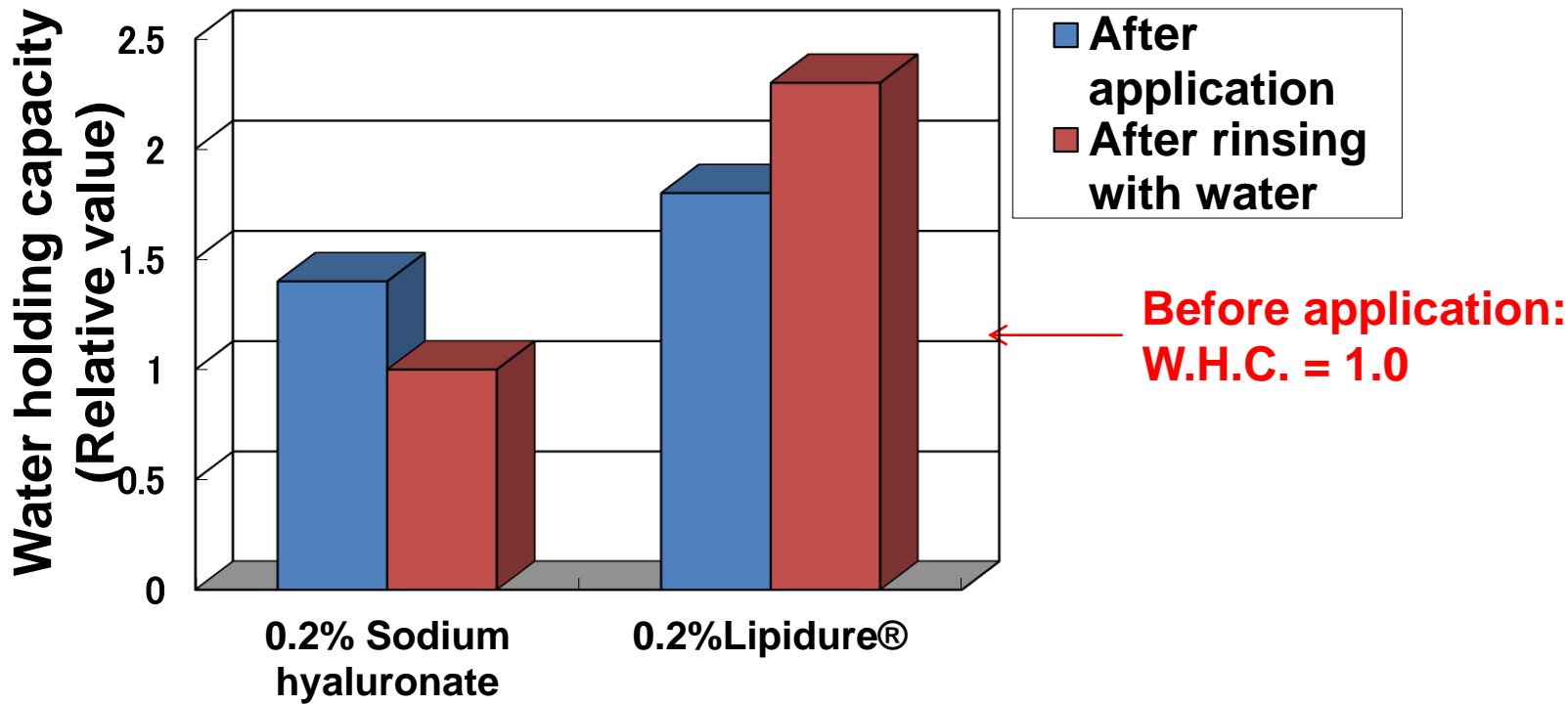


- A. Healthy mouse has “pits” on cross section of epidermis.
- B. “Pits” are disappeared by application of alcohol disinfectant, and the epidermis surface becomes smooth.
- C. Alcohol Disinfectant with Lipidure® keep the “pits”, means Lipidure protects skin from alcoholic stimulants and keep healthy skin.

Moisturizing Efficacy of Lipidure[®]

< Experiment >

- (1) Measure the conductance on the skin before the application.
- (2) Apply Lipidure[®] aq. and Sodium hyaluronate at 0.2% as an active matter on the skin.
- (3) Rinse the applied point off with water after the application.
- (4) Measure the conductance of the skin after application and 1 hour after rinsed with water.



Lipidure[®] shows excellent water holding capacity compared to sodium hyaluronate.

Water Resistance Property of Lipidure[®]

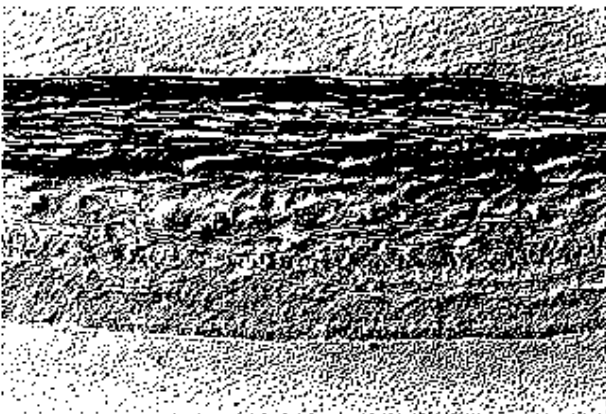
Living Skin Equivalent (LSE)



< Experiment >

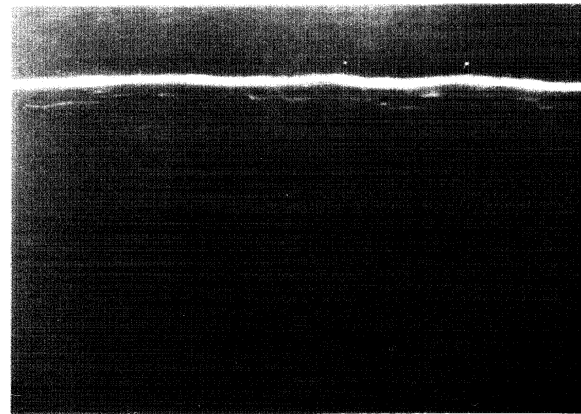
- (1) Apply fluorescent marked Lipidure[®] aq. on Living Skin Equivalent (LSE)
- (2) Rinse LSE with phosphate buffer saline 10 times
- (3) Observe LSE with fluorescent microscope

Cross section



Differential Interference Image

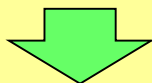
Stratum
corneum
(30μm)
Dermis



Lipidure[®] layer
(10μm)

Fluorescent Microscope Image

Lipidure[®] remains on LSE after rinsing with PBS 10 times.



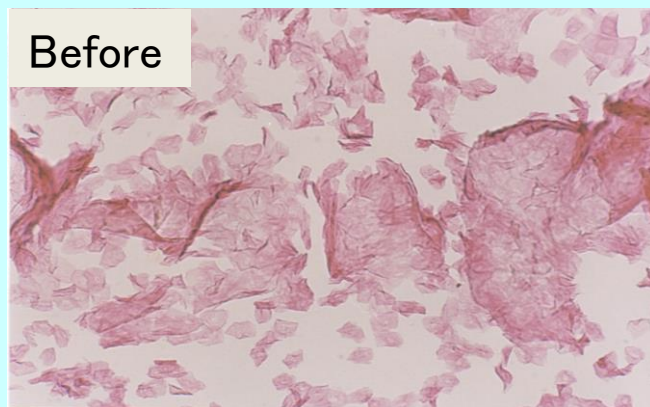
Lipidure[®] shows an excellent waterproof property.

Effect of Lipidure[®] on Rough Skin

< Test method >

1. Application of cream with Lipidure on the Elbow (2 times/day, for 2 weeks)
2. Stripping of horny layer
3. Observation by optical microscope after staining by Mayer's Hematoxylin-Eosin sol.

< Result >



Application of cream
with Lipidure[®]
for 2 weeks.



Lipidure[®] significantly improve desquamation of horny layer

Trade Name and Property

- YT-Lipidure®-PMB , 5% polymer, aqueous solution, non-preservatives

Approval Status

- JP Approved as additive for Urea Cream, Eye Drop and Quasi-drug Grade Medical Lotion by PMDA*
 - China Listed in 2014國際化粧品原料基準中文名称目錄
- *PMDA
= Pharmaceuticals
and Medical Devices Agency

Safety Data

Testing	Result
Oral mucosal irritation test	Negative
Skin primary irritation test	No stimulation
Continuous skin irritation test	No stimulation
Maximization sensitization test	No sensitization
Tests for <i>in vitro</i> cytotoxicity	No stimulation
Acute eye irritaion test	No stimulation
Acute toxcity test	LD50>2000mg/kg
Human patch test	Negative
Mutagenicity test	Negative

Preferred Concentration for Formulation 0.5–10%

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Thank you for your attention.



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