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Number

Development of Natural Cosmetics with Novel Solubilization System Using Lysophospolipids

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Introduction

Cosmetic products usually include synthetic surfactants or solubilizers which improve the mixing of the ingredients and are implemented in various formulations. Specifically, synthetics from PEGs and Sulfates are highly used because of the cost efficiency and good surfactant effect. However they stimulate the skin and cause hives, rashes and dermatitis which can damage the skin and cause toxicity by being absorbed into the body. Recently, polyglyceryl surfactants are commonly used although it has a skin irritation and sticky sensation. Various attempts have been made to use substances from natural materials as solubilizers but this technology has a lower solubilization ability, formulation stability and a reducing skin absorption. Therefore, development of new solubilizer is required at present.

In the present study, we propose natural cosmetics with novel natural solubilizer. Lysophospholipid, from phospholipids via an enzymatic reaction, has single chain fatty acid molecules compare to phosoholpid. A cone-shape structure of lysophospholipid can form a special micellar structure. It is able to pack closely and forms small and tight emulsions that are more stable. The unique structure of molecules allows it to coat the particles and offer high skin tolerance, skin hydration and skin absorption. The solubilization ability of lysophospholipid under the conditions of using polyols containing carbon chains of 5 to 6 carbon numbers is similar to synthethic solubilizers such as PEG-40 hydrogenated caster oil and polysorbate 80.

Products solubilized by lysophospholipd were stable except the low viscosity formulations such as skin and toner. The clarity decreases at high temperatures within 2 weeks because of weak bondings of natural viscosity increasing agents such as pectin, xanthan gum. Diutan gum, a new microbial polysaccharide, has a perfect double helix molecular conformation that is stable at extreme temperature and pH. Therefore, Diutan gum gives a better stability of low viscosity formulation at high temperatures because of higher water retention, stronger network and higher viscoelasticity of diutan gum than that of other gums at the same concentration. We compared skin absorption rate with using the methodology of Franz diffusion cells and skin irritation test with the patch test between cosmetics containing natural and synthethic solubilizer.

Materials and Methods

01 Materials

No.	INCI Name	Manufacturer
1	Glycine Soja (Soybean) Seed Extract	Lucas Meyer Cosmetics
2	Diutan gum	CP Kelco®
3	Xanthan gum	CP Kelco®
4	Pectin	CP Kelco®
5	Pentylene Glycol	Minasolve
6	1,2-Hexanediol	BETTER&BEST(SYMRISE)(OSAKA ORGANIC CHEMICAL)

02 Methods

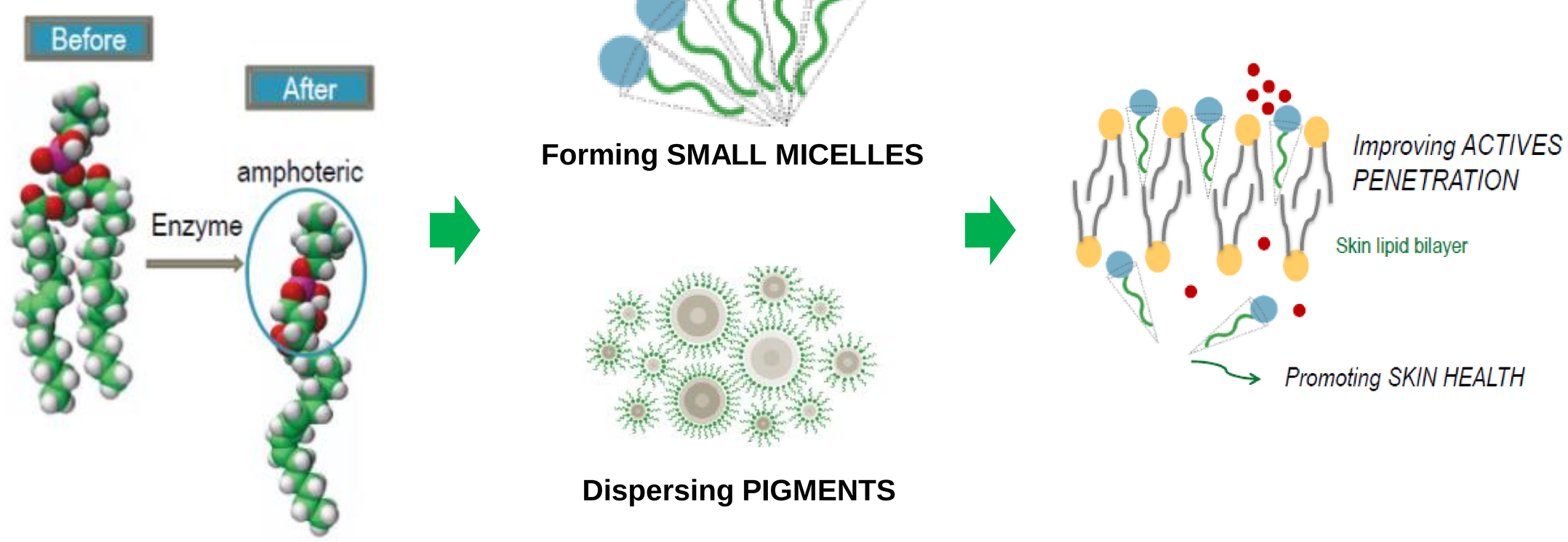


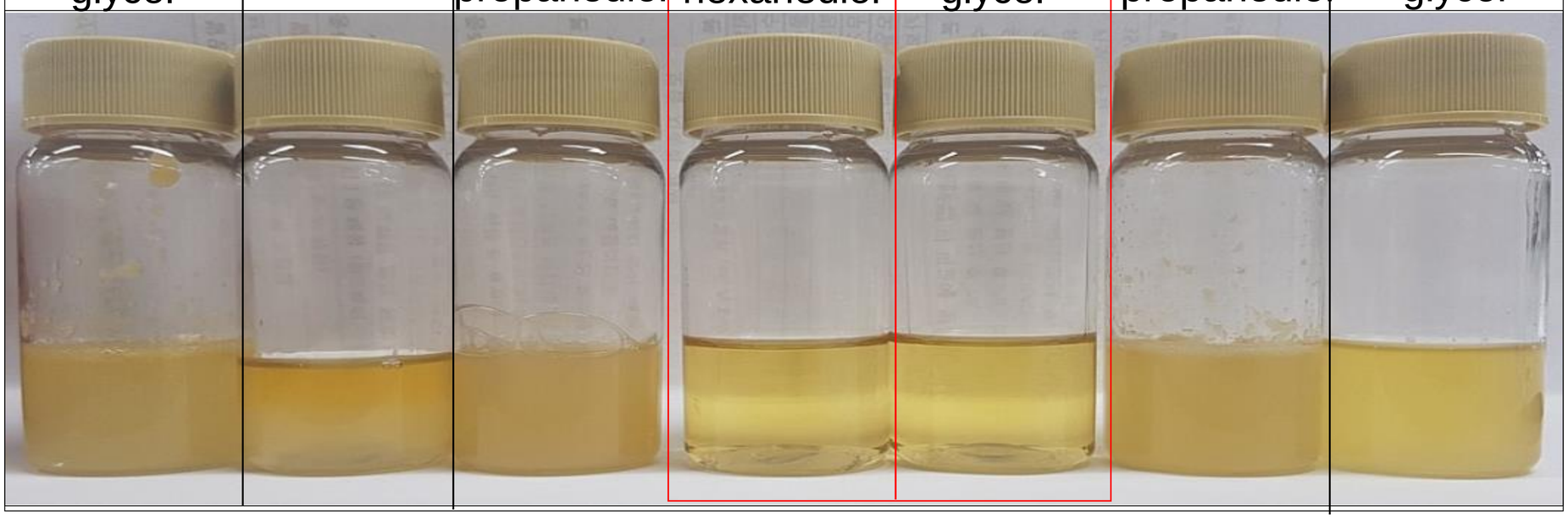
Figure. 1 Forming micellar structure of Lysophospholipids

03 Characterization

1. Optical Microscope : Bx51, DP74, OLYMPUS
2. Skin absorption : Franz Diffusion Cell
3. Skin irritability : SK101-3X, SeKi potical

Results and Discussion

01 Solubilization analysis of various polyols

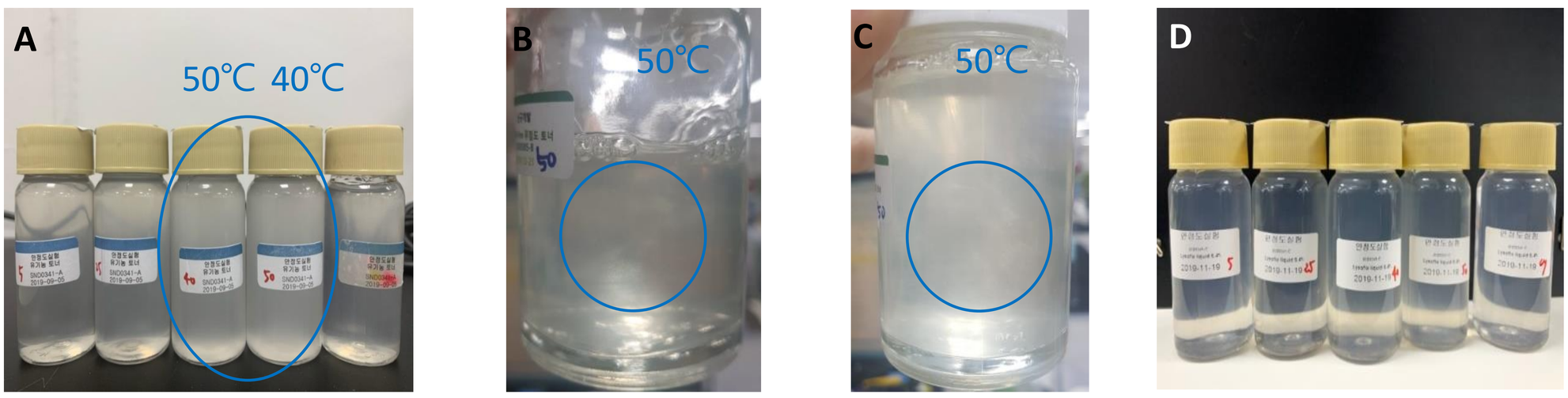
butylene glycol	glycerine	1,3-propanediol	1,2-hexanediol	pentylene glycol	methyl propanediol	dipropylene glycol
						

*Oil 0.03 %

	A	B	C	D	E	F	G
Polyol	butylene glycol	glycerine	1,3-propanediol	1,2-hexanediol	pentylene glycol	methyl propanediol	dipropylene glycol
Content	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
State	X	X	X	transparent	transparent	X	X

Figure 1. Solubilization of lysophospholipid via various polyols

02 Stability of Low viscosity formulation at High Temperature



	A	B	C	D
INCI Name	xanthan gum	pectin	gellan gum	diutan gum
Content	0.2%	0.2%	0.2%	0.2%
State	precipitation	precipitation	precipitation	stable

Figure 2. Stability of low viscosity formulation via various viscosity agents

Number

Results and Discussion

03 Microscopy analysis of solubilization by lysophospholipid

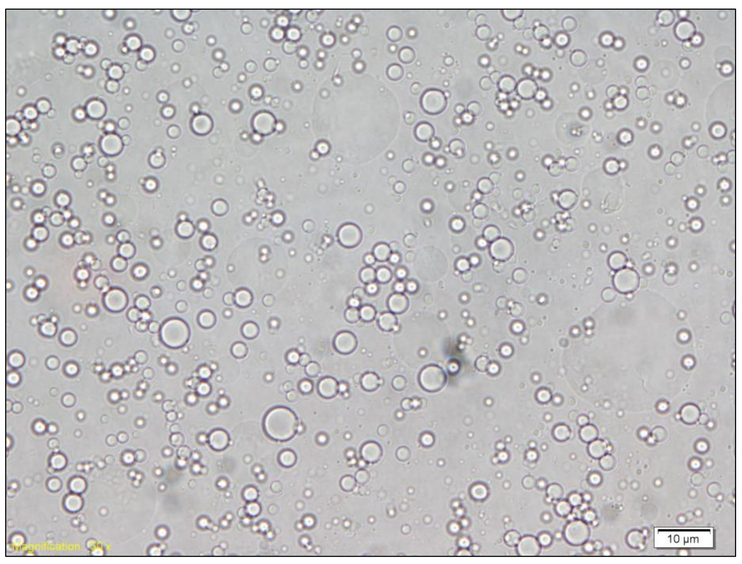


Figure 4. Optical microscope image of solubilization by Glycine Soja (Soybean) Seed Extract

04 Skin Abosorption Rate

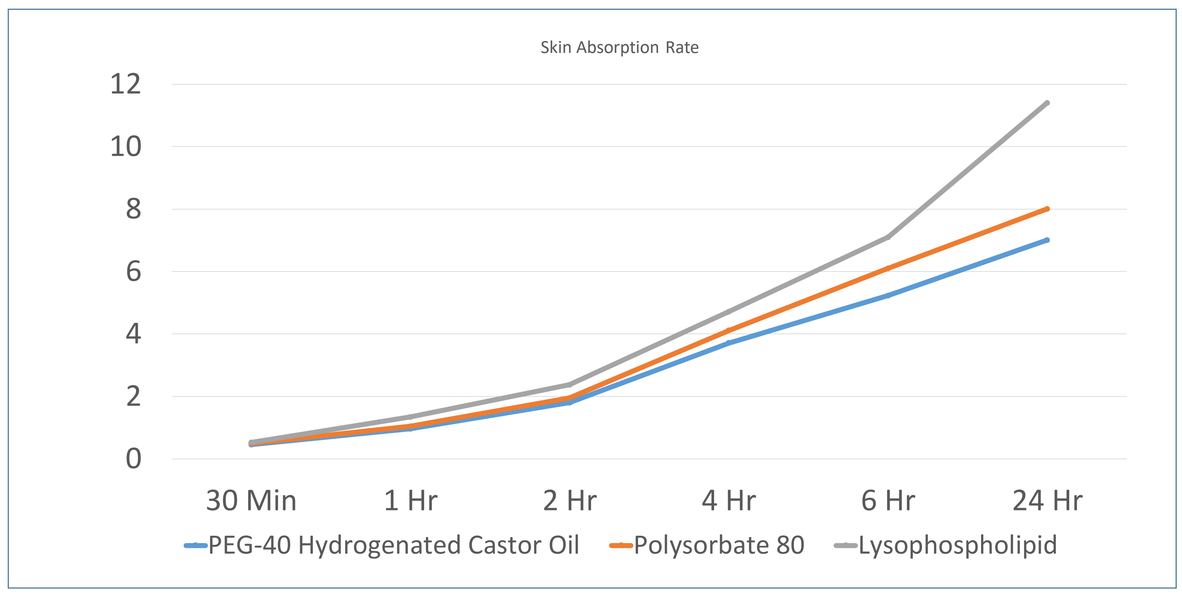


Figure 5. Skin absorption rate of PEG-40 hydrogenated caster oil, Polysorbate 80 and lysophospholipid analyzed by HPLC

05 Skin Irritability

SCORE	MARK	EXPLAIN
0	-	No reaction
0.5	±	Faint erythema reaction
1	+	Weak but clear erythema reaction
2	++	Clear erythema reaction with edema
3	+++	Strong erythema reaction with edema
4	++++	Erythema reaction with edema and blisters

Average Skin Reaction	Judgement
0.00 ~ 0.87	Hypoallergenic
0.88 ~ 2.42	Mild stimulation
2.43 ~ 3.44	Medium stimulation
More than 3.45	Strong stimulation

Table 1~2. Reaction index (RI)

	30 mins later(24 hrs)						12 hours later(36 hrs)						Average reaction
	0.5 ±	1 ±	2 ±	3 ±	4 ±	Average reaction	0.5 ±	1 ±	2 ±	3 ±	4 ±	Average reaction	
PEG-40 Hydrogenated Caster Oil	7	3	-	-	-	0.22	5	2	-	-	-	0.15	0.19
Polysorbate 80	6	3	-	-	-	0.2	4	1	-	-	-	0.1	0.15
Lysophospholipid	-	-	-	-	-	0	-	-	-	-	-	0	0

(Average age : 34.4, 30 peoples)

Table 3. Skin Reactions of subjects

Conclusion

In this study, we provided natural cosmetics with natural surfactant and viscosity agent. Soy bean seed extract(lysophospholipid) was used as natural surfactant. The solubilization power of lysophospholipid was remarkable under the conditions of using polyols containing carbon chains of 5 to 6 carbon numbers. However, oils were precipitated in a low viscosity formulation at high temperatures because of a weak distribution stability of natural viscosity agents.

This problem has been solved by diutan gum which can form a perfect double helical structure with side chains all distributed in the core of the double helix. Therefore, a great quantity of water molecules can enter the interior of the double helix and adhere to the side chains via hydrogen bonds, while most of the water molecules simply adhere to the periphery of the xanthan gum double helix.

The skin irritation was lower than synthethic solubilizers. Skin absorption of lysophospholipid is higher than synthethic solubilizers, so it is expected to be a new natural solubilizer with hypoallergenic to skin.

References

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