IFSCC 2025 full paper (IFSCC2025-1541)

"Novel Natural Peeling System Containing Lactobacillus Exosome for Anti-Aging"

Kim Hyojung[1*, 2], Lee Haeyoung[1], Park Haewoong[3], Lee Haekwang[4]

[1]SB LAB, Dr.JCOS INC, Incheon, [2]Bioindustrial Engineering, Yonsei University, Seoul, [3]R&D center, World Institute of Kimchi, Gwangju,, [4]Skin Research Center, P&K Skin Research Center, Seoul, Korea, South

1. Introduction

A novel peeling system was formulated through saponification from olive oil rich in oleic acid and coconut oil rich in lauric acid and lactic acid bacteria (LAB) isolated from Kimchi, and Sauerkraut selected among 104 LAB strains. The 16S rRNA gene sequences of the strains were identified through biochemical and gram staining methods. The LAB strains were cultured at 30 degree for 24 h in glucose and yeast extract as plant media. The LABs isolated from Kimchi, and Sauerkraut in this study may be used as probiotics, with isolate Lactobacillus spp. as the most promising novel probiotics for anti-aging applications based on its excellent cell activity [1,2,3,4].

The peeling effect was evaluated by the melanin solubility and keratin resoltion as the in vitro biological activity. The skin aging improvement effect was evaluated by the human clinical test about representative skin aging phenomenon(keratin improvement, moisturizing, pigmentation, brightness, wrinkle, dermal density, skin transparency). A healthy of 23 women volunteers (aged 20-56) were included in this study.

This study revealed that the novel natural peeling system showed superior melanin pigment resolution and keratin protein resolution than chemical peeling agents such as AHA(alpha hydroxy acid). But the pain of skin peeling was lower than that of AHA chemical peeling. And it was found that when applied to the skin for 1 month, the skin aging phenonmenon was significantly improved.

The novel peeling system developed through this study exhibited good potential as anti-aging cosmeceutical and can either be used alone or as an additive to an anti-aging formulation. And it can replace the existing chemical peeling agent like AHA and can be used as a peeling system that is safe for the skin.

2. Materials and Methods

2-1. Natural Peeling Solution (PSol) is produced through 1st hydrogenation method and 2nd saponification method of oleic acid of olive oil and lauric acid of coconut oil. The process involves ultra emulsification, *Olive Oil PEG-8 Esters, Potassium Cocoate, Glycerin* recovery, and purification. Phyto-derived Natural Peeling Solution, which is skin-friendly, safe, and can be used to promote skin aging prevention and improvement through remove skin dead cell.

2-2. Lactic acid bacteria (LAB) is produced through fermentation of *Lactobacillus Plantarum* using glucose as the primary carbon source. The process involves harvesting, cell disruption, *Lactobacillus Ferment Lysate*, *Heat killed Lactobacillus* and *Lactobacillus Extracellular Vesicles* recovery, and purification. Phyto-derived lactic acid bacteria, which is skin-friendly, safe, and improves skin function, and culture using these lactic acid bacteria can be used to promote skin aging prevention and improvement through antioxidant, inflammatory, moisturizing, skin tone, elasticity and wrinkles.

2-3. Test materials are used Natural Peeling Solution (PSol) and Lactic acid bacteria (LAB)
① Natural Peeling formula (1) is formuated through 42% PSol (Olive Oil PEG-8 Esters, Potassium Cocoate, Glycerin) and 33% LAB (*Lactobacillus Ferment Lysate*, *Heat killed Lactobacillus, Lactobacillus Extracellular Vesicles*) and 25% other additives (1,2-Hexanediol , Ethylhexylglycerin, Butylene Glycol, Potassium Hydroxide, D.I water et al.)
② Natural Peeling formula (2) is formuated through 35% PSol (Olive Oil PEG-8 Esters, Potassium Cocoate, Glycerin) and 36% LAB (*Lactobacillus Ferment Lysate*, *Heat killed Lactobacillus, Lactobacillus Extracellular Vesicles*) and 29% other additives (1,2-Hexanediol , Ethylhexylglycerin, Butylene Glycol, Potassium Hydroxide, D.I water et al.)

2-4. Human application test on skin keratin turnover of Natural Peeling formulas
A total of 23 healthy Korean women volunteers (average age 46.565) were participated in the study in 02 ~ 04 December 2024. Skin keratin turnover was measured using VISIA-CR (Canfield Imaging Systems, USA) to photograph the same right forearm of the test subject before and after using the test product. Dansyl Chloride derivatives capable of labeling amino groups such as amino acids and proteins of the skin were applied to stain the keratin with fluorescent dye. The captured images (UV mode) were analyzed using Image-pro® plus (Media Cybernetics, USA), and the parameter is Intensity, which indicates skin brightness. If skin keratin turnover of the area where the test product was used is improved, the skin dyed with Dansyl Chloride is quickly shed, making the skin appear darker. Therefore, a decrease in the skin brightness (Intensity) value indicates an effect on skin keratin turnover.
In order to determine the significance of the measurement values before and after using the test product, the statistical analysis program SPSS was used. Significance was confirmed when the significance probability was $p<0.05$ at the 95% confidence interval, and the significance probability was rounded to the third decimal place.

2-5. Human application test on anti-aging effect of Natural Peeling formulas
A total of 20 healthy Korean women volunteers (average age 46.050) were participated in the study before, immediate after use, after 2 weeks, after 4 weeks in 02 ~ 31 December 2024.
① The skin keratin was collected from the same cheek area of the test subject before and after using the test product using a special film (keratin tape, ADNCS & C Beauty, Korea), and then photographed using Visioscan VC98 (Courage+Khazaka electronic GmbH, Germany). The parameter is D.I. (%), and a decrease in the value indicates improvement.
② The sebum amount was analyzed by photographing the same frontal face of the test subject before and after using the test product using the UV mode of Janus (PIE Co., Ltd., Korea), and then analyzing the cheek area on both sides. The parameter is sebum count (ea), and a decrease in the value indicates improvement.

③ The skin pores were photographed from the same cheek area of the test subject before and after using the test product using the Pore Mode of Antera 3D CS (Miravex Ltd., Ireland). The parameter is pore area (㎟), and a decrease in the value indicates improvement.
④ Skin radiance was analyzed using Image-pro® plus (Media Cybernetics, USA) after taking pictures of the same frontal face of the test subject before and after using the test product using the Parallel mode of VISIA-CR (Canfield Imaging Systems, USA). The parameter is Pixel, and an increase in the value indicates improvement.
⑤ Pigmentation was analyzed using Melanin Mode of Antera 3D CS (Miravex Ltd., Ireland) after taking pictures of the same eye area and cheek area of the test subject before and after using the test product. The parameter is pigmentation area (㎟), and a decrease in the value indicates improvement.
⑥ Cheek lifting was analyzed using Image-pro® plus (Media Cybernetics, USA) after taking pictures of the same 30° angled face of the test subject before and after using the test product using F-ray (BEYOUNG Co., Ltd., Korea). The parameter is angle (°), and a decrease in the value indicates improvement.
⑦ The nasolabial folds were photographed on the same nasolabial fold area on both sides of the test subject before and after using the test product using the Wrinkle Mode of Antera 3D CS (Miravex Ltd., Ireland). The parameter is Depth (mm), and a decrease in the value indicates an improvement.
In order to determine the significance of the measurement values before and after using the test product, the statistical analysis program SPSS was used. Significance was confirmed when the significance probability was $p<0.05$ at the 95% confidence interval, and the significance probability was rounded to the third decimal place.

2-6. Primary irritation test on human skin of Natural Peeling formulas
A total of 30 healthy Korean volunteers (average age 45.033) were participated in the study in 04 ~ 06 December 2024. Skin irritation test (before, after 1 hour, 24 hours) was evaluated on the back area using the patch test methods(International Contact Dermatitis Research Group: ICDRG), expressed in grade of Mean score (grade 1: non-irritant (Mean Score 0.00~0.25), grade 2: slight irritant (Mean Score 0.26~1.00), grade 3: irritant (Mean Score 1.01~2.50), grade 4: severe irritant (Mean Score 2.51~4.00).

2-7. Primary irritation test on human skin targeting sensitive skin of Natural Peeling formulas
A total of 34 healthy Korean volunteers (average age 51.65) were participated in the study in 24 ~ 27 September 2024. First, a skin irritation test is conducted on a panel of selected subjects through the Lactic Acid Sting Test.
Lactic Acid Sting Test is conducted as dollows.
① The test was performed immediately after the hydration process in which a steam towel was applied to the face for 5 minutes while the subject was lying down comfortably.
② 50㎕ of 10% lactic acid was applied to the micropipette, dropped onto the nasolabial fold area, and gently rubbed with a cotton swab.
③ 1 minute after application, the test subjects were asked to evaluate their subjective stinging sensation on a scale of 0 to 3. (0=none, 1=weak, 2=moderate, 3=severe)
④ If a reaction of 1 or higher was observed even once, it was judged as a positive reaction.

3. Results

This study revealed that Natural Peeling formulas showed superior skin keratin turnover ability in Table 1. The topical application of the cosmetics with Natural Peeling formulas showed that the skin aging phenonmenon was significantly improved 66~76% keratin improvement effect,

37~45% Sebum control effect, 22~30% Skin Pore minimize effect, 108~131% Skin radiance effect, 15% pigmentation improvement effect, 5.6~5.9% Lifting improvement effect, and 23~31% wrinkle decrease effect after 4 weeks of use in Figure 2. Also, the adverse effects, such as erythema, ederma, saling, itching, stinging, burning, tightness, and prikling, were not reported.

3.1. The Result of *Lactobacillus Extracellular Vesicles* shown in Figure 1.
Spherical PHA particles of various sizes were observed in the cytoplasm, with particle diameters ranging from 0.3 μm to a maximum of 1 μm, and these particles existed in a clearly distinguishable form in the cytoplasm (Figure 1).

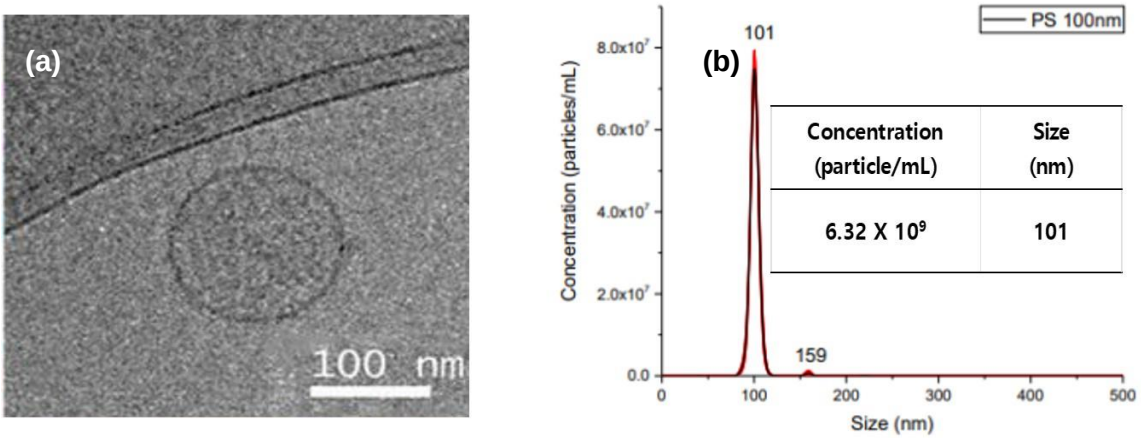

Figure 1. Characterization of the *Lactobacillus Extracellular Vesicles*.
(a) Analysis of the particle morphology of *Lactobacillus Extracellular Vesicles* using Scanning Electron Microscope (SEM) through 100,000x magnification images, (b) Analysis of Size and concentration distribution graph of *Lactobacillus Extracellular Vesicles* measured by nanoparticle tracking analyzer (NTA)

3-2. The Result of skin keratin turnover activity of Natural Peeling formulas

It was found that Natural Peeling formulas with brush was 5.8 times more effective than Natural Peeling formulas with hand (Table 1). Natural Peeling formulas with brush is judged to be 13% improved skin keratin turnover using 4 minutes of brush application and 10 minutes of leaving, but 2.3% improved skin keratin turnover using 4 minutes of hand application and 10 minutes of leaving (Table 1)

Table 1. Results of Human application test on skin keratin turnover

No.	Test	Intensity (mean)			Improvement rate (%)	*p* -value		
		Before application Dansyl Chloride Derivatives	24 hours after application Dansyl Chloride Derivatives	Immediately after use natural peel formula		Intra-military comparison	Inter-military comparison (Placebo)	Inter-military comparison (Hand : Brush)
1	Placebo	81.905 ± 21.687	247.013 ± 5.780	246.479 ± 5.725	0.216%	0.000**	-	-
2	Hand application for 2 min. & leave on for 5 min., then wash area with water	78.812 ± 21.691	244.981 ± 6.511	236.634 ± 14.629	3.407%	0.000##	-	0.003₸₸
3	Hand application for 4 min. & leave on for 10 min., then wash area with water	78.555 ± 21.563	243.288 ± 7.569	237.637 ± 30.350	2.323%	0.000##	-	0.001₸₸
4	Brush application for 2 min. & leave on for 5 min., then wash area with water	82.614 ± 21.833	247.226 ± 6.020	220.061 ± 29.206	10.988%	0.000##	0.000₸₸	0.003₸₸
5	Brush application for 4 min. & leave on for 10 min., then wash area with water	81.935 ± 21.488	246.429 ± 6.415	213.306 ± 27.823	13.441%	0.000##	0.000₸₸	0.001₸₸

※ Improvement rate (%) = | (after-before) | / before*100
: p<0.025(=5%/2) by Friedman test, post hoc Wilcoxon signed rank test with Bonferroni correction, ₸₸ : p<0.05 by Generalized Estimation Equation

3-3. The Result of Human application test on anti-aging effect of Natural Peeling formulas

① The test product, Natural Peeling formulas are judged to be a product that helps improve keratin decreasing effect. The improvement rate of keratin decreasing effect was significantly increased immediately after use, and 2, 4weeks ($p<0.05$) (Table 2). The mean improvement rate of keratin decreasing effect increased 76% for cosmetic with Natural Peeling formula(1) (from 11.077 to 2.579, $p = 0.000$) and 66% for cosmetic with Natural Peeling formula(2) (from 10.869 to 3.669, $p = 0.000$).

Table 2. Results of Human application test on keratin decreasing effect

Test-1	Keratin decreasing effect, %				Improvement rate(%)			*p*-value ## $p<0.017$, **, ŦŦ $p<0.05$	
	before	Immediately after use	after 2 weeks	after 4 weeks	Immediately after use	after 2 weeks	after 4 weeks	Intra-military comparison	Inter-military comparison
natural peel formula(1)	11.077 ± 1.210	5.262 ± 1.950	3.432 ± 2.285	2.579 ± 1.839	52.496	69.017	76.718	0.000##	0.018 ~ 0.027ŦŦ
natural peel formula(2)	10.869 ± 1.152	4.956 ± 2.535	3.365 ± 2.304	3.669 ± 2.400	54.402	69.040	66.243	0.000##	

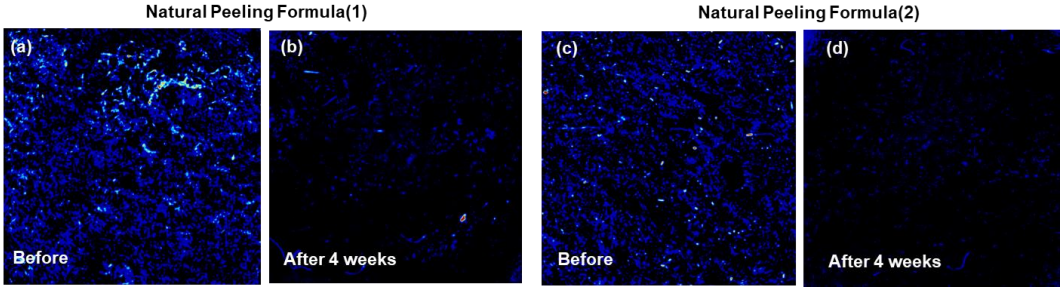

Figure 2. Keratin decreasing effect measurement results taken with Visioscan VC98 (Courage+Khazaka electronic GmbH, Germany) after using cosmetics with Natural Peeling formulas (a) Before image of keratin using Natural Peeling formula(1), (b) After 4 weeks image using Natural Peeling formula(1), (c) Before image of keratin using Natural Peeling formula(2) (d) After 4 weeks image using Natural Peeling formula(2)

② The test product, Natural Peeling formulas are judged to be a product that helps improve sebum control effect. The improvement rate of sebum control effect was significantly increased immediately after use, and 2, 4weeks ($p<0.05$) (Table 3). The mean improvement rate of sebum control effect increased 37% for cosmetic with Natural Peeling formula(1) (from 120.050 to 74.600, $p = 0.000$) and 45% for cosmetic with Natural Peeling formula(2) (from 129.100 to 69.850, $p = 0.000$).

Table 3. Results of Human application test on sebum control effect

Test-2	Sebum amount measurement results, ea				Improvement rate(%)			*p*-value ## $p<0.017$, **, ŦŦ $p<0.05$	
	before	Immediately after use	after 2 weeks	after 4 weeks	Immediately after use	after 2 weeks	after 4 weeks	Intra-military comparison	Inter-military comparison
natural peel formula(1)	120.050 ± 125.586	105.250 ± 119.688	91.000 ± 116.439	74.600 ± 90.941	12.328	24.198	37.859	0.000##	*
natural peel formula(2)	129.100 ± 141.997	100.600 ± 122.341	92.450 ± 137.108	69.850 ± 103.730	22.076	28.389	45.895	0.000##	

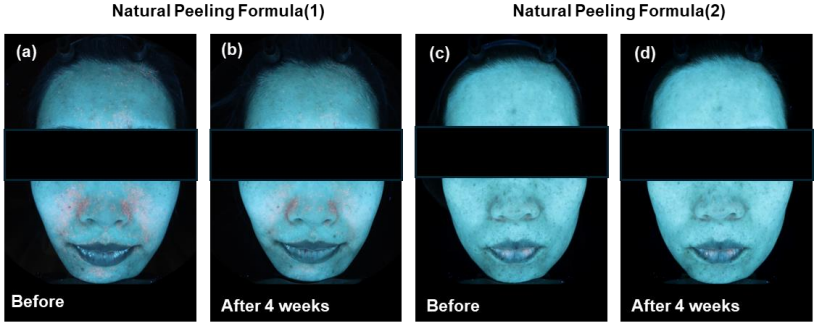

Figure 3. sebum control effect measurement results taken with UV mode of Janus (PIE Co., Ltd., Korea) after using cosmetics with Natural Peeling formulas (a) Before image of face using Natural Peeling formula(1), (b) After 4 weeks image using Natural Peeling formula(1), (c) Before image of face using Natural Peeling formula(2) (d) After 4 weeks image using Natural Peeling formula(2)

③ The test product, Natural Peeling formulas are judged to be a product that helps improve skin pore decreasing effect. The improvement rate of skin pore decreasing effect was significantly increased immediately after use, and 2~4weeks ($p<0.05$) (Table 4). The mean improvement rate of skin pore decreasing effect increased 22% for cosmetic with Natural Peeling formula(1) (from 0.173 to 0.134, $p = 0.000$) and 30% for cosmetic with Natural Peeling formula(2) (from 0.175 to 0.122, $p = 0.000$).

Table 4. Results of Human application test on skin pore decreasing effect

Test-3	Skin pore measurement results, ㎟				Improvement rate(%)			*p*-value ## $p<0.017$, **, ₸₸ $p<0.05$	
	before	Immediately after use	after 2 weeks	after 4 weeks	Immediately after use	after 2 weeks	after 4 weeks	Intra-military comparison	Inter-military comparison
natural peel formula(1)	0.173 ± 0.058	0.147 ± 0.047	0.145 ± 0.048	0.134 ± 0.041	15.029	16.185	22.543	0.000**	*
natural peel formula(2)	0.175 ± 0.066	0.137 ± 0.046	0.135 ± 0.052	0.122 ± 0.046	21.714	22.857	30.286	0.000##	

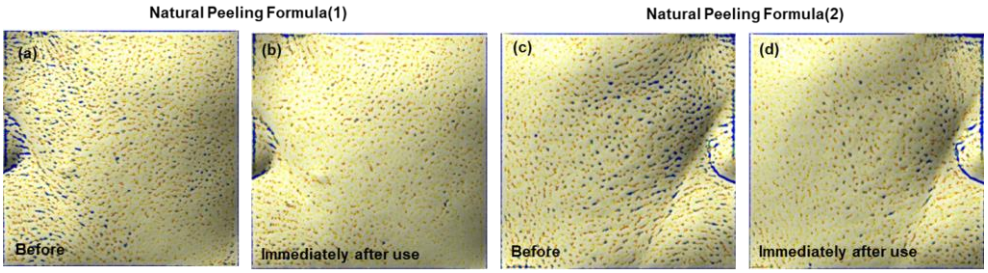

Figure 4. skin pore decreasing effect measurement results taken with Antera 3D CS (Miravex Ltd., Ireland) after using cosmetics with Natural Peeling formulas (a) Before image of skin pore using Natural Peeling formula(1), (b) Immediately after use image using Natural Peeling formula(1), (c) Before image of skin pore using Natural Peeling formula(2) (d) Immediately after use image using Natural Peeling formula(2)

④ The test product, Natural Peeling formulas are judged to be a product that helps improve skin radiance effect. The improvement rate of skin radiance effect was significantly increased immediately after use, and 2~4weeks ($p<0.05$) (Table 5). The mean improvement rate of skin radiance effect increased 108% for cosmetic with Natural Peeling formula(1) (from 24354 to 50706, $p = 0.000$) and 131% for cosmetic with Natural Peeling formula(2) (from 25248 to 58524, $p = 0.000$).

Table 5. Results of Human application test on skin radiance effect

Test-4	Skin radiance measurement results, Pixel				Improvement rate(%)			*p*-value ## $p<0.017$, **, ₸₸ $p<0.05$	
	before	Immediately after use	after 2 weeks	after 4 weeks	Immediately after use	after 2 weeks	after 4 weeks	Intra-military comparison	Inter-military comparison
natural peel formula(1)	24354.200 ± 7522.787	44310.250 ± 8105.741	48686.650 ± 8731.460	50706.750 ± 9782.751	81.941	99.911	108.205	0.000**	0.001₸
natural peel formula(2)	25248.350 ± 7543.668	49217.800 ± 8707.364	54997.500 ± 8726.765	58524.200 ± 8778.713	94.935	117.826	131.794	0.000**	

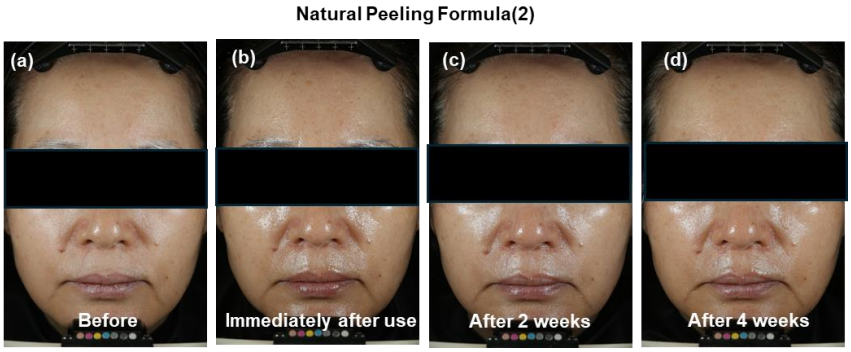

Figure 5. Skin radiance effect measurement results taken with Image-pro® plus (Media Cybernetics, USA) and VISIA-CR (Canfield Imaging Systems, USA) after using cosmetics with Natural Peeling formula(2) (a) Before image of face using Natural Peeling formula(2), (b) Immediately after use image using Natural Peeling formula(2), (c) After 2 weeks image of face using Natural Peeling formula(2) (d) After 4 weeks image using Natural Peeling formula(2)

⑤ The test product, Natural Peeling formulas are judged to be a product that helps improve Pigmentation remove effect. The improvement rate of pigmentation remove effect was significantly increased after 2 weeks and 4 weeks use ($p<0.05$) (Table 6). The mean improvement rate of Pigmentation remove effect increased 15% for cosmetic with Natural Peeling formula(1) (from 84.676 to 71.693, $p = 0.001$) and 15% for cosmetic with Natural Peeling formula(2) (from 88.265 to 74.672, $p = 0.001$).

Table 6. Results of Human application test on pigmentation remove effect

Test-5	Pigmentation remove effect (㎟)				Improvement rate (%)			*p*-value ## $p<0.017$, **, ₸₸ $p<0.05$	
	before	Immediately after use	after 2 weeks	after 4 weeks	Immediately after use	after 2 weeks	after 4 weeks	Intra-military comparison	Inter-military comparison
natural peel formula(1)	84.676 ± 97.289	83.272 ± 97.745	74.525 ± 81.222	71.693 ± 80.084	*	11.988	15.333	0.001##	*
natural peel formula(2)	88.265 ± 80.223	86.794 ± 81.506	74.619 ± 72.384	74.672 ± 76.470	*	15.460	15.400	0.001##	

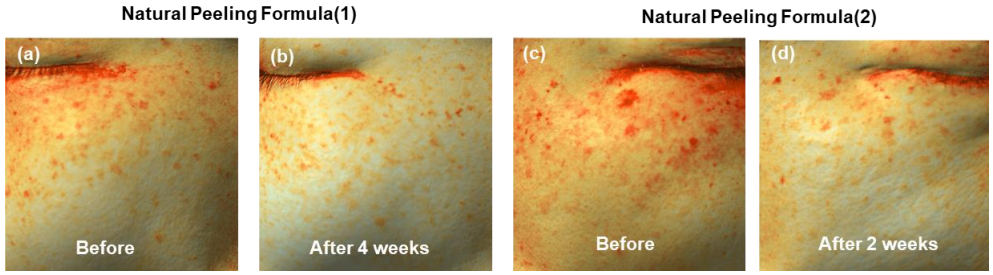

Figure 6. Pigmentation remove effect measurement results taken with Melanin Mode of Antera 3D CS (Miravex Ltd., Ireland) after using cosmetics with Natural Peeling formulas (a) Before image of face using Natural Peeling formula(1), (b) After 4 weeks image using Natural Peeling formula(1), (c) Before image of face using Natural Peeling formula(2) (d) After 2 weeks image using Natural Peeling formula(2)

⑥ The test product, Natural Peeling formulas are judged to be a product that helps improve lifting effect. The improvement rate of lifting effect was significantly increased immediately after use, and 2~4weeks ($p<0.05$) (Table 7). The mean improvement rate of lifting effect increased 5.65% for cosmetic with Natural Peeling formula(1) (from 31.593 to 29.808, $p = 0.000$) and 5.98% for cosmetic with Natural Peeling formula(2) (from 33.219 to 31.230, $p = 0.000$).

Table 7. Results of Human application test on lifting effect

Test-6	Lifting measurement results, angle(°)				Improvement rate(%)			*p*-value ## $p<0.017$, **, ŦŦ $p<0.05$	
	before	Immediately after use	after 2 weeks	after 4 weeks	Immediately after use	after 2 weeks	after 4 weeks	Intra-military comparison	Inter-military comparison
natural peel formula(1)	31.593 ± 4.275	31.154 ± 4.249	30.394 ± 4.020	29.808 ± 4.193	1.390	3.795	5.650	0.000**	*
natural peel formula(2)	33.219 ± 3.744	32.577 ± 3.658	31.912 ± 3.771	31.230 ± 3.687	1.933	3.934	5.988	0.000**	

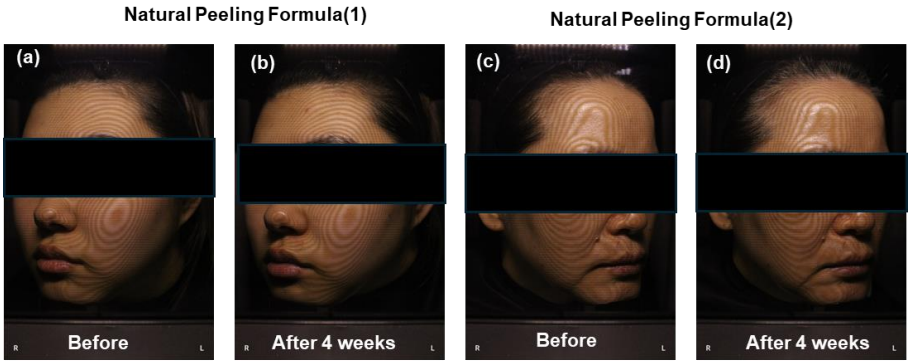

Figure 7. Lifting effect measurement results taken with Image-pro® plus (Media Cybernetics, USA) after using cosmetics with Natural Peeling formulas (a) Before image of face using Natural Peeling formula(1), (b) After 4 weeks image using Natural Peeling formula(1), (c) Before image of face using Natural Peeling formula(2) (d) After 4 weeks image using Natural Peeling formula(2)

⑦ The test product, Natural Peeling formulas are judged to be a product that helps improve wrinkle decreasing effect. The improvement rate of wrinkle decreasing effect was significantly increased immediately after use, and 2~4weeks ($p<0.05$) (Table 8). The mean improvement rate of wrinkle decreasing effect increased 31% for cosmetic with Natural Peeling formula(1) (from 0.095 to 0.065, $p = 0.000$) and 23% for cosmetic with Natural Peeling formula(2) (from 0.103 to 0.079, $p = 0.000$).

Table 8. Results of Human application test on wrinkle decreasing effect

Test-7	Results of wrinkle measurement, Depth(㎜)				Improvement rate(%)			*p*-value ## $p<0.017$, **, ŦŦ $p<0.05$	
	before	Immediately after use	after 2 weeks	after 4 weeks	Immediately after use	after 2 weeks	after 4 weeks	Intra-military comparison	Inter-military comparison
natural peel formula(1)	0.095 ± 0.042	0.074 ± 0.034	0.083 ± 0.042	0.065 ± 0.02	22.105	12.632	31.579	0.000##	0.047ŦŦ
natural peel formula(2)	0.103 ± 0.060	0.087 ± 0.057	0.083 ± 0.056	0.079 ± 0.044	15.534	19.417	23.301	0.000##	

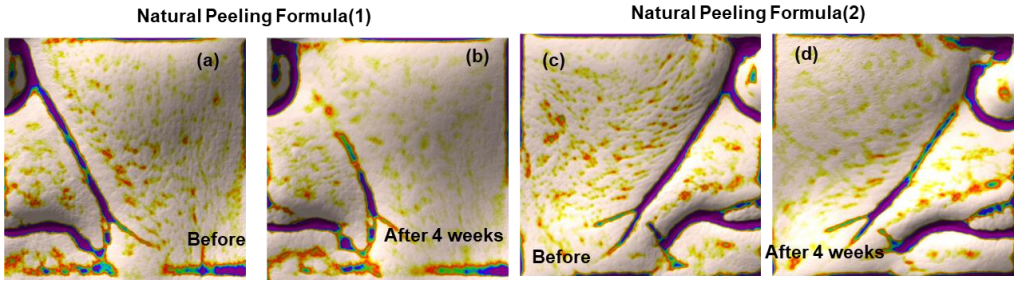

Figure 8. Wrinkle decreasing effect measurement results taken with Wrinkle Mode of Antera 3D CS (Miravex Ltd., Ireland) after using cosmetics with Natural Peeling formulas (a) Before image of face using Natural Peeling formula(1), (b) After 4 weeks image using Natural Peeling formula(1), (c) Before image of face using Natural Peeling formula(2) (d) After 4 weeks image using Natural Peeling formula(2)

3-4. The Result Primary irritation test on human skin of Natural Peeling formulas.

In the 24 hours occlusive patch test, the mean skin reaction score of the tested of Natural Peeling formulas was shown in Table 9. Natural Peeling formulas show that they can be used safely on the skin without irritation.

Table 9. Results of human patch test

No.	Sample name	Mean score	Grade
1	Natural Peeling formula (1)	0.00	non-irritant
2	Natural Peeling formula (2)	0.00	non-irritant

3-5. The Result Primary irritation test on human skin targeting sensitive skin of Natural Peeling formulas.
In the 24 hours occlusive patch test, the mean skin reaction score of the tested of Natural Peeling formulas was shown in Table 10. Natural Peeling formulas show that they can be used safely on the sensitive skin without irritation.

Table 10. Results of human patch test in sensitive skin

No.	Sample name	Mean score	Grade
1	Natural Peeling formula (1)	0.00	non-irritant
2	Natural Peeling formula (2)	0.18	non-irritant

4. Discussion

Skin aging is one of the most concerned in women, and it can be noticed as wrinkles, sagging, uneven skin tone, and dull or dry skin [5].The causes of skin aging can be categorized into intrinsic and extrinsic factors. Extrinsic factors especially ultraviolet are superimposed on intrinsic factors and account for most age-associated changes in skin appearance. Ultraviolet irradiation causes the aging skin by producing free radicals and reactive oxygen species (ROS), which interferes collagen synthesis, degrades collagen and elastin, and damages lipid component of membranes leading to ceramide and arachidonic acid release causing more water loss and more inflammation, respectively [6]. Facial skin brightening encompasses abundant light reflection from an evenly pigmented skin surface conferring the visual appearance of healthy skin. Since skin brightening is multifactorial, this formulation was designed to brighten the skin by containing an innovative combination of active ingredients [7]. Chemical peeling is grounded on the scientific foundation of skin restorative pattern observed with chemical burns. For decades, this technique of skin rejuvenation has been in fashion, however, in less refined ways. They help in achieving skin radiance and luminosity with youthful smoother tighter, more even toned textured skin with refreshed appearance [8, 9]

To provide anti-aging & brightening effect to the skin, topical products may combine various ingredients. The present evaluation revealed improvements in skin aging, pigment appearance, dry skin and slowing of the epidermal turnover rate that were in agreement with the anti-aging & brightening effects of topical cosmetics with natural peeling formulas on Korean women. And this study revealed that the natural peeling formulas with Natural Peeling Solution and Lactic acid bacteria (LAB) is expected superior skin keratin turnover activity. And it was found that when applied to the skin for 4 weeks, the skin aging phenonmenon was significantly improved immediately after use and after 2, 4 weeks of use.

5. Conclusion

The novel natural peeling formulas with Natural Peeling Solution and Lactic acid bacteria (LAB) developed through this study exhibited good potential as anti-aging cosmeceutical formulation. And it considered to be substitutable the existing chemical peeling agent like AHA and can be used as a peeling system that is safe for the skin.

Acknowledgments.
This research was supported by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number : HP20C0085) and by the Technology development Program(S2694472) funded by the Ministry of SMEs and Startups (MSS, Korea).

References.

1. Ye-On J, Haengdueng J, Yejin C, Eun-Ok L, Hye-Won J, Jinwook K, Ki Taek N, Kyung-Min L (2019) Lysates of a probiotic, Lactobacillus rhamnosus, Can Improve Skin Barrier Function in a Reconstructed Human Epidermis Model, Int.J.Mol.Sci. 20:4289-4301
2. Hye Yeon L, Deok J, Sang Hee P, Kon Kuk S, Yo Han H, Eunji K, Yeong-Gyeong Y, Tae-Rahk K, Hun K, Jongsung L, Jae Youl C. (2020) Int.J.Mol.Sci. 21:1620-1635.
3. Ia K, Eile B, Susanne F, Johanna M. (2019) Lactobacillus reuteri DSM 17938-A comparative study on the effect of probiotics and lysates on human skin. Experimental Dermatology. 28:822-828
4. Gueniche A, Philippe D, Bastien P, Reuteler G, Blum S, Castiel-Higounenc, Breton L, Benyacouub, (2014) Randomised double-blind placebo-controlled study of the effect of lactobacillus paracasei NCC 2461 on skin reactivity. Benificial Microbes. 5(2):137-145
5. Pattarawan R, Rungsima W, Akkarach B, Mart M (2020) Anti-Aging and brightening effects of topical treatment containg vitamin C, Vitamin E, and raspberry leaf cell culture extract: A split-face, randomized controlled trial. J Cosmet Dermatol 10:671-676.
6. Yaar M, Gilchrest B. (2007) Photo ageing: mechanism, prevention and therapy. Br J Dermatol.157(5):874-887.
7. Zoe Diana D, Isabel D, Aaron C, Junhong M, Thomas B (2020) A novel skin brightening topical technology. J.Cosmet Dermatol 19:3280-3285.
8. Bari AU, Iqbal Z, Rahman SB (2005) Tolerance and safety of superficial chemical peeling with salicylic acid in various facial dermatoses. Indian J Dermatol Venereol Leprol.71:87-90.
9. Rendon MI, Berson DS, Cohen JL, et al. (2010) Evidence and considerations in the application of chemical peels in skin disorders and aesthetic resurfacing. J Clin Aesthet Dermatol.3:32-43.