



# The Transdermal Absorption of Retinol and Retinyl Palmitate in Cosmetics Formulations

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### Introduction:

Since The Cosmetic Ingredient Review (CIR) Expert Panel concludes that retinol and retinyl palmitate are safe as cosmetic ingredients in the present practices of use and concentration in 1987. There are numerous studies concerning about the safety and stability of retinol and retinyl palmitate thereafter.

Retinol and retinyl palmitate are commonly used in topical antiaging preparations. Retinol and its derivatives have shown great benefit in treating the signs of aged skin.[1][2] In 2016, the SCCS issued the opinion SCCS/1576/16 on Vitamin A concluding that its use as a cosmetic ingredient is safe at given concentrations for body lotions and face creams, leave-on (other than body lotions) and rinse-off products.[3] Transdermal absorption can be affected by numerous factors including the structure and concentration of active ingredients, type of formulations, temperature and etc.. The transdermal absorption efficiency can by increased by using enhancer. The enhancing mechanism can be due to a single model or combined with multiple models.[4]

Therefore, a clear understanding about the transdermal absorption of retinol and retinyl palmitate is essential for the safety evaluation of these ingredients in cosmetics.

# Materials & Methods:



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						enuition	emulsion								emultion	enultion			
Nermulation	1391	No.3	59.2	No.3	Ni.4	No.3	764.8	59.7	769.8	Nonuclation	Base 2	59.11	59.12	No.13	No.14	No.15	764.16	59.17	No.18
Phase A										Phase A									
Olivers 1000								1.00		Olivern 1000								1.00	
Capitylic/										Caprylic/									
Capit: Triplycende								6.00	4.00	Capits Triglycende								6.00	6.00
Mineral all								13.00	15.00	Mineral at								13.00	13.00
Kopropyl palmitate								1.00	3.00	teopropyl palmitate								3.00	3.00
Squatere								6.00	6.00	Spalere								6.00	6.00
Oliven 900									3.00	Cliven 900									3-00
Phase 8										Place E									
Propylene Olycol	0.00	3.00	1000					3.00	3.00	Propylene Diyod	0.00	3.00	10.00					5.00	3.00
1,3-Batylene Glycol				3.00	30.00					1.3-Butylene Glycol				3.00	13.00				
dipoeta						3.00	12.00			Glycevia						3.00	10.30		
Dubled Water	19.30	34.10	4510	54.10	49.30	54.32	48.10	30.20	48.20	Distile/Water	18.12	54.10	49.30	14.12	49.10	54.10	49.10	50.20	48.30
Xanthan Sun( 1N)	30.00	32.00	35.00	30.00	30.00	30.00	32.00	8.00	8.00	Xanthan Gum( 25)	32.00	30.00	30.00	30.00	32.00	30.00	30.00	3.00	8.00
Germades 11	0.30	0.50	0.90	630	0.30	0.50	0.90	0.50	0.90	Gernüben II	0.50	0.50	0.30	0.50	0.50	0.90	0.30	0.30	0.30
1728-276	0.10	0.30	0.10	0.10	0.10	0.30	0.10			17DA-2No	0.10	0.10	0.10	0.30	0.10	0.10	0.10		
Phase C										Place C									
Recipul doll and				_						retired patrotate ETE and									
Polycorbate 22 and	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	Asachis Hypogana oil and	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
ERT and EHA										Tasapheral									
p23	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	µ23	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.90
Twees 80	2.00	2.00	2.00	2.00	2.00	2.00	2.00			Tween 80	2.00	2.00	2.00	2.00	2.00	2.00	2.00		
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# **Results & Discussion:**

title 1. The results of transform	d description	d essence wi	horizad				
Permulation	Range 1	No.1	Ain 2	No.3	No.4	Au.1	No.6
Applied mass. (vid)	8734943	356.de16.1	86.942.9	88.5+28.0	387 1421 8	1120414	333.3+12.6
Residue mass in danar cell (vil)	148.0488.0	206.3x33.0	239 (m.G. 9	206.3+38.5	187.4+65.4	242.5x29.4	215.4428.6

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Formulation	No.1	No.7	No.8
Applied mass(jag)	356.6414.1	397.9x28.0	268.0+11.0
Residue mass in donor cell(µg)	206.3x23.0	131.0+64.1	153.9+45.0
amounts on cotton bud(µg)	51.9433.0	175.1x64.0	150.8x33.2
amount on stripping tape(jug)	14.0x11.3	12,2x3.7	21.1+4.8
amount diffused into the skin(µg)	35.8x10.6	61.4x10.8*	48.7x10.8
amount collected in receptor(µg)	35.8+16.2	10.645.5	2.9x0.5*
transdermal absorption amount(jag)	71.2419.6	72.0x7.1	\$1.7411.2**
Recovery (%)	95.4x10.0	98.4128.6	102.6414.2
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\*\*a<0.05 similicant difference to a/w emulsi

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Formulation	No.11	No.17	No.18
Applied mass(ag)	354.21+14.88	344.23+13.76	354.60x15.96
Residue mass in donor cell(jug)	132.68x20.16	104.40+16.44	147.82x25.6
amounts on cotton bud(jag)	102.13x39.63	128.80x35.54	118.23x37.3
amount on stripping tape(µg)	\$1.9147.98	42.72x8.88	41.76+4.33
amount diffused into the skin(µg)	71.28x11.11	\$5.66x17.10	27.32±17.17
amount collected in receptor(µg)	0.00+0.00	0.00+0.00	0.00+0.00
transdermal absorption amount(µg)	71.28x11.11	\$5.66x17.10	37.32+17.17
Recovery (N)	101.0747.57	99.29x12.37	97.33+7.03

>:0.05 significant difference to esse

The results show that retinol has stronger transfer ability to diffuse into and delivered across of the dermal layer than retinyl palmitate. Higher molecular weight of retinyl palmitate is harder to move cross the stratum corneum, which is demonstrated by the determined amount on stripping tape, which is around 3-6% for retinol and around 11-20% for retinyl palmitate for all the tests.

Without enhancer, the transdermal absorption amount, the amount diffused into the skin and the amount delivered across the skin, of retinyl palmitate is around two third of that of retinol. With 5% propylene glycol as enhancer in essence, the transdermal absorption amount of retinol and retinyl palmitate are both increased to around 20% and retinyl palmitate is all stayed at the dermal layer.

For comparing the effect of formulation type on the transdermal absorption, the transdermal absorption amount of retinol is almost the same for essence and o/w emulsion, however the transdermal absorption amount of retinyl palmitate is slightly lower in o/w emulsion than in essence. Nevertheless, the transdermal absorption amount of retinol and retinyl palmitate in w/o emulsion is the lowest among the three formulation types.

About the effect of enhancer type and concentration on the transdermal absorption, it was studied only for essence. Generally, essence with enhancer, propylene glycol gives better transdermal absorption result than 1,3-Butylene glycol and then glycerin. 5% propylene glycol, 1,3-Butylene glycol or glycerin also shows better transdermal absorption result than 10% propylene glycol, 1,3-Butylene glycol or glycerin. It was also noticed that retinyl palmitate is all retained on the dermal layer without transfer across it. Furthermore, 5% propylene glycol and 5% glycerin are giving higher amount delivered across the dermal layer.

### **Conclusions:**

The retained amount in dermal layer of retinyl palmitate from essence and o/w emulsion are higher than retinol.

For cosmetics, use retinyl palmitate as active gradient with enhancer may be able to decrease the active gradient concentration in the formulation and still achieve the effective concentration with less safety concern.

#### Acknowledgements:

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