

UNIMER U-6

FILM - FORMING POLYMER FOR COSMETICS

UNIMER U-6

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1. Characteristics

Composition	Unimer U-6 is an alkylated vinylpyrrolidone copolymer.
Appearance	White to yellowish, waxy solid with a weak, characteristic odor Melting range at approx. 70°C. Unimer U-6 is supplied in pastilles form
Analytical data	See specification.
Solubility	Soluble in cosmetic lipids such as mineral oil, ester oils or triglycerides. Insoluble in ethanol and water.
Properties	<p>Unimer U-6 shows exceptional pigment dispersing properties as well as ideal film-forming properties.</p> <p>Unimer U-6 is not sticky.</p> <p>Unimer U-6 is a waxy emollient with skin protecting properties.</p> <p>Unimer U-6 is dermatologically tested. A closed patch test was performed at the back of 50 volunteers with 30% Unimer U-6 in Miglyol 812. None of the volunteers exhibited any skin changes whatsoever in the test region after 48 and 72 hours. According to the test results the product is classified regarding possible skin irritating properties as harmless.</p> <p>The mucous membrane compatibility of Unimer U-6 was determined by means of alternative in vitro technology. Unimer U-6 was tested in the undiluted state on a proven corneal model composed of cultivated human keratinocytes. The corneal model underwent an MTT test after a contact time of 10 minutes, 1, 3 and 24 hours (Acute Ocular Toxicity in vitro Test). The product was classified as only slightly irritant to the human reconstituted cornea and thus as harmless.</p>
Use	<p>Because of the film-forming and water-repellent properties, the favored application of Unimer U-6 is for sun care products.</p> <p>Even in a low concentration, the addition of Unimer U-6 gives a significant increase of the sunburn protection factor (SPF) and the wash-off resistance of the formulation.</p> <p>Furthermore Unimer U-6 is an excellent pigment dispersant and film-forming agent and therefore a useful ingredient for color cosmetics, e.g. eyeliners, mascaras, eye shadows and lipsticks.</p> <p>Unimer U-6 is a versatile additive also for all types of face care and body care products.</p> <p>Unimer U-6 containing products form moisture balancing water-resistance films on the skin, which is of great value in protective creams and lotions. They are not sticky and have no occlusive effects.</p>
Dosage	1-5%, depending on the application

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Storage	5°C - 25°C (see safety data sheet)
Shelf life	2 years (see specification)
Processing	Unimer U-6 is rather stable and can easily be processed under conditions common in cosmetic manufacturing.
Biodegradability	A biodegradability of 85% was determined with the OECD 301 D „Closed Bottle Test“. Unimer U-6 can thus be regarded as readily biodegradable.

Identification

INCI Monograph ID	INCI Name	Chinese Name	CAS No.
5297	Triacotanyl PVP	蜂花烷基 PVP	136445-69-7

2. Unimer for wash-off-resistant products

Influencing the wash-off - resistance of sun-protection formula with Unifilter B-42 by means of various Unimer types

2.1 Introduction

Film-forming substances such as, for example, various types of Unimers by Induchem AG, are known to be capable of enhancing the water-resisting properties of sun-protection formulation with UV-absorbing filter substances. In order to be able to quantify these effects which are of special importance for the long-term effectiveness of sun-protection preparations, we commissioned an in vivo study of the water-resistance (wash-off resistance) of sun-protection preparations containing Unifilter B-42 and various fractions of a number of different types of Unimers.

2.2 Materials and methods

To determine the influence of Unimer U-6, Unimer U-15 and Unimer U-151 (1) on water-resistance, sun-protection preparations were made up as indicated in the following table. The various formulations differed only in content and type of the various Unimers (varying from 0 to 6% merely at the expense of the water-content in each case). A 10% Unifilter B-42 (2) was used as UV-filter in all formulations.
(Ethylhexyl Methoxycinnamate, Ethylhexyl Triazone, 4-Methylbenzylidene Camphor, Glycereth-26)

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Designation	INCI	L45872-1	L46033-2	L46033-3	L46033-4	L46033-5	L46033-6
Water	Aqua	61.6%	63.1%	61.6%	61.6%	64.6%	58.6%
Unicide U-13	Imidazolidinyl Urea	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Sepigel 305	Polyacrylamide C13-14 Isoparaffin Laureth-7	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
Crodamol AB	C12-15 Alkyl Benzoate	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Tegocare PS	Methyl Glucose Sesquistearate	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Lipocol S-20	Steareth-20	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Uniphen P-23	Phenoxyethanol Methylparaben Butylparaben Ethylparaben Propylparaben	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Silikonöl DC200-100	Dimethicone	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Unifilter B-42	Ethylhexyl Methoxycinnamate Ethylhexyl Triazone 4-Methylbenzylidene Camphor Glycereth-26	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Unimer U-6	Triacotanyl PVP	3.0%	1.5%				6.0%
Unimer U-15	VP / Eicosene Copolymer			3.0%			
Unimer U-151	VP / Hexadecene Copolymer				3.0%		
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 1: The influence of Unimer U-6, Unimer U-15 and Unimer U-151 (1) on water-resistance

The water-resistance was determined by an external lab with 4 test samples each (3).

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2.3 Results

The results obtained can be seen from the following figure and table:

Formulation	Unimer U-6	Unimer U-15	Unimer U-151	Wash-Off Resistance (in vivo)
L-46033-5 (Placebo)				52.3 %
L-46033-2	1.5 %			70.8 %
L-45872-1	3.0 %			84.6 %
L-46033-6	6.0 %			77.8 %
L-46033-3		3.0 %		88.3 %
L-46033-4			3.0 %	79.3 %

Table 2: Results

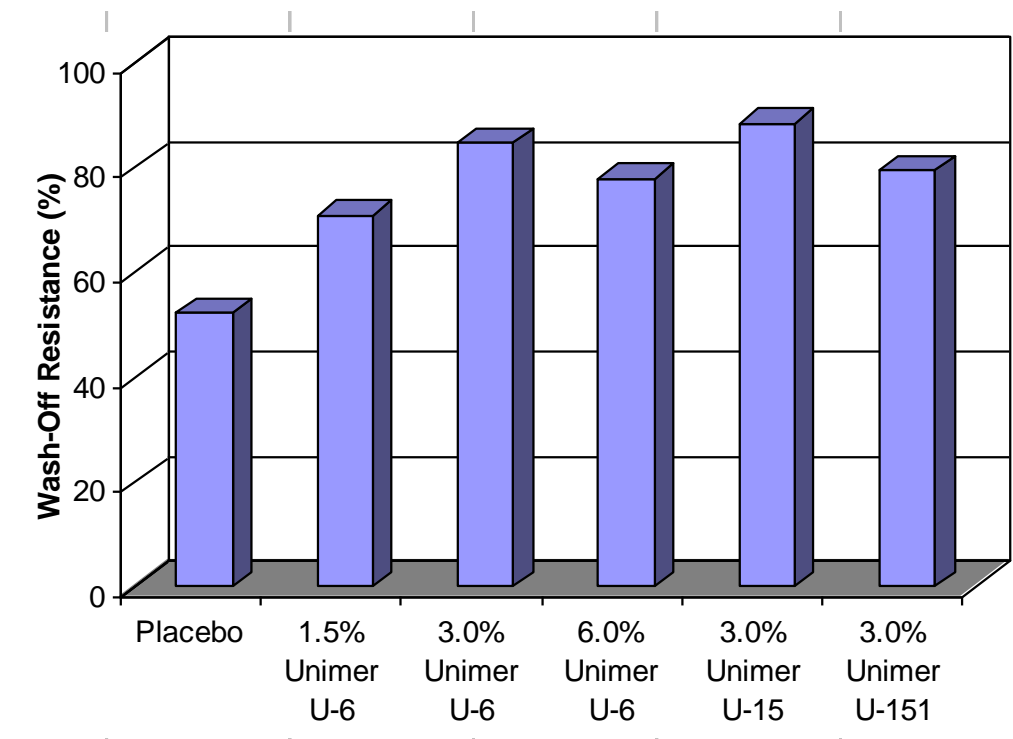


Figure 1: Results

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2.4 Conclusions

The investigations showed that by adding Unimers to sun-protection formulation, a considerable enhancement of water-resistance can be achieved. Whereas with a placebo formulation devoid of Unimer, a water-resistance of around 50% can be achieved, by adding 3% Unimer an improvement of some 80% was noted. The difference between the various types of Unimer resides in the area of precision of measurement. The addition of 3% Unimer seems, for the tested formulations at least, to be the optimum concentration.

2.5 References

1. Induchem AG: Unimer U-6, Unimer U-15 and Unimer U-151 sales documentation.
2. Induchem AG: sales documentation Unifilter B-42.
3. Schwarzenbach, R. *et al.* Determination of Wash-Off Resistance of UV-Filters *Cosmetics and Toiletries Manufacture Worldwide* 193-195 (1996).

3. Unimer U-6 as SPF-Booster

Concentration dependent influence of Unimer U-6 on the sun-protection-factor in sun-protection-formulations with Unifilter B-42

3.1 Introduction

Film-forming substances such as, for example, Unimer U-6 (TriacontanylPVP) are known to enhance the sun-protection factor of sun-protection formulations with UV-absorbing filter-substances. Numerous attempts to quantify this effect by determining the sun-protection-factor (SPF) in vitro have unfortunately shown that this extremely cost-effective method for determining SPF is inappropriate for formulations involving film-forming ingredients, or else that, contrary to in vivo SPF determination, the SPF-enhancing effect of the so-called SPF-booster cannot be shown. Based on this realisation, we have had an in vivo study conducted to determine the sun-protection factor using sun-protection preparations with different proportions of Unimer U-6.

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3.2 Material and methods

The sun-protection preparations shown in following table were produced to investigate the concentration-dependent influence of Unimer U-6 (1) on the sun-protection factor. The only difference between the various formulations is the Unimer U-6 content (varying from 0 to 6% merely at the expense of the water-content in each case). A 4% Unifilter B-42 (2) was used as UV-filter in all formulations.

Designation	INCI	L46053-1	L46053-2	L46053-3	L46053-4
Water	Aqua	70.6%	69.1%	67.6%	64.6%
Unicide U-13	Imidazolidinyl Urea	0.3%	0.3%	0.3%	0.3%
Sepigel 305	Polyacrylamide C13-14 Isoparaffin Laureth-7	0.8%	0.8%	0.8%	0.8%
Crodamol AB	C12-15 Alkyl Benzoate	20.0%	20.0%	20.0%	20.0%
Tegocare PS	Methyl Glucose Sesquistearate	1.0%	1.0%	1.0%	1.0%
Lipocol S-20	Steareth-20	1.0%	1.0%	1.0%	1.0%
Uniphen P-23	Phenoxyethanol Methylparaben Butylparaben Ethylparaben Propylparaben	0.3%	0.3%	0.3%	0.3%
Silikonöl DC200-100	Dimethicone	2.0%	2.0%	2.0%	2.0%
Unifilter B-42	Ethylhexyl Methoxycinnamate Ethylhexyl Triazone 4-Methylbenzylidene Camphor Glycereth-26	4.0%	4.0%	4.0%	4.0%
Unimer U-6	TriacantanylPVP	-	1.5%	3.0%	6.0%
Total		100.0%	100.0%	100.0%	100.0%

Table 3: Sun-protection preparations

An external lab determined the SPF according to COLIPA using 5 volunteer each.

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3.3 Results

The results obtained can be seen from the following table and figure:

Formulation	Unimer U-6	SPF (in vivo)
L-46053-1	0.0 %	6.2
L-46053-2	1.5 %	14.9
L-46053-3	3.0 %	22.3
L-46053-4	6.0 %	24.9

Table 4: Results

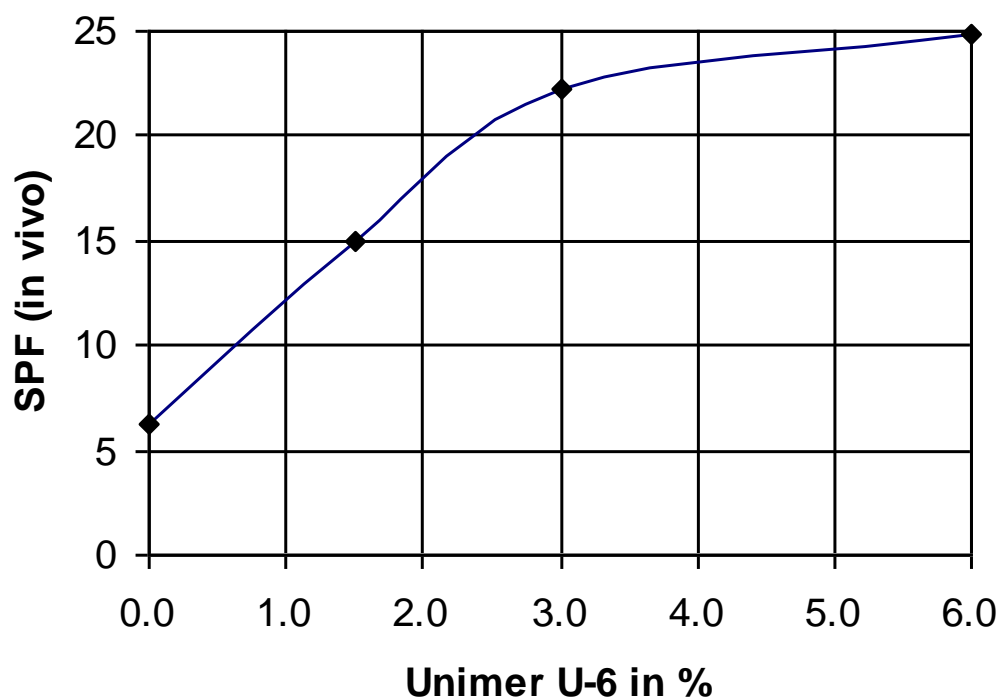


Figure 2: Results

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3.4 Conclusions

It was possible to show a clear, concentration-dependent SPF enhancement by the addition of Unimer U-6 to sun-protection formulations. The addition of 3% Unimer U-6 seems, at least for the tested formulation, to be the optimum concentration. These results are in agreement with those presented at the Forum Cosmeticum 2002, 24.-26. April 2002, Innsbruck (3).

3.5 References

1. Induchem AG Unimer U-6 sales documentation.
2. Induchem AG Unifilter B-42 sales documentation.
3. Schwarzenbach, R. and Huber, U. Optimization of Sunscreen Efficacy; *SÖFW-Journal* **128** (Juni 2002).

Our indications and recommendations have been worked out to the best of our knowledge and conscience, but without any obligation from our part. In particular, we do not take any responsibility concerning protection rights of a third party.