

Allergic contact dermatitis from sodium dihydroxycetyl phosphate, a new cosmetic allergen?

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Sodium dihydroxycetyl phosphate (trade name Dragophos S 2/918501) was identified as a contact allergen in a herbal moisturizing cream causing severe acute contact dermatitis on the hands and face of a 41-year-old woman. Sodium dihydroxycetyl phosphate is a complex mixture of phosphate esters of dihydroxycetyl alcohol, and subsequent analysis and testing revealed hexadecane-1,2-diol as 1 of the allergenic ingredients. Another possible allergen in the compound appears to be hexadecane-1,2-diol, 2-isopropyl ether.

Key words: allergic contact dermatitis; cosmetics; emulsifiers; surfactants; cross-sensitivity; phosphorus compound; sodium dihydroxycetyl phosphate; hexadecane-1,2-diol. © Munksgaard, 2001.

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Phosphorus compounds are used in cosmetic applications as surfactants, wetting agents and emulsifiers. They are primarily organic esters of orthophosphoric acid (1) and contact allergy to these substances apparently is uncommon. To our knowledge, only 1 previous report has documented contact allergy to similar compounds, describing 2 patients reacting to DEA-dihydroxypalmityl phosphate and isopropyl hydroxypalmityl ether in a facial beauty lotion (2).

We report a case of allergic contact dermatitis from sodium dihydroxycetyl phosphate; this is the sodium salt of a complex mixture of phosphate esters of dihydroxycetyl alcohol, and was used as a surfactant in a herbal moisturizing cream. The surfactant was analysed to identify allergenic components.

Case Report

A 41-year-old woman, with previous childhood atopic dermatitis, was admitted with acute severe confluent oedematous eczema localized to the face, neck and hands. She was treated with systemic prednisolone, and underwent allergological testing after clearing of the eczema.

Standard prick tests were positive to dust mite, cat and latex. She had a clinical history of contact urticaria from latex gloves and a slight tendency to hand dermatitis. Prior to onset of eczema she

had used 3 different herbal moisturizing creams. Patch tests with the European standard series supplemented with topical products were positive to only 1 of the moisturizing hand creams.

Product information and chemical analyses

The herbal cream causing the allergic contact dermatitis was Dr. Scheller, Arnica, herbal blossom hand cream (Apotheker Dr. Scheller, Göppingen, Germany). The manufacturer kindly supplied all ingredients and product information. The concentration of sodium dihydroxycetyl phosphate (SDP) (Dragophos S 2/918501, Dragoco Inc., PA, USA) in the cream was given as in the range of 1–5%.

A 4% ethanol extract of SDP was fractionated by the use of an Al₂O₃ column and elution with hexane, hexane-ethanol mixtures and ethanol. The chemical substances were identified by gas chromatography – mass spectrometric (GC-MS) analysis. As shown in Fig. 1A, the SDP extract contains 1-hexadecene, hexadecan-2-one, isopropyl myristate, hexadecane-1,2-diol, and an unknown substance (possibly isopropyl ether of hexadecane-1,2-diol).

Supplementary patch tests

Supplementary patch tests showed only 1 positive reaction, a +++ reaction to SDP 5% pet (Table

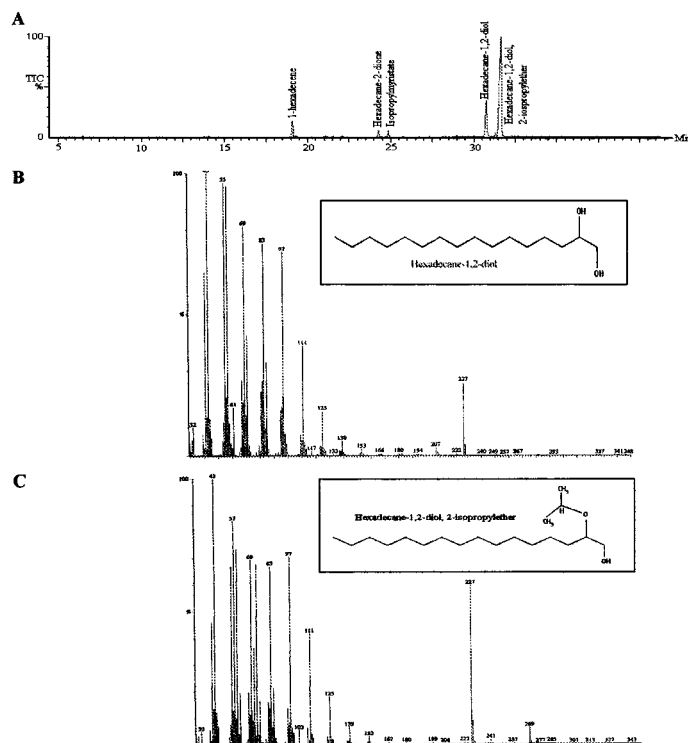


Table 1. Results of patch tests

Number of test	Substances	Concentration	Reaction	
			D3	D7
1st series	European standard series		—	—
	Dr. Scheller Arnica hand cream		++	+
2nd series	arnica ingredients except SDP SDP		—	—
		0.1% aq.	+	
		0.25% aq.	+	
		0.5% aq.	++	
		1% aq.	++	
		2% aq.	+++	
3rd series	ethanol extract of SDP	5% pet.	+++	++
		4% eth.	++	
4th series	fraction I (substance 1 – 5)* fraction II (substance 1)* fraction III (substance 1, 2 less 4, 5)* fraction IV (substance 4, 5)*	1% eth.	++	
		10% eth.	—	
		10% eth.	?+	
		10% eth.	+	
5th series	hexadecan-2-one isopropyl myristate hexadecane-1,2-diol	3% eth.	—	
		20% pet.		
		3% eth.	+	?+
	hexadecane-1,16-diol hexadecan-3-one hexane-1,2-diol DEA-hydroxypalmitylether/palmityl phosphate	0.3% eth.	—	—
		1% eth.	—	
		1% eth.	—	
		1% eth.	—	
		0.1% aq.	—	
		0.25–2% aq.	++-+++	
		5% pet.	?+(8), - (12)	—
		1% aq.	?+(1), - (19)	—
Controls	SDP (20 patients)			
	SDP (20 patients)			

*4 fractions of the 4% ethanol extract of SDP were obtained by use of an Al_2O_3 column and elution with hexane/ethanol. 5 chemical substances were identified by gas chromatography – mass spectrometric analysis numbered from substance 1 to 5 as follows: (i) 1-hexadecan, (ii) 2-hexadecanone, (iii) isopropyl myristate, (iv) hexadecan 1,2-diol, (v) unknown substance possibly isopropyl ether of hexadecan 1,2-diol.

cane-1,2-diol. It was not possible to confirm the identity of this substance, as a reference compound was not available for analysis and testing. This substance constituted about 25% of the ethanol extract (corresponding to approximately 1% in SDP, calculated as hexadecane-1,2-diol).

Interestingly, the patient also reacted to the DEA-hydroxypalmitylether and palmityl phosphate mixture, as well as to a neutralized mixture of these components previously reported as contact allergens (2). Both are phosphorus compounds produced at the same factory, 1 of them having the same trade name, and used as surfactants in creams. The reason for the cross-reactivity is not clear. However, it may be possible that the same allergenic site (chemical structure) – ether of a fatty alcohol/diol – present in the 2 technical compounds, is responsible for the skin reactions. It would be interesting if the emulsifier were available for patch testing without this particular component. Further research is needed to establish the allergenic potential of ethers of fatty alcohols/diols, which may be present as impurities in emulsifiers synthesised from fatty alcohols.

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