

- CONTRIBUTIONS TO THIS SECTION MAY NOT UNDERGO PEER REVIEW, BUT WILL BE REVIEWED BY THE EDITOR •

Occupational contact allergy to sodium cocoamphopropionate in a hand cleanser

Maria Pesonen, Sari Suomela, Outi Kuuliala and Kristiina Aalto-Korte

Occupational Medicine, Finnish Institute of Occupational Health (FIOH), 00290 Helsinki, Finland

doi:10.1111/cod.12474

Key words: aminoethylethanolamine; amphotoacetates; disodium cocoamphodipropionate; occupational dermatitis; sodium cocoamphoacetate; sodium lauroamphoacetate; surfactant.

Sodium cocoamphopropionate (INCI; CAS 132647-08-6; alternatively 93820-52-1) is an amphoteric surfactant that is used in skin cleansers, shampoos and hair conditioners as a foaming and cleansing agent. We report 5 cases of occupational contact dermatitis caused by sodium cocoamphopropionate in a disinfectant hand cleanser. All of the patients had been using the same hand cleanser brand, which contains 2.0% sodium cocoamphopropionate. Four of them were employees of an international fast-food restaurant chain, and 1 was a nurse in a surgical department.

Cases

Case 1

A 34-year-old nurse who worked in a surgical department suffered from work-related hand and forearm dermatitis. At work, she washed her hands and forearms with a disinfectant hand cleanser (Sensisept H34®). As she showed a positive patch test reaction to the hand cleanser (tested as a dilution series from 20% to 3.2%; Table 1), we obtained the ingredients of the product, including sodium cocoamphopropionate (Rewoteric® AM KSF 40; Evonik Industries, Essen, Germany), and patch tested them along with three related surfactants: sodium cocoamphoacetate, sodium lauroamphoacetate and disodium cocoamphodipropionate, and aminoethylethanolamine (AEEA) (Table 1).

Cases 2–5

These patients were young women aged 20–28 years. One of them had had atopic dermatitis in childhood, but

the other 3 had no previous history of dermatitis. All developed hand eczema after working for a few months in a fast-food restaurant. In 1 case, the patient's hand eczema occurred as early as 1 month after she began fast-food restaurant work. At work, the patients washed their hands with disinfectant hand cleanser (Sensisept H34®) several times an hour, as instructed.

We performed the patch tests on all of the patients with Finn Chambers® (Smart Practice, Phoenix, AZ, USA), and according to ICDRG recommendations. We read the tests two or three times [on day (D)2, D3, and D4, or D2, D3, and D6, or on D2 and D5], depending on the day of the week on which the test patches were applied. Patch tests were performed on all of the patients with a baseline, antimicrobial and cosmetic ingredients series, as well as with the patients' own workplace materials, including the hand cleanser, and with individual test substances related to sodium cocoamphopropionate (Table 1).

Of our patients, cases 1, 2 and 5 were patch tested with AEEA. Case 1 showed a doubtful reaction to AEEA. As part of her examination, we analysed the AEEA content of the sodium cocoamphopropionate product (Rewoteric® AM KSF 40) by using liquid chromatography, and found that AEEA was undetectable. Case 2 had a doubtful patch test reaction to AEEA 0.1%, but did not react to a higher concentration of AEEA (Table 1). Hence, these findings do not prove AEEA to be the contact allergen in cases 1 and 2. AEEA was also tested in the most recent of our patients, case 5. She showed a strong patch test reaction to 1% AEEA (+++), but only a doubtful reaction to 0.32% AEEA.

Discussion

Two cases of occupational contact dermatitis in fast-food restaurant workers caused by sodium cocoamphopropionate in disinfectant hand cleanser have been recently reported in Sweden (1). We report 5 cases of occupational contact dermatitis caused by sodium

Correspondence: Maria Pesonen, Occupational Medicine, Finnish Institute of Occupational Health, Topeliuksenkatu 41 aA, FI-00250 Helsinki, Finland. Tel: +358 30 4741; Fax: +358 9 5875449. E-mail: maria.pesonen@ttl.fi

Funding: None.

Conflicts of interest: The authors declare no conflict of interests.

Table 1. Patient cases and patch test results

Patient no., age (years), year of examination	Patch test results on final reading (D4, D5, or D6)						
	Sensisept H34® hand cleanser*	Sodium cocoamphopropionate†	Sodium cocoamphoacetate‡	Sodium lauroamphoacetate§	Disodium cocoamphodipropionate¶	Aminoethyl- ethanolamine**	Other test substances
1, 34, 2002	20% pet. +	10% pet. ++	10% pet. ?+	10% pet. ?+	10% negative	1% aq. ?+	Polyhexamethylene biguanide††
	10% pet. ?+	3.2% pet. ++	3.2% pet. ?+	3.2% pet. ?+		0.5% aq. ?+	2.0% pet. negative
	5.0% pet. ?+	1.0% pet. ?+	1.0% pet. negative	1.0% pet. negative		0.32% aq. ?+	Chlorhexidine gluconate††
	3.2% pet. negative					0.1% aq. negative	0.5% aq. negative
2, 24, 2007	10% pet. +	10% pet. ++	10% pet. +	10% pet. ++	10% pet. negative	1.0% aq. negative	Polyhexamethylene biguanide††
	3.2% pet. negative	3.2% pet. ++	3.2% pet. ?+	3.2% pet. ++		0.1% aq. ?+	2.0% pet. negative
		1.0% pet. ++	1.0% pet. negative	1.0% pet. negative		0.32% aq. negative	Chlorhexidine gluconate††
		0.32% pet. ?+					0.5% aq. negative
3, 28, 2014		0.1% pet. negative					
	10% pet. +++	10% pet. +++	10% pet. +++	10% pet. +++	10% pet. ++	NT	Chlorhexidine gluconate††
	3.2% pet. ++	3.2% pet. +++	3.2% pet. ++	3.2% pet. ?+	3.2% pet. ++		0.5% aq. negative
	1.0% pet. negative	1.0% pet. +++	1.0% pet. ?	1.0% pet. ?	1% pet. ?+		
4, 20, 2014		0.32% pet. negative					
		0.1% pet. negative					
	20% pet. +	10% pet. ++	10% pet. negative	10% pet. negative	10% pet. negative	NT	Chlorhexidine gluconate††
	10% pet. +	3.2% pet. ++					0.5% aq. negative
5, 24, 2015	5% pet. negative	1.0% pet. +					
		0.32% pet. ?+					
		0.1% pet. ?+					
	10% pet. ++	10% pet. +++	3.2% pet. +	3.2% pet. +	3.2% pet. negative	1% pet. +++	Chlorhexidine gluconate††
Control subjects, n = 20	3.2% pet. negative	3.2% pet. ++				0.32% pet. ?+	0.5% aq. negative
		1.0% pet. +				0.1% pet. negative	
	10% pet. negative	10% pet. negative	NT	NT	NT	NT	NT
	3.2% pet. negative						

AEEA, aminoethylethanolamine; NT, not tested.

*Lever Sensisept H34® (Johnson Diversey Finland, Turku, Finland) in patients 1 and 2 and in control subjects, Soft Care Sensisept H34® (Diversey Europe, Utrecht, The Netherlands) in patients 3–5.

†The products used as test substances:

‡Rewoteric® AM KSF 40 (Evonik Industries AG, Essen, Germany; CAS 132647-08-6);

§Miranol® Ultra C 32 (Rhodia UK Ltd, Halifax, UK; CAS 68608-65-1);

¶Miranol® Ultra L 32 (Rhodia UK Ltd, Halifax, UK; CAS 68608-66-2);

**Miranol® C2M-SF (Rhodia UK Ltd, Halifax, UK; CAS 68604-71-7);

††Aminoethylethanolamine, 2-[(2-aminoethyl)amino]ethanol (Sigma-Aldrich GmbH, Steinheim, Germany; CAS 111-41-1).

‡‡Ingredient of Sensisept H34®.

cocoamphopropionate in the same hand cleanser product. Contact allergy to amphoteric surfactants (amphoacetates) has previously been considered to be rare, with only a few reports of cases of contact allergy to disodium cocamphodipropionate (tested 1%, 0.6%, 0.3% and 0.1% aq.) (2), sodium cocoamphoacetate (tested 2% and 1% aq.) (3), and sodium lauroamphoacetate (tested 10%, 5% and 1% aq.) (4). It has been suggested that the amphoacetates themselves may not be contact allergens, but that the actual allergen might be an impurity, raw material or side product of the amphoacetate synthesis (1, 4). AEEA, one of the reagents used in the synthesis of amphoacetates, was proposed as a possible allergen in detergents containing amphoacetates (4). The observed test reactions to AEEA may indicate contact allergy to AEEA, but might also be attributable to irritation. The actual allergen in the sodium cocoamphopropionate product remains to be defined in further studies. Four of our patients also had patch test reactions to the three related amphoacetates sodium cocoamphoacetate, sodium lauroamphoacetate and disodium cocamphodipropionate. It remains to be clarified whether these

amphoacetate products share a common impurity that might represent the actual allergen.

Four of our patients worked for the same multinational fast-food restaurant chain, but in different restaurants. They developed allergic contact dermatitis soon after starting restaurant work. Frequent hand washing with a particular disinfectant hand cleanser that contains sodium cocoamphopropionate was required as part of the hygiene routines of our patients' work. On the basis of the present cases, our opinion is that the usage of sodium cocoamphopropionate-containing hand cleanser for frequent hand washing in workplaces should be discouraged. This would be especially important in a restaurant chain (or in other institutions such as hospitals or nursing homes) with a large number of employees, who follow the hygiene protocol and use the products specified by their employer. Furthermore, it should be noted that the use of antiseptic hand rubs is considered to be less irritating to the skin than the practice of repeated hand washing with soap and water, which is an important risk factor for irritant contact dermatitis (5, 6).

References

- 1 Hagvall L, Bråred-Christensson J, Inerot A. Occupational contact dermatitis caused by sodium cocoamphopropionate in a liquid soap used in fast-food restaurants. *Contact Dermatitis* 2014; **71**: 122–124.
- 2 de Groot A, Weijland W. Contact allergy to disodium cocamphodipropionate. *Contact Dermatitis* 1996; **35**: 248–249.
- 3 Goossens A, Bruze M, Gruvberger B et al. Contact allergy to sodium cocoamphoacetate present in an eye make-up remover. *Contact Dermatitis* 2006; **55**: 302–304.
- 4 Foti C, Bonamonte D, Mascolo G et al. Aminoethylethanolamine: a new allergen in cosmetics? *Contact Dermatitis* 2001; **45**: 129–133.
- 5 Pedersen L K, Held E, Johansen J D, Agner T. Less skin irritation from alcohol-based disinfectant than from detergent used for hand disinfection. *Br J Dermatol* 2005; **153**: 1142–1146.
- 6 Slotosch C M, Kampf G, Löffler H. Effects of disinfectants and detergents on skin irritation. *Contact Dermatitis* 2007; **57**: 235–241.