

Occupational allergic contact dermatitis caused by tetrahydroxypropyl ethylenediamine in hand disinfectants

Maria Blomberg¹  | Caroline C. L. Jørgensen² | Anne Bregnhøj² |
Ulrik Ahrensboell-Friis^{1,3}  | Claus Zachariae¹ | Mette Sommerlund² |
Jeanne D. Johansen³ 

¹Department of Dermatology and Allergy, Herlev and Gentofte Hospital, University of Copenhagen, Copenhagen, Denmark

²Department of Dermato-venereology, Aarhus University Hospital, Aarhus N, Denmark

³National Allergy Research Center, Department of Dermatology and Allergy, Herlev and Gentofte Hospital, University of Copenhagen, Hellerup, Denmark

Correspondence

Associate professor Maria Blomberg, Department of Dermatology and Allergy, Herlev and Gentofte Hospital, University of Copenhagen, Copenhagen 2900, Denmark.

Email: maria.helene.blomberg@regionh.dk

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CASE 1

A 54-year-old man with a history of atopic dermatitis and mild interdigital hand eczema presented with erythematous swelling of the face and neck and aggravation of hand eczema during the coronavirus disease 2019 (COVID-19) pandemic (1½ years). For 20 years he had worked in the same large warehouse for electronics, with no change in his work tasks (mainly computer work and unpacking of goods). He noticed clinical improvement of the rash during summer vacation, and a relapse after only 1 day of work.

Patch testing was done with the European Baseline Series and a locally composed supplementary series. We used Finn Chambers and Scanpor Tape (Epitest Ltd Oy, Tuusula, Finland), applied on the upper back and occluded for 2 days. Readings were performed according to the European Society of Contact Dermatitis' guideline.¹ The only positive reaction was to tetrahydroxypropyl ethylenediamine (THPE) 1% in pet. (+ on days 2, 5, and 6). THPE was contained in the patient's hand sanitizer at work (Plum disinfectant gel) at a concentration of <1% according to the data sheet. Repeated Open Application Test (application of the hand sanitizer two times daily on a 5-cm² area of the patient's antecubital fossa) was positive after 3 days (Figure 1). The patient described use of the hand disinfectant 10 to 30 times daily during the pandemic. Both his facial and hand eczema disappeared completely after replacing it.

CASE 2

A 40-year-old healthcare worker with a history of atopic dermatitis and hand eczema presented with worsening of hand eczema during

the COVID-19 pandemic and improvement during periods of work leave. During a workday, she was exposed to wet work and used hand disinfectants up to 200 times. She experienced aggravation related to use of hand disinfectants.

Patch testing was performed with the European Baseline Series. Personal products and three available hand disinfectants were tested "as is." Testing was performed like in Case 1. Positive reactions were



FIGURE 1 Positive Repeated Open Application Test with the Plum disinfectant gel showing erythema in the cubital fossa after 3 days



FIGURE 2 Patch test result at day 3 showing a dose-response reaction to increasing concentrations of tetrahydroxypropyl ethylenediamine, follicular reaction to 0.01%, and a + reaction to 0.1% and 1%

found to Ceduren ethanol gel (+ on days 3 and 7) and Quick disinfection gel (+ on day 7). Test with the presently used Plum hand disinfection liquid was negative. A recently used Plum hand disinfection gel declared THPE, but was not available for testing. THPE is an ingredient in the other two hand disinfectants used (Ceduren and Quick) according to the products labels. In one of the products, THPE is named by its synonym ethylenedinitrillotetrapropan-2-ol. Patch testing with THPE showed a dose-response reaction; follicular reaction to THPE 0.01%, and a positive reaction to 0.1% (+ on day 3) and 1% (+ on day 3; Figure 2).

In conclusion, the patient had occupational allergic contact dermatitis to THPE contained in several hand disinfection products used in the workplace. The eczema improved after cessation of use of THPE-containing disinfectants.

DISCUSSION

Both patients presented here were allergic to THPE in hand disinfection gels. THPE is used as a neutralizer to achieve the gel-like consistency. Only a few cases of THPE allergy have previously been reported, but most of them related to exposure to cosmetics and

sunscreens.² Antelmi et al.³ reported a case of occupational allergic contact dermatitis, also to Plum disinfection gel. In this case, the patient used a gel from an old batch, because batches produced after 2016 have been THPE free in Sweden. In Denmark, however, THPE is still included in the gel, but according to the producer, they are considering replacing it with another neutralizing agent.

Both our patients had onset of symptoms during the COVID-19 pandemic. During this period the use of hand sanitizers exploded, potentially resulting in THPE allergy becoming more frequent. However, because many centres do not test with THPE by default, allergic contact dermatitis due to hand disinfectants could have been overlooked and the symptoms misinterpreted as irritant contact dermatitis. Allergic contact dermatitis due to hand disinfectants should be considered not only with hand eczema, but also in case of facial rashes, as touching of the face probably occurs unconsciously several times daily.

Our cases illustrate the importance of considering THPE allergy if patch testing is negative, but clinical suspicion is maintained. Clinicians should be aware of this allergen in patients with eczema of the hands, face, and neck, who are in contact with cosmetics, sunscreen, or disinfectants. In our two hospitals in Denmark we have recently added THPE (1% in pet. prepared in-house) to our supplementary baseline series.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

ORCID

Maria Blomberg  <https://orcid.org/0000-0002-0993-9570>

Ulrik Ahrensboell-Friis  <https://orcid.org/0000-0003-4181-0926>

Jeanne D. Johansen  <https://orcid.org/0000-0002-3537-8463>

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