

Contact allergy caused by stannous fluoride in toothpaste

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Case Report

A 50-year-old atopic female patient with pre-existing chronic spontaneous urticaria presented with episodes of lip swelling, (angular) cheilitis, and small aphthous ulcers (Fig. 1), accompanied by perianal itching and mild flexural dermatitis involving the elbow folds, axillae, and groins. Because contact allergy was suspected, patch tests were performed on the upper back with a baseline series, and cosmetic, fragrance and dental (metal) series, along with personal hygiene products. These included two toothpastes, from the same brand (Sensodyne®; GSK, London, UK), which were tested semi-open, but also occlusively, as recently recommended (1). All commercial allergens were from Chemotechnique Diagnostics (Vellinge, Sweden), mounted on Allergeaze® patch test chambers (SmartPractice, Calgary, Canada), and occluded for 2 days with Fixomull® stretch (BSN Medical, Hamburg, Germany). Readings were performed, according to ESCD guidelines (2), on day (D) 2, D4, and D7. On D2, only one positive reaction (+) was observed to one of the two toothpastes (Sensodyne® Complete Protection, Extra Fresh), whereas no reactions were seen to the other toothpastes, including in the semi-open tests. The patch test with the first toothpaste, despite the presence of known irritants such as sodium lauryl sulfate (SLS) and cocamidopropyl betaine, was considered to have an allergic morphology. Moreover, the reaction increased towards D4 (++). On D4, a strong positive patch test reaction (++) was observed to tin 50% pet. All reactions persisted on D7 (Fig. 2), and no later reactions were reported.

Examination of the first toothpaste showed the presence of stannous fluoride, whereas the second one



Fig. 1. Mild (angular) cheilitis following the use of a tin fluoride-containing toothpaste.

contained sodium fluoride. The history showed that, several months before, the patient had suffered from airborne dermatitis of the face, followed by a similar flexural dermatitis, shortly following occupational exposure to the welding of metal constructions at an art exhibition. We hypothesize that our patient had very likely become airborne sensitized to tin on that occasion, as has been previously reported (2), and had then developed systemic (flexural) allergic dermatitis, possibly because of inhalation. Following the current exposure to stannous

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Fig. 2. Positive patch test reactions (++) on day 7 to the toothpaste 'as is' and to tin 50% pet.



fluoride in toothpaste, she developed angioedema-like lip dermatitis, aphthous stomatitis, and, eventually, perianal itch, that is, a recurrence of the flexural, putatively systemic allergic dermatitis.

In order to better establish the contact-allergic nature of the reaction, and to clarify the role of tin as a relevant culprit allergen, a more extensive work-up was performed:

1. The patient was retested with tin 50% pet., but also with tin chloride 1% pet. and tin(II) oxalate 1% pet. (all from Chemotechnique), which all gave strong positive reactions (++, +++, and ++, respectively) on D4.
2. The suspected toothpaste was also retested, and again gave a positive reaction (+) on D4; a dilution series with the toothpaste (30% down to 0.003%), in both water and pet., was positive down to 3% in both vehicles.
3. Fifty control patients showed negative patch test results with both the culprit toothpaste and tin 50% pet. One additional control patient, a 41-year-old male, showed a strong positive reaction to the toothpaste (++) (Fig. S1), and subsequently also to tin 50% pet. (++) , tin chloride 1% pet. (++) , and tin(II) oxalate 1% pet. (++) . This particular patient had suffered from hand eczema in the past while working as an electrician, possibly owing to previous sensitization to tin. Three further control patch tests with the toothpaste showed weak irritant reactions ('soap effect') in 2 patients, and a clear irritant reaction (mild erosion) in 1 patient.
4. Despite repeated requests, the manufacturer of the toothpaste did not provide us with a sample of stannous fluoride (usually present at a concentration of < 0.5% in the finished product) for separate patch testing.

Following replacement of the culprit toothpaste with a sodium fluoride-containing toothpaste, the dermatitis

in our patient resolved and did not recur. The chronic spontaneous urticaria, which had already been present for much longer, did not resolve.

Discussion

Tin can be present in various items, such as metal cans, imitation jewellery, organ pipes, and dental amalgams. It can be used for soldering, in electrical wiring, and in metal platings and coatings. A typical alloy is bronze, which is a combination of tin and copper. Menné et al. reported the first cases of contact allergy to tin (3), which is considered to be a rare sensitizer (4). Tin in dental amalgams only rarely results in oral contact allergy (5). Airborne occupational allergic contact dermatitis caused by tin has been occasionally reported in patients involved in the production of metal constructions or the assembly of electrical wiring (6, 7). Stannous fluoride, which we report on here, is a potential ingredient in toothpastes and mouth washes. Anti-caries, bacteriostatic and even bactericidal properties, aiding in the prevention of plaque formation and gingivitis, have been attributed to it. The use of stannous fluoride-containing toothpastes may result in yellowish dental stains, and contact allergy, although only reported once before, may occur (8). The latter concerned a patient with recurrent idiopathic urticaria and cheilitis attributed to a stannous fluoride-containing toothpaste. Patch tests showed only a weak reaction (+) to tin 50% pet. on D4. The toothpaste itself was not patch tested, and no control tests were performed. Avoidance of the toothpaste led to resolution of the patient's symptoms, whereas accidental re-use caused a flare-up.

Our case confirms that toothpastes, although they contain potential irritants (e.g. cocamidopropyl betaine and SLS), can indeed be patch tested, and perhaps should be patch tested, as semi-open tests may result in false-negative reactions. Although fluoride itself has never been reported as an allergen, its derivatives may be important sensitizers in toothpastes. Besides

amine fluoride (9, 10), we show here that stannous fluoride is also a potential culprit allergen in dental care products. Furthermore, our case highlights – once again – the need for more commitment from industrial manufacturers to assist dermatologists who try to solve complex allergological problems related to the use of their consumer products.

Conflicts of Interest

The authors declare no conflict of interests.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Fig. S1. A positive patch test reaction (++) to the toothpaste ('as is', occlusive patch testing) in 1 control patient; note the characteristic spreading reaction, suggestive of a contact-allergic mechanism.

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