

Sensitizing oat extracts in cosmetic creams: is there an alternative?

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Case Report

A 33-year-old woman suffered from atopic eczema and allergic rhinoconjunctivitis, and was known to have type-I reactions to house dust mite, cats, dogs, malassezia, nut mixture, walnuts, shrimp, lobsters, and asparagus, all of which she strictly tried to avoid. However, treatment with topical corticosteroids, tacrolimus, oral antibiotics or antifungal therapy did not always yield the expected improvement in her dermatitis.

The patient was referred to our contact allergy unit because she developed an itchy and erythematous eruption with papules and patchy lesions on the face immediately after the application of a moisturizer 'Exomega emollient cream with omega 6 and vitamin B3 for atopic and very dry skin' of A-Derma® (Pierre-Fabre, Castanet-Tolosan, France). She had been using this cream for approximately 1 year, but the symptoms had been present for about 6 months. The skin lesions were localized at the application site and faded a few hours after the application. She had no extracutaneous symptoms. However, later on, she noticed that immediately after she had eaten certain biscuits or bread containing oatmeal, she experienced itching and swelling of her lips, as well as pruritic, erythematous papules and patchy lesions on the trunk, never having experienced this previously.

The patient was patch tested with the European baseline series and her

own cosmetic products, using van der Bend® chambers (van der Bend, Brielle, The Netherlands) mounted on Micropore® (3 M; St Paul, MN, USA) and fixed on the intact skin of the back with Mefix (Mölnlycke, Göteborg, Sweden) acrylic tape. The readings were performed at D2 and D4, but all tests, including that with her emollient cream, gave negative results. Because of the appearance of the symptoms immediately after application of the emollient, prick tests with the cream as is, histamine as a positive control and physiological saline as a negative control were performed. A wheal and flare reaction to histamine and the emollient cream were observed (Fig. 1). A blood sample showed an elevated total IgE level (1328 kU/l; reference value, ≤ 126 kU/l) and slightly elevated specific IgE antibodies to oat (1.23 UA/ml), as compared with wheat (0.12 UA/ml), rye (<0.10 UA/ml), barley (0.11 UA/ml), corn (0.31 UA/ml), and gluten (<0.10 UA/ml).

Further prick tests with the different components of the cream, provided by the company, showed a 2+ wheal and flare reaction (Fig. 2) only to the *Avena sativa* alcoholic extract, (with a 1+ wheal and flare reaction to histamine, the positive control).

We subsequently sent the patient's serum to Pierre Fabre laboratories in France, who further analysed the immunoreactivity to the *A. sativa* extract present in the cream, as well as to a newly prepared oat extract, from which the company had eliminated the proteins. With the application of enzyme-linked immunosorbent assay (ELISA) tests, immunoreactivity of our patient's serum to the causal oat extract was detected (although not confirmed by western immunoblot), but not to the protein-free extract. Pierre Fabre laboratories tested the sera of 3 other cereal-sensitized patients with five different extracts of oat (four proteinic extracts and one extract without proteins): two of them reacted with different intensities to all of the extracts, except for the new protein-free extract; the third one did not react to any of the extracts tested. The new extract has now replaced the former one in the commercialized products.

Discussion

Our patient is an atopic woman with immunological contact urticaria resulting from a cosmetic emollient cream,



Fig. 1. Positive prick test to cosmetic product that caused contact urticaria.



Fig. 2. Positive prick test to causal oat extract.

owing to the oat extract present in it. The diagnosis was confirmed by prick tests and ELISA testing. Moreover, the oral allergy syndrome that she experienced later on was found to be correlated with the eating of oatmeal-containing biscuits and bread.

A recent trend in the cosmetics industry is the use of plant protein derivatives (e.g. from soya, wheat, oat or sesame). *A. sativa* extract (wild oat) is used in moisturizing creams and hygiene products intended for use in atopic patients because of its

anti-inflammatory, anti-oxidant and anti-pruritic properties. However, several cases of allergic reactions (delayed-type contact allergy as well as immediate type-I reactions) to oat extract in cosmetics have been reported in the literature (1–3). The route of sensitization to proteins can be gastrointestinal, respiratory, and also percutaneous, although the penetration of proteins through intact stratum corneum is very low. However, this is facilitated by a damaged or impaired skin barrier, such as in atopic individuals, and is significant enough to cause contact urticaria (4). Moreover, the elevated level of IgE and the presence of skin inflammation in atopic individuals are additional predisposing factors for the development of an IgE-mediated allergy (5, 6).

Immunological contact urticaria induced by cosmetics is not common, certainly not in association with an oral allergy syndrome resulting from the same proteins. In the literature, there is an ongoing discussion on whether or not it is safe for atopic individuals to use cosmetics with oat (or other flour extracts), because of the possible risk of subsequent sensitization to food proteins. Boussalt et al. suggested the avoidance of topical products containing oat proteins in infants with atopic dermatitis, on the basis of the following study results: sensitization to oat was found in 32.5% of children with atopic dermatitis referred for allergy testing, and multivariate analysis indicated that the only risk factor for obtaining a positive oat atopy patch test result was the application of a moisturizer containing oat proteins (7). Conversely, Goujon-Henri et al. suggested that the evidence for induction of sensitization by repeated use of oat-containing topical products is insufficient (8). Previously, Rancé et al. had not observed any significant difference in sensitization to oat between 105 oat-based emollient users and 97 non-users (9), and nor did Pigatto et al., who studied 65 children (atopic and non-atopic), 41 of whom who had used topical colloidal grain suspensions (10). In a more recent study on atopic adults with known sensitization to oat and/or wheat, no allergic reactions occurred during the application of oat-based cosmetics over a 3-week period. Moreover, none of 8 patients with a positive prick test reaction to commercially available oat extract and/or elevated serum IgE to oat presented with a positive

reaction to prick tests with *Rhealba* oat extracts, so the authors concluded that this extract does not cross-react with oat, to which the patients were sensitized (11). This is in contrast to the situation with our patient, however, as she presented a positive prick test reaction to *Rhealba* oat extract, elevated serum IgE antibodies to oat, and an urticarial reaction after eating food containing it. Moreover, as she first noticed contact urticaria, and only later developed oral allergy symptoms, sensitization to oat by using the cosmetic cream is most likely. Similar cases have been previously reported in literature, e.g. with sesame (12) and particularly with hydrolysed proteins (e.g. wheat), which tend to become more allergenic than the native proteins because of additives, the formation of new epitopes, and facilitation of transport through the skin. In those subjects sensitized, oral intake of dietary products containing the same hydrolysed proteins (and not the native proteins) is likely to cause symptoms (13, 14).

Conclusion

Both delayed-type contact allergy and immediate type-I reactions to oat (and other protein-containing animal and plant extracts) in cosmetic products have been reported in the literature. Although a matter of debate, cases of subsequent type-I allergic reactions to food containing the same proteins, as seen in our patient, have been observed. Randomized controlled trials evaluating the risk of sensitization as a result of the application of oat-based (or other grain-based) cosmetics in atopic individuals will be welcome.

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Conflicts of interest: An Goossens is a consultant for Pierre Fabre (France) regarding patch testing of cosmetic ingredients.

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