

Occupational immediate contact allergy to hydrolysed wheat protein after cosmetic exposure

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Immediate contact allergy to hydrolysed wheat protein (HWP) has frequently been reported in consumers of HWP-containing cosmetics from Japan and Europe (1–7). We present here the first case of confirmed occupational immediate hypersensitivity to HWP.

Case Report

A 34-year-old technician, without a medical history, was working in industrial maintenance for a cosmetic manufacturer. He developed two immediate hypersensitivity reactions with a 1-year interval, 5 min after cleaning a tank containing an anti-wrinkle cream (Supreme-DHE™, Ericson, Stockholm, Sweden), despite wearing a protective suit and gloves. The first reaction comprised rhinitis, conjunctivitis, and sneezing, whereas the second episode was more severe, combining immediate contact urticaria, conjunctivitis, and dyspnoea. The patient recovered spontaneously from the first episode, whereas oral glucocorticoid treatment was required for the second. The offending cosmetic product contained 12% Tritisol™ powder, mainly composed of HWP, which represented 10% of the final cosmetic product.

The results of open tests remained negative with the cosmetic product and all of the ingredients provided by the manufacturer, including Tritisol™ powder. However, prick tests gave positive results at 20 min (> 50% of the

Table 1. Analysis of IgEs specific for wheat protein fractions by enzyme-linked immunosorbent assay

Specific IgE		Results (ng/ml)
Glutenins	Low molecular weight glutenins	23
	High molecular weight glutenins	0
Gliadins	α-Gliadins	0
	γ-Gliadins	1
	ω1,2-Gliadins	25
	ω5-Gliadins	0
Soluble proteins	Lipid transfer proteins	0
	Albumins/globulins	0
	Serpins	0
Others	Supreme-DHE	85
	Tritisol™ Powder	76
	Laboratory-deamidated gluten	49

*Baseline series used by the Department of Dermatology and Venereology, University Hospital Centre Zagreb, University of Zagreb School of Medicine, Zagreb, Croatia.

positive control response induced by histamine chloride at 10 mg/ml) for the cosmetic product (10% aq.), Tritisol™ powder (10% aq.), and wheat extract (ALK, Varennes-en-Argonne, France). Prick tests gave negative results for gluten extract (ALK). Titration of IgE specific for wheat protein fractions was performed by fluorimetric enzyme-linked immunosorbent assay (Table 1). All antigens were coated on white 384-well plates (NUNC 460372; Fisher Scientific, Waltham, MA, USA) at a concentration of 5 µg/ml. IgE was detected with alkaline phosphatase-conjugated goat anti-human IgE and 4-methylumbelliferyl as a substrate (A3525 and A3168, respectively; Sigma, Saint-Quentin Fallavier, France). Concentrations of specific IgE were calculated by reference to a standard curve included in each microtitre plate (standard human IgE; 2nd World Health Organization international reference NIBSC 75/502).

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Conflicts of interest: None.

Low amounts of specific IgE were measured for some native wheat proteins (low molecular weight glutenin, γ -gliadins, and ω 1,2-gliadins), whereas IgEs specific for the cosmetic product, the Tritisol™ HWP and deamidated gluten were strongly detected, confirming the diagnosis of immediate IgE-mediated hypersensitivity to HWP with an occupational origin. The patient did not report a history of food reactions to wheat protein between or after the two hypersensitivity episodes. After avoidance of all cosmetics and foods containing HWP and wheat protein, and optimization of the personal protective equipment at work (gloves, mask, goggles, and full protective suit), no further reactions were observed.

Discussion

The physiopathology of immediate contact allergy to HWP is still unclear. However, modification of wheat proteins was shown to create new antigenic determinants that are able to cause sensitization (8). Biochemical characterization indicated that wheat proteins in the Tritisol™ product were modified both by proteolysis and by deamidation (9). In most cases, reported in literature, reactions have been observed between 3 to 10 months after self-reported first skin exposure to droplets (6). In our observation, the delay is similar and compatible with sensitization by the skin. In our investigation, we detected IgEs specific for the Tritisol™ HWP and deaminated gluten, as well as for

γ -gliadins and ω 1,2-gliadins, which are the main allergens identified in the previous Japanese and French cases (10, 11). The main risk after skin sensitization is the development of immediate allergy to HWP-containing food and wheat-dependent exercise-induced anaphylaxis (6, 10, 11). The immunological profile of these patients is different from that of patients with conventional wheat-dependent exercise-induced anaphylaxis (co-WDEIA), because they present IgEs specific for native or deamidated γ -gliadins and ω 2-gliadins and/or glutenins, without IgE specific for ω 5-gliadins, as in seen in patients with co-WDEIA (6, 8, 11). Denery et al. observed a deamidated repeated consensus epitope (QPEEPFPE) on these proteins, which may induce strong specific IgE binding and effective mast cell and basophil activation. This could explain the severity of anaphylactic reactions to HWP (11). Therefore, avoidance of all sources of HWP is recommended. After HWP withdrawal, Hiragun et al. observed a decrease in the level of IgE specific for gluten in some Japanese patients, but a relapse of clinical symptoms after re-exposure to HWP-containing foods or cosmetics (10).

In conclusion, this is the first case of occupational anaphylaxis caused by HWP, reflecting the immunogenicity of these molecules in an occupational setting. However, the recent limitation of the HWP concentration to a maximum of 1.7% in cosmetics and the recommended use of HWP with a molecular weight of < 3500 should prevent these reactions (8).

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