

A case of wheat-dependent exercise-induced anaphylaxis sensitized with hydrolysed wheat protein in a soap

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We present a case of wheat-dependent exercise-induced anaphylaxis possibly sensitized with hydrolysed wheat protein through the use of hydrolysed wheat protein-supplemented soap. Physicians should be aware of the potential allergenicity of hydrolysed wheat protein.

Case Report

A 49-year-old woman had been using hydrolysed wheat protein-supplemented soap for 1 year. After 1 month, she

developed eyelid oedema and dyspnoea while working after having breakfast (bread and coffee). She experienced similar episodes three times while working and four times while walking over the next 11 months. Additionally, she had facial wheals and nasal discharge after bathing on several occasions. A prick test showed a positive reaction to the soap (0.1% in saline). Serum allergen-specific immunoglobulin (Ig)E tests (ImmunoCAP; Phadia, Uppsala, Sweden) showed specific IgE reactions to wheat (1.35 kUA/l) and gluten (1.78 kUA/l). Provocation tests with noodles made from wheat (120 g) and aspirin (500 mg) induced eyelid oedema, nasal discharge and dyspnoea (Fig. 1). No symptoms were observed with wheat challenge alone or aspirin intake alone, performed on separate days. A face wash challenge test with the soap induced facial wheals. On the basis of her medical history

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and the positive provocation test results, wheat-dependent exercise-induced anaphylaxis and wheat contact urticaria were diagnosed.



Fig. 1. Provocation test with aspirin + wheat challenge induced eyelid oedema, nasal discharge, and dyspnoea.

Examination of Allergens

Western blotting revealed specific IgE for hydrolysed wheat protein (>25 000 MW), salt-soluble wheat proteins (27 000 and 30 000 MW) and salt-insoluble wheat proteins (30 000 MW) in the patient's sera (Fig. 2), but not for omega-5 gliadin.

Gliadin was undetectable in serum, even during the positive provocation test performed with the methods of Matsuo (1).

Discussion

Wheat contains a variety of proteins (approximately 10%), which can be divided into salt-soluble proteins and salt-insoluble proteins. The latter are referred to as gluten, a mixture of several gliadins and glutenins, which gives the characteristic feature of wheat. Recently, hydrolysed wheat protein has been widely used in cosmetics. It is likely that our patient had been sensitized with hydrolysed wheat protein through using hydrolysed wheat protein-supplemented soap, because she had symptoms after starting to use the soap, a positive

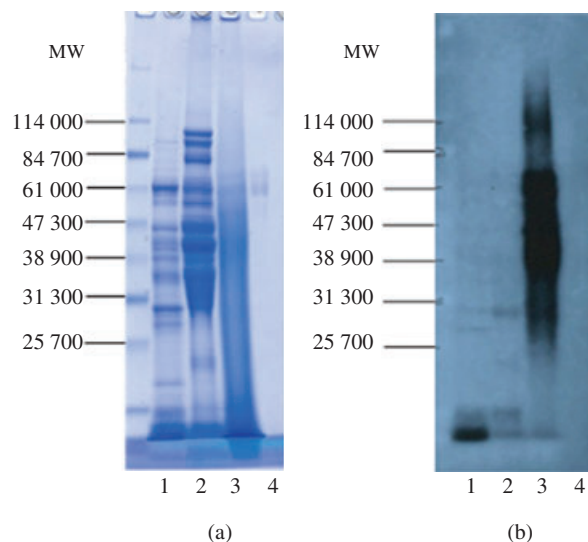


Fig. 2. Sodium dodecyl sulfate–polyacrylamide gel electrophoresis and blotting analyses of wheat protein fractions and commercial hydrolysates. (a) Gel stained with Coomassie Blue. (b) IgE immuno blotting with the patient's serum. Lane 1: salt-soluble wheat proteins. Lane 2: salt-insoluble wheat proteins. Lane 3: Hydrolysed wheat protein. Lane 4: omega-5 gliadin.

skin reaction to diluted soap solution, and serum IgE reacting to hydrolysed wheat protein, as determined by western blotting. The penetration of hydrolysed wheat protein into her skin was confirmed by the wheal formation in the face-washing challenge test. Interestingly, her symptoms were limited to her face. Most patients with wheat-dependent exercise-induced anaphylaxis have specific IgE to omega-5 gliadin and/or high-molecular-weight glutenin; these undigested proteins appear in the sera during positive provocation tests (1, 2). However, gliadins/glutenins were not detected in our patients's serum during the positive provocation test, suggesting that wheat proteins were not only absorbed from the gastrointestinal tract but also penetrated through the oral mucosa and diffused to the face tissue. It is entirely conceivable that the IgE reacting to hydrolysed wheat protein cross-reacted with the wheat proteins.

Wheat-dependent exercise-induced anaphylaxis was diagnosed in our patient, although symptoms were induced with combined wheat and aspirin challenge. Provocation tests employed a combination with aspirin, because symptoms can be induced even in patients with no history of urticaria with non-steroidal anti-inflammatory drugs, and the provocation test with aspirin challenge is performed more safely and more easily than that with exercise challenge (3).

References

- 1 Matsuo H, Morimoto K, Akaki T et al. Exercise and aspirin increase levels of circulating gliadin peptides in patients with wheat-dependent exercise-induced anaphylaxis. *Clin Exp Allergy* 2005; **35**: 461–466.
- 2 Matsuo H, Kohno K, Niihara H, Morita E. Specific IgE determination to epitope peptides of omega-5 gliadin and high molecular weight glutenin subunit is a useful tool for diagnosis of wheat-dependent exercise-induced anaphylaxis. *J Immunol* 2005; **175**: 8116–8122.
- 3 Morita E, Kohno K, Matsuo H. Food-dependent exercise-induced anaphylaxis. *J Dermatol Sci* 2007; **47**: 109–117.