

SHORT COMMUNICATION

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Occupational protein contact dermatitis with type I allergy to different kinds of meat and vegetables

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Abstract Objective: Even though occupational protein contact dermatitis is not an uncommon finding in occupational dermatology, reports about multiple sensitizations are rare. High-molecular-weight substances such as proteins can pass the epidermis only if it is damaged and cause a sensitization. In a high percentage of cases, atopic dermatitis might be the cause of this damage but cannot be regarded as the only cause. An interesting case is presented that was carefully worked up. **Methods:** Scratch, intracutaneous, and prick or prick-to-prick tests with native occupational allergens were performed as single tests. The patient was patch-tested with the European Standard Series. The determination of allergen-specific IgE was performed by ImmunoCAP. The results were subdivided into six classes. In addition, oral provocations with relevant allergens were performed. **Results:** The skin tests showed positive type I allergies to beef, lamb, horse, and pork meat, to pork and horse blood as well as to rye and wheat flour, raw potato, and pasta. Weak positive reactions could be found for fowl, duck, goose, and turkey in intracutaneous testing. The ImmunoCAP showed elevated specific IgE values for pork meat, raw potato, and rye and wheat flour. The oral provocation did not show any systemic or skin change. **Conclusions:** This case report demonstrates how an initial case of contact urticaria turns into protein contact dermatitis. It shows that the diagnosis can be made by means of scratch or prick tests with native occupational allergens. The determination of allergen-specific IgE by ImmunoCAP might be helpful, but a negative result does not exclude protein contact dermatitis.

Key words Contact urticaria · Protein dermatitis · Occupational dermatitis · Atopy

Introduction

Protein contact dermatitis has been reported in many different occupations, mostly in individuals dealing with meat, such as cooks, bakers, butchers, veterinary surgeons, slaughtermen and fish-factory workers [5, 7, 10, 11, 14, 17, 18]. Besides being tested for meat, it is important that such workers also be tested for the epithelia of animals when relevant [8]. A recent publication of the occupations most commonly associated with contact dermatitis in Finland has shown that cooks, chefs, and cold-buffet managers are in the fourth position with regard to the frequency of this disease [12].

Frequently there is a positive personal and/or family anamnesis for atopy. However, other conditions may also be responsible for the ability of high-molecular-weight substances to pass the epidermis and lead to a sensitization. It is not uncommon that contact urticaria is associated with irritant contact dermatitis, as the latter helps the allergen to penetrate.

Type I allergies to different meats have previously been reported, but to our knowledge there is no report in which a sensitization to different kinds of meat is accompanied by a sensitization to meat and vegetables.

Case report

A 47-year-old man presented with a 2-year history of dishydrotic dermatitis on his fingers, turned to hyperkeratosis and blur-bordered rhagades (Fig. 1). He also reported a wheal and flare response to working with different kinds of meat. The symptoms were so severe that he could not carry on in his profession for more than 6 weeks. The patient works as a cook in his own pizzeria and has reported an improvement during vacation. Topical medications, including corticosteroid creams, lotions, and ointments, provided intermittent temporary relief. Because of the severity of his symptoms the patient was sent for allergologic investigation.

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The patient had experienced known epicutaneous sensitizations to neomycin, balsam of Peru, and ethylenediaminehydrochloride. His personal history revealed that he had had asthma since the age of 25 years and allergic rhinitis until about 25 years ago. It is known that his father also suffered from asthma.

Patient and methods

Skin testing

Skin-prick tests (SPT) were performed as single tests using commercial extracts in glycerol (Alyostal, Stallergenes Laboratories, France) applied to the volar side of the forearm with a standardized prick-test needle (Stallerpoint). Our atopy screening included extracts of *Dermatophagoides pteronyssinus* and *D. farinae*; *Candida albicans*, *Penicillium*, *Cladosporium*, *Aspergillus*, *Alternaria*, grass mix, rye, mugwort, birch, alder, and hazel pollen; cat, dog, and horse hair; and cow's milk and egg proteins.

The i.c. skin tests were performed using allergens supplied by the same manufacturer as were the SPT, diluted 1:1000 in water. The results of SPT and i.c. skin tests were evaluated at 20 min, and the positive results were graded in the following manner according to Dreborg [3]: diameter of the wheal 3–5 mm (+), wheal 5–10 mm (++), and wheal 10–15 mm (+++). Prick-to-prick and scratch tests [3] were performed with native allergens and evaluated in the same manner.

The patient was patch-tested with the European Standard Series and with a corticosteroid series using Finn chambers on Scanpore fixed to the back for 48 h (all allergens from Hermal, Reinbek, Germany). This test was performed according to the recommendations of the International Contact Dermatitis Research Group [2].

IgE analyses

Total and specific serum IgE was determined using ImmunoCAP (carrier-polymer) technology (IgE-FEIA and RAST-FEIA, respectively; Pharmacia CAP system, Uppsala, Sweden) according to the manufacturer's recommendation. The RAST results, expressed in kilounits per liter, were subdivided into six classes, whereby concentrations of less than 0.35 kU/l represented a negative result (class 0).

Results

The SPT atopy screening was positive for dog and horse hair, grass mix, rye, and cow's milk. Negative SPT were obtained for *Dermatophagoides pteronyssinus* and *D. farinae*; *Candida albicans*, *Penicillium*, *Cladosporium*, *Aspergillus*, *Alternaria*, mugwort, birch, alder, and hazel pollen; cat hair; and cow's milk and egg proteins. All other skin test results obtained with occupational allergens and CAP technology are listed in Table 1 (Fig 2).

Patch testing did not show any positive reaction. An oral provocation with raw and cooked potato, rice, lamb, and beef meat (also in the raw form as tartar) did not show any systemic or skin change. The total IgE level was 700 kU/l. With regard to the prick, prick-to-prick, i.e., scratch, and CAP test results, protein contact dermatitis with immediate-type sensitization to different kinds of meat, wheat and rye flour, pasta, and potato was diagnosed.

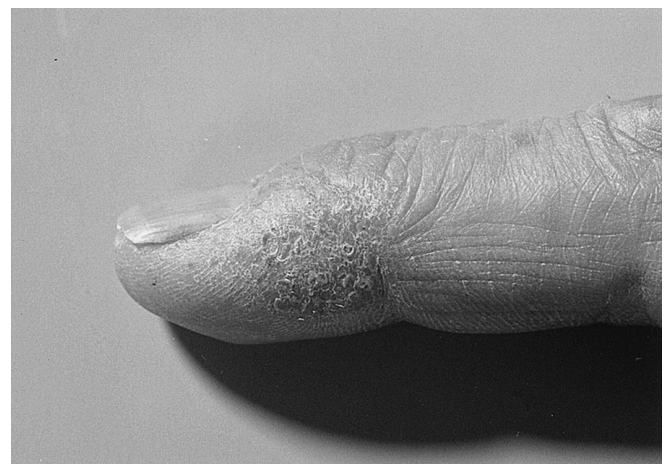


Fig. 1 Detail of the index finger in a patient with protein contact dermatitis

Table 1 Results of different skin tests and specific IgE determination by CAP (n.d. Not determined)

Substance	Prick ^a	i.c. ^a	Prick-to-prick ^b	Scratch ^b	CAP
Beef meat	++	n.d.	Ø	++	Class 0
Pork meat	++	n.d.	Ø	+++	Class 1 (0.42 kU/l)
Pork blood	n.d.	n.d.	n.d.	+++	n.d.
Lamb meat	+++	n.d.	Ø	++	Class 0
Horse meat	n.d.	+++	Ø	+	Class 0
Horse blood	n.d.	n.d.	n.d.	+++	n.d.
Fowl	Ø	+	n.d.	n.d.	Class 0
Duck	Ø	+	n.d.	n.d.	n.d.
Goose	Ø	+	n.d.	n.d.	n.d.
Turkey	Ø	++	n.d.	n.d.	n.d.
Rye flour	+++	n.d.	n.d.	n.d.	Class 4 (17.5 kU/l)
Wheat flour	+	n.d.	++	n.d.	Class 3 (12.0 kU/l)
Potato (raw)	Ø	+	+++	++	Class 3 (11.0 kU/l)
Potato (cooked)	n.d.	n.d.	Ø	n.d.	n.d.
Pasta	n.d.	n.d.	n.d.	+++	n.d.

^a Commercially available allergens

^b Native allergens



Fig. 2 Positive scratch tests with native pork, lamb, beef, and horse meat

Discussion

Occupational contact dermatitis is quite common in cooks and other kitchen personnel. Hjorth and Roed-Petersen [6] showed for the first time for this specific occupation that not only haptens but also proteins can induce acute dermatitis via a type-I hypersensitivity mechanism. Such a particular kind of contact dermatitis, due not to a hapten but rather to a protein that elicits an immediate positive weal and flare reaction on prick or scratch testing, is called protein contact dermatitis. This means that proteins must be capable of penetrating the skin surface and that a type I allergy can turn into contact dermatitis with urticaria. In certain conditions, such as irritant contact dermatitis or atopic eczema, this penetration might happen more easily than in normal skin.

Besides the positive atopy prick test, screening of the total and specific IgE values confirmed the atopy of our patient. According to Janssens et al. [9], only 50% of all reported patients with protein contact dermatitis had an atopic predisposition, which allows the conclusion that there are other similarly skin-affecting conditions.

Usually, protein contact dermatitis presents as chronic eczema, with episodic acute exacerbation occurring a few minutes after contact with the offending

allergen. The hands are the most commonly affected site [10]. Our case can be clearly classified according to the following criteria of Veien et al. [14] for protein contact dermatitis: eczema following contact with the causative substance and a positive scratch test and/or RAST response to that substance. In our case the CAP test for different kinds of meat was negative, indicating the greater importance of the prick-to-prick and/or scratch test, as a negative CAP result does not exclude protein contact dermatitis [1, 16]. As patch tests for the protein allergen in protein contact dermatitis are described as being negative, they were not performed in our case. However, some authors suggest that these tests are negative only because large molecules cannot penetrate the skin unless it is damaged [4, 13]. Janssens et al. [9] have divided the causative proteins into four groups: fruits, vegetables, spices, and plants; animal proteins; grains; and enzymes.

A case of sensitization to different kinds of meat has recently been reported [15]. However, our patient suffered allergic responses to substances from three of these groups. To our knowledge, no case has thus far been reported in which such a broad spectrum of sensitization is present. Therefore, in every case of occupationally related contact dermatitis a careful allergologic evaluation of type I allergies should be performed.

References

1. Abeck D, Korting HC, Ring J (1990) Kontakturtikaria mit Übergang in eine Protein-Kontaktdermatitis bei einem Koch mit atopischer Diathese. *Dermatosen in Beruf und Umwelt. Occup Environ Dermatosen* 38: 24–26
2. Cainan CD, Fregert S, Magnusson B (1976) The International Contact Dermatitis Research Group. *Cutis* 18: 708–710
3. Dreborg S (1989) Skin tests used in type I allergy testing. *Position paper. Allergy* 44 [Suppl]: 22–30
4. Fisher AA (1975) Allergic "protein" contact dermatitis due to foods. *Cutis* 16: 793–796
5. Hafner J, Riess CE, Wüthrich B (1992) Protein contact dermatitis from paprika and curry in a cook. *Contact Dermatitis* 26: 51–52
6. Hjorth N, Roed-Petersen J (1976) Occupational protein contact dermatitis in food handlers. *Contact Dermatitis* 2: 28–42
7. Hjorth N, Roed-Petersen J (1980) Allergic contact dermatitis in veterinary surgeons. *Contact Dermatitis* 6: 27–28
8. Huwyler T, Wüthrich B (1992) A case of fallow deer allergy. *Allergy* 47: 574–575
9. Janssens V, Morren M, Dooms-Goossens A, Degreef H (1995) Protein contact dermatitis: myth or reality? *Br J Dermatol* 132: 1–6
10. Jovanovic M, Oliwiecki S, Beck MH (1992) Occupational contact urticaria from beef associated with hand eczema. *Contact Dermatitis* 27: 188–189
11. Kanerva L (1996) Occupational IgE-mediated protein contact dermatitis from pork in a slaughterman. *Contact Dermatitis* 34: 301–302
12. Kanerva L, Jolanki R, Toikkanen J (1994) Frequencies of occupational allergic diseases and gender differences in Finland. *Int Arch Occup Environ Health* 66: 111–116

13. Malten KE (1968) The occurrence of hybrids between contact allergic eczema and atopic dermatitis (and vice versa) and their significance. *Dermatologica* 136: 404–406
14. Veien NK, Hattel T, Justesen O, Norholm A (1983) Causes of eczema in the food industry. *Dermatosen in Beruf und Umwelt. Occup Environ Dermatoses* 31: 84–86
15. Weigl L, Disch R (1997) Proteinkontakturtikaria auf verschiedene Fleischsorten bei einer Lebensmittelhändlerin. *Allergologie* 20: 192–194
16. Wüthrich B (1996) Allergien auf Fleischiweisse bei Erwachsenen. *Allergologie* 19: 130–134
17. Wüthrich B (1996) Protein contact dermatitis. *Br J Dermatol* 135: 332–333
18. Zenarola P, Lomuto M (1991) Protein contact dermatitis with positive RAST in a slaughterman. *Contact Dermatitis* 24: 134–135