

Short Communication

Occupational allergic contact urticaria and rhinoconjunctivitis from a detergent protease

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Case Report

After 1 year in his present job, a 27-year-old atopic process man in a chemical enzyme factory developed continuous flu-like symptoms, consisting mainly of rhinitis and dyspnoea. He also had whealing lasted 1–2 h and itching 6–8 h after contact with enzymes. He was occupationally exposed to liquid proteases and amylases and worked in 4-day work-shifts. Symptoms ameliorated, without completely disappearing, during his 4-day leaves. As part of the workers' annual health surveil-

lance programme, prick tests were performed at the work site. 1 *Bacillus-subtilis*-derived detergent protease (BSDDP) provoked a strong 3+ prick test reaction (diameter of wheal 8 mm + pseudopodia; histamine 10 mg/kg, 6 mm). A radioallergosorbent test (RAST) to BSDDP, prepared as previously described (1–3), was elevated (class 3=3.5–17.5 kU/l). 1 year earlier, a prick test with the same enzyme had been negative. Some weeks later, a BSDDP solution was accidentally spilled on his forehead. Within hours, he developed a severe oedematous facial dermatitis, his right eye becoming

Table 1. Industrial enzymes, their source and major applications, and reports of skin reactions

Enzyme	Source	Major applications	Allergic skin reactions
α -amylase	<i>Aspergillus niger</i> , <i>Aspergillus oryzae</i> , <i>Bacillus subtilis</i>	alcohol production, animal feed, baking, brewing, detergents, pulp and paper industry, starch and sugar production, textile industry, wine and fruit juice	(1, 6–9, 20)
cellulase (cellobiohydrolases, endoglucanases, β -glucosidases)	<i>Trichoderma reesei</i>	alcohol production, animal feed, baking, brewing, composting, detergents, protein industry, pulp and paper industry, starch and sugar production, textile industry	(2, 10–12, 20)
xylanase (hemicellulase)	<i>Trichoderma reesei</i>	pulp and paper industry	(10, 11)
papain	the plant <i>Carica papaya</i>	brewing, contact lens detergent, cosmetology, meat portioning, pharmaceuticals	(13–18)
glucoamylase	<i>Aspergillus niger</i> , <i>Aspergillus oryzae</i>	alcohol production, baking, brewing	(19)
protease	<i>Aspergillus niger</i> , <i>Bacillus subtilis</i>	alcohol production, animal feed, baking, brewing, contact lens detergents, detergents, leather production, pharmaceuticals, protein industry	(20; delayed allergy 21–23; irritant)

practically closed. The next night, he developed an asthmatic reaction. After a visit to an emergency clinic, a 1-week sick leave, and topical corticosteroids, the reaction healed.

6 weeks later, he was prick tested with common environmental allergens, an extended industrial enzyme series (1–3), and a dilution series of the previous BSDDP. Birch (7 mm), alder (8 mm), meadow fescue (4 mm) and dog epithelium (4 mm) provoked allergic prick test reactions (histamine 10 mg/kg, 9 mm). The patient's BSDDP and 2 other proteases provoked wheals on prick testing, whereas all other enzymes were negative (Table 1). In a dilution series of the original BSDDP, 50 µg/ml and 10 µg/ml induced a 6-mm reaction, 5 µg/ml 4 mm, and 1 µg/ml 2 mm (histamine 9 mm). 20 controls were negative when prick tested with this BSDDP (10 µg/ml). A provocation test with 50 µg/ml of the BSDDP on a 3×3 cm area of the skin elicited 1 small wheal within 20 min. Total IgE was normal at 109 kU/l. A bronchial provocation test with the BSDDP did not confirm occupational asthma, but resulted in rhinoconjunctivitis.

Comment

A recent study indicated that occupational allergic respiratory reactions to detergent enzymes may be more common than believed (4), though not non-occupational (5). Industrial enzymes may also cause both allergic (1, 2, 6–20) and irritant contact dermatitis (3, 21–24) (Table 2). Sensitization to current industrial enzymes (1–4, 25–26) may follow minute exposure, even in office personnel in factories (26). Sensitization in this case may have de-

veloped via either the skin or the respiratory tract (18). Though the symptoms caused by industrial enzymes may be mild (19), they were severe in our patient and we recommended that he should not continue working with enzymes.

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Table 2. The patient's prick test reactions to an industrial enzyme series; wheals ≥ 3 mm in diameter considered positive; BSDDP = *Bacillus subtilis*-derived detergent protease

Prick test substances; enzymes and controls	Origin of prick test substance	Wheal diameter (mm)
histamine HCl (10 mg/ml)		9 (=3+)
negative control		0 (negative)
coca-glycerol control		0 (negative)
cellulase	fungal	0 (negative)
xylanase	fungal	0 (negative)
glucose-oxidase	fungal	0 (negative)
pectinase	fungal	0 (negative)
glucoamylase	fungal	0 (negative)
protease	bacterial	3 (positive)
protease	fungal	0 (negative)
α -amylase	bacterial	0 (negative)
α -amylase	fungal	0 (negative)
α -amylase	bacterial	0 (negative)
α -amylase	fungal	0 (negative)
phytase	fungal	0 (negative)
protease	bacterial	2
lipase	fungal	0 (negative)
<i>own proteases</i>		
BSDDP (50 µg/ml)	bacterial	6 (positive)
BSDDP (10 µg/ml)	bacterial	6 (positive)
BSDDP (5 µg/ml)	bacterial	4 (positive)
BSDDP (1 µg/ml)	bacterial	2

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