

## LETTER

## Occupational allergic rhinoconjunctivitis and bronchial asthma induced by goat cheese

Occupational asthma represents 25% of cases of occupational lung disease and 5–10% of cases of asthma in adults.<sup>1</sup>

A 49-year-old woman developed rhinoconjunctivitis and bronchial asthma related with the production of goat cheese, in a cheese factory. She was in charge of the cheese production process three days a week, and she had episodes of coughing, sneezing, rhinorrhea, watery eyes, wheezing and dyspnoea, for 2 years. Symptoms decreased during the cheeses packing process and disappeared during holidays and weekends, suggesting an occupational exposure. She tolerated eating goat cheese.

The patient had a normal respiratory function test (FEV<sub>1</sub>) (92%). FEV<sub>1</sub> decreased during working days, but there was not significant fluctuation on holidays. Methacholine test was positive.

Skin prick tests (SPTs) (Bial-Aristegui, Bilbao, Spain) and ImmunoCAP (Phadia, Uppsala, Sweden) were positive to cow's milk (8×9 mm),  $\alpha$ -lactalbumin (8×8 mm,

13.9 kU/l), casein (8×8 mm, 5.17 kU/l), cow's whey (8.64 kU/l) and goat's whey (21.5 kU/l).

Prick-to-prick tests were performed with goat's milk, goat's whey, curd and antibutyric enzyme handled by the patient. Only the whey was positive (10×11 mm).

Bronchial provocation tests were performed with dilutions of goat's whey by nebuliser inhalation. The patient showed an immediate response: itching eyes, cough and dyspnoea (30% decreases in FEV<sub>1</sub>) with 1/1000 goat's whey, requiring treatment.

The goat cheese was defatted with acetone (1:10 (wt/vol) 4°C/1 h) followed by acetone/methanol (8:1 (vol/vol) 4°C/1 h) and extracted with phosphate buffered saline (PBS) (4°C/2 h). After centrifugation (4500 g/30 min), supernatant was dialysed and freeze-dried. The extract, the whey and  $\alpha$ -lactalbumin,  $\beta$ -lactoglobulin and casein used for SPTs were analysed (15  $\mu$ g of protein) by SDS-PAGE and IgE-immunoblotting.<sup>2</sup>

SDS-PAGE revealed bands of apparent molecular weights around 15, 20, 30 and 98 kDa, from cheese and whey;  $\alpha$ -lactalbumin,  $\beta$ -lactoglobulin and casein appeared poorly purified (figure 1A). Patient's serum detected allergens, around 15 kDa from cheese, 15 and 20 kDa from whey, 14 kDa from  $\alpha$ -lactalbumin,  $\beta$ -lactoglobulin and casein, and weakly around 20 kDa from casein (figure 1B).

Aliquots of patient's serum were preincubated with cheese extract, whey,  $\alpha$ -lactalbumin,  $\beta$ -lactoglobulin and casein (10  $\mu$ g of protein) during 3 h. The 15 kDa allergen detection was inhibited by cheese and whey, suggesting it was the same protein (figure 1C). The 20 kDa allergen from whey was not inhibited by cheese. Both allergens were inhibited by casein, suggesting they could be caseins.

Cheese extract and whey (15  $\mu$ g of protein) were digested with simulated gastric fluid (12.8  $\mu$ g/ $\mu$ l pepsin A (Sigma, St Louis, Missouri, USA) in 50 mM HCl, 37°C/30 min). Digestion eliminated both 15 and 20 kDa allergens (figure 1D). This result explains that the patient tolerated goat cheese.

Occupational asthma related to enzymes used during cheese production was described, but not with whey.<sup>1,3</sup>

Around 27% of the content of whey protein is casein.<sup>4</sup> The 20 kDa allergen detected from whey could correspond with kappa-casein (19 kDa), protein involved in the curd process.<sup>4,5</sup> Casein was previously related with occupational rhinitis and asthma caused by dispersed milk proteins in the work environment.<sup>6</sup>

To our knowledge, this is the first reported case of occupational asthma induced by goat's whey.

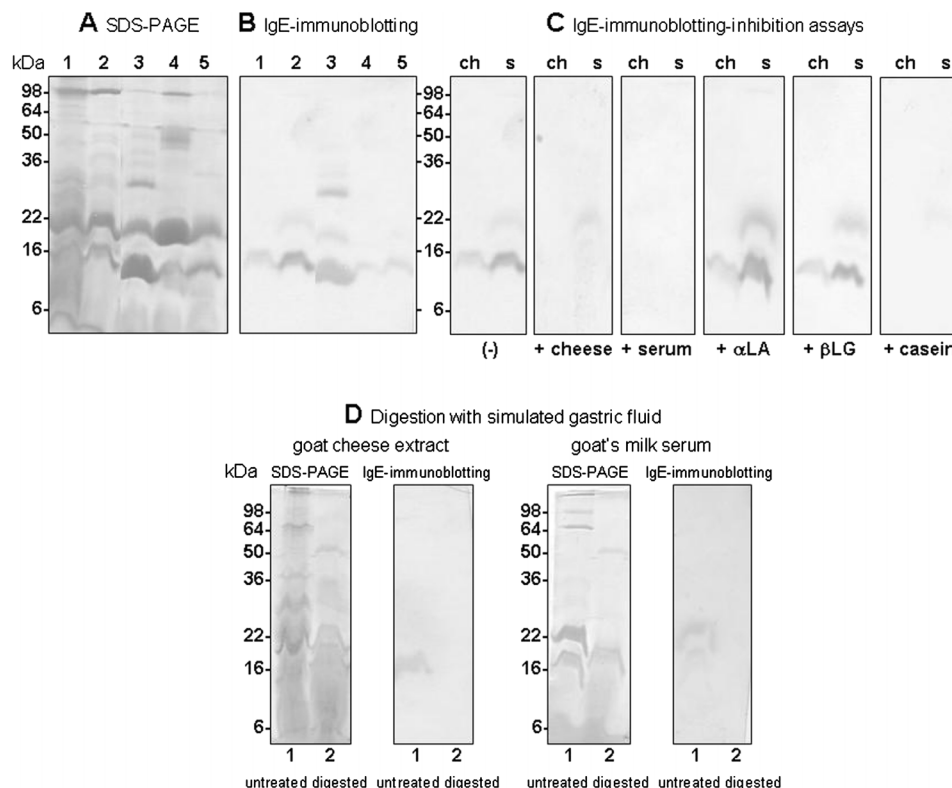


**Figure 1** (A) SDS-PAGE and Coomassie staining. Lanes: (1) goat cheese extract; (2) goat's whey; commercial extracts: (3)  $\alpha$ -lactalbumin; (4)  $\beta$ -lactoglobulin; (5) casein. (B) IgE-immunoblotting performed with the patient's serum. (C) IgE-immunoblotting-inhibition assays. Lanes: (ch) goat cheese extract; (s) goat's whey. (-), Non-inhibited; +cheese, inhibition by the goat cheese extract; +serum, inhibition by goat's whey; + $\alpha$ LA, inhibition by  $\alpha$ -lactalbumin; + $\beta$ LG, inhibition by  $\beta$ -lactoglobulin; +casein, inhibition by casein. (D) Digestion with simulated gastric fluid of the goat cheese extract and the goat's whey. (1) Untreated; (2) digested.

## PostScript

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