

## Allergic asthma to shiitake and oyster mushroom

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**Key words:** allergic asthma; occupational allergy; shiitake (*Lentinus edodes*); oyster mushroom (*Pleurotus ostreatus*); specific IgE.

• BASIDIOMYCETES spores from edible mushrooms are a very rare cause of respiratory allergies. To our knowledge, we describe here the first case of spores of shiitake and oyster mushroom as a cause of asthma in the same patient.

Ever since the age of 15, a 48-year-old truck driver had been suffering from seasonal rhinoconjunctivitis. During the last 3 years he had been complaining of workplace-related attacks of asthma, rhinitis, and conjunctivitis. His work consisted of transporting food, especially mushrooms. The asthmatic attacks occurred immediately after unloading and carrying boxes filled with different mushrooms, especially shiitake and oyster mushrooms. The symptoms did not occur when he loaded the boxes from the freezer into the truck, but only when they were thawed.

Skin prick tests and specific IgE with routine inhalants including molds were negative with the exception of grass and rye pollen. Prick-to-prick tests were strongly positive for shiitake gills (wheal 8 mm) and for oyster mushroom (wheal 7 mm), but negative for the stalk of shiitake as well as for *Boletus edulis*, *Morchella esculenta*, *Psalliota arvensis*, *P. bispora*, and

*Cantharellus cibarius*. Total serum IgE and ECP levels were elevated to 901 kU/l and 37.7 µg/l, respectively. CAP results for shiitake and oyster mushroom, as well as spores from Japan (shiitake) and (oyster mushroom) Switzerland, were dose-dependently positive (Table 1). Spirometry showed a moderately reduced airflow obstruction with a FEV<sub>1</sub> of 2170 ml/s (predicted normal 3490 ml/s). Forced vital capacity was 3870 ml (predicted normal 4240 ml). Due to the severe asthma symptoms, the patient refused inhalative provocation tests with mushroom spores. However, the patient's history, the immediate positive skin reactions in the prick-to-prick tests, and the demonstration of a significant amount of IgE to shiitake and oyster extracts supported the allergic, IgE-dependent pathogenesis of this occupational asthma.

There are other cases described in the literature in which respiratory symptoms developed in patients involved in the

commercial production of shiitake mushrooms. The cause of the respiratory diseases described in 1959 among mushroom workers was considered to be allergy to thermophilic actinomycetes that grew in heated hay. It was described as "mushroom worker disease" (1). Later a study of workers at a shiitake farm demonstrated the presence of precipitating IgG antibodies to shiitake spores. Allergic alveolitis developed in these patients within 4-8 months, and three of four examined patients had precipitating antibodies to shiitake spore extract; none of them had IgE (2). In Japan and China, where shiitake is extensively cultivated both outdoors and indoors, up to 9% of the exposed workers in one study developed asthmatic symptoms (3).

Oyster mushrooms (*Pleurotus ostreatus*) are cultivated for human consumption in various subspecies. Their spores are highly potent allergens which can also cause exogenous allergic alveolitis. A reliable

### Patch-test-positive patient with oral symptoms.

Table 1. Results of CAP for allergy to shiitake and oyster mushroom with increased allergen concentration

| Allergen                                                   | ImmunoCAP | Patient P.S. kU/l | Control (mushroom positive) kU/l | Negative control kU/l |
|------------------------------------------------------------|-----------|-------------------|----------------------------------|-----------------------|
| Shiitake ( <i>Lentinus edodes</i> ) Switzerland            | 10 µl     | <0.35             | 0.5                              |                       |
|                                                            | 100 µl    | 1.0               | 1.5                              |                       |
|                                                            | 500 µl    | 4.2               | 2.4                              |                       |
|                                                            | 1000 µl   | 4.5               | 2.4                              | <0.35                 |
| Shiitake spores ( <i>L. edodes</i> ) Japan                 | 1000 µl   | 4.5               | 4.1                              | <0.35                 |
| Oyster mushroom ( <i>Pleurotus ostreatus</i> ) Switzerland | 10 µl     | <0.35             | <0.35                            |                       |
|                                                            | 100 µl    | <0.35             | 0.8                              |                       |
|                                                            | 500 µl    | 1.2               | 1.2                              |                       |
|                                                            | 1000 µl   | 1.7               | 1.5                              | <0.35                 |
| Oyster mushroom spores ( <i>P. ostreatus</i> ) Switzerland | 1000 µl   | 3.3               | 1.5                              | <0.35                 |

spore extraction method has been devised, and a reasonable number of available patients were skin test and RAST positive (4).

The majority of the basidiomycete-sensitive subjects are atopic according to their personal history, clinical symptoms, and skin test reactivity to common inhalant allergens (5), as was the case in our patient. Since no suitable extracts are commercially available, the production of well-defined allergenic extracts and the characterization of specific allergens at the molecular level are needed (5).

A strict environmental control of basidiomycetes spores is reasonable in the industry to reduce the high risk of sensitization and possible development of immunologic lung diseases. The wearing of appropriate face masks in all workplaces where significant levels of spores are detected, and monitoring environmental spore levels may be useful in the prevention of this disease (6).

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## Anaphylaxis to cherimoya

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**Key words:** anaphylaxis; cherimoya; cross-reactivity; latex; RAST.

● IMMEDIATE allergic reactions to proteins of natural rubber latex represent an important occupational problem among health-care workers, who frequently wear gloves to avoid infections (1). Latex is a complex allergen mixture with major protein bands of 10-14, 30-45, and about 67 kDa (2). On the other hand, hypersensitivity to *Annona cherimola* is infrequent; only two cases of cherimoya allergy have been described (3, 4). Association between latex allergy and various fruit sensitizations has been reported. Thus, relevant IgE-binding proteins with molecular masses of 30-35 kDa have been detected in fruits (5). In this way, class I chitinases could be the

panallergens responsible for the latex-fruit syndrome (6).

We present a 43-year-old nurse, with a history of rhinitis and asthma due to *Parietaria* pollen sensitization, as well as acute contact urticaria together with rhinoconjunctivitis and asthma clearly related to exposure to glove dust. Two years before, the patient presented lip pruritus, suddenly followed by facial angioedema, generalized urticaria, bronchospasm, and severe hypotension within a few minutes after ingestion of cherimoya. Since the reaction proved resistant to treatment with epinephrine,  $\beta_2$ -agonists, theophylline, corticosteroids, antihistamines, and oxygen, intubation with 100% oxygen ventilation and sympathomimetic drugs were required for the patient's recovery.

The patient exhibited positive skin prick tests to *Parietaria* pollen, latex, and crude cherimoya extracts. In serum from the patient, the presence of specific antilact IgE (12.2 PRU) and anticherimoya IgE (10.5 PRU) was confirmed by RAST, while SDS-PAGE immunoblotting demonstrated the existence of one 43-kDa allergen to latex and two bands of 34 and 42-kDa to crude cherimoya extract (Fig. 1). Existence of cross-reactivity between the two extracts was demonstrated by RAST inhibition. The experiment using cherimoya as solid phase and latex as inhibitor extract showed maximal inhibition (>90%), while in the cross-analysis (latex as solid phase and cherimoya as inhibitor extract) the maximal inhibition raised was about 50%. These results could be due to a higher concentration of cross-reacting allergen in the latex extract.

This is the first time that a potentially life-threatening anaphylactic reaction induced by sensitization to cherimoya has been described. Results of the experimental work carried out have proved the existence of cross-reactivity between latex and cherimoya, increasing the list of foods