

Occupational asthma due to esparto hypersensitivity in a building worker

Francisco Javier Ruiz-Hornillos, M.D., Manuel De Barrio Fernández, M.D., Pilar Tornero Molina, M.D., Itziar Sánchez Marcén, M.D., Galicia Davila Fernandez, M.D., María Rubio Sotés, Ph.D., and María Luisa Baeza Ochoa de Ocariz, Ph.D.

ABSTRACT

Esparto is a gramineous plant that has multiple applications in today's industry. Several cases of hypersensitivity pneumonitis (HP) caused by esparto inhalation have been reported, but only one case of asthma caused by Aspergillus fumigatus contaminating esparto has been communicated. We report a case of asthma induced by esparto inhalation in a 58-year-old man, who is a building industry worker, with subclinical sensitization to grass pollen. The relation between clinical symptoms and work activities was supported by peak expiratory flow (PEF) monitorization; PEF values decreased by 20% the days he handled esparto. Prick test with esparto was positive. Immunoblot analysis revealed several allergens in the esparto extract, some of them present in Lolium and A. fumigatus extracts. IgE immunoblot inhibition revealed a complete inhibition of lolium and A. fumigatus IgE reactive bands by esparto proteins. The patient then avoided the exposure to esparto at work and has remained asymptomatic for the last 2 years. In conclusion, this is a case of occupational asthma caused by esparto dust mediated by IgE antibodies. Proteins of A. fumigatus as well as proteins from this gramineous plant, which cross-reacted with esparto allergens, were responsible for the disease.

(Allergy Asthma Proc 28:571–573, 2007; doi: 10.2500/aap2007.28.3032)

Key words: Allergic asthma, *Aspergillus fumigatus*, construction material, esparto, extrinsic allergic alveolitis, gramineous, hypersensitivity pneumonitis, IgE, mold spore, occupational asthma

Esparto (*Stipa tenacissima* and *Lygeum spartum*) is a gramineous plant that has multiple applications in today's industry. In the past years, several cases of occupational respiratory pathology caused by esparto inhalation have been reported, mainly referred to as hypersensitivity pneumonitis (HP).^{1–5} Recently, the first case of asthma caused by esparto was described, the causative agent being a contaminant fungus, *Aspergillus fumigatus*.⁶ We report a new case of occupational asthma by inhalation of esparto dust, caused by allergens of the plant itself and by other fungi contaminant agents.

CASE REPORT

A 58 year-old man, who is a nonsmoker and who had worked in the building industry for 20 years, had been handling stucco for the last 3 years. During the last 2 years he presented episodes of rhinorrhea, nasal congestion, sneezing, ocular itching, dry cough, shortness of breath, and wheezing. He had no fever and showed no other symptoms. Symptomatology ap-

peared mainly on the days he worked with stucco. Symptoms were perennial, without seasonal worsening, improving during holidays and weekends, when he remained asymptomatic. Nasal mucosa and chest auscultation remained normal.

Blood differential count showed slight eosinophilia (447 eosinophils/mm³). The chest x ray was normal. A basal spirometry revealed mild airflow limitation due to small airways obstruction (forced vital capacity [FVC], 3.9 L [104.1%]; forced expiratory volume [FEV]₁, 2.52 [84%]; FEV₁/FVC, 64.6%; forced expiratory flow [FEF]₅₀, 44.3%), with a positive postbronchodilator test (31% increased FEV₁).

The peak expiratory flow (PEF) rate daily measurements revealed a 30% fall as well as a daily variability of 20% the days he handled esparto. The days off work the PEF values were normal and stable (Fig. 1). A sample of esparto provided by the patient, cultivated in medium for fungi, showed the growth of several colonies of *A. fumigatus*. The protein of the esparto was extracted in phosphate-buffered saline (PBS; protein content, 0.49 mg/mL).

Prick test with esparto extract (0.1% w/v) was positive, whereas no reaction was observed in 10 atopic patients. Prick test with a standard battery of common aeroallergens were positive to pollens of *Lolium*, *Cynodon*, *Phragmites*, *Olea*, *Chenopodium*, *Plantago*, *Artemisa*, *Salsola*, *Alternaria tenuis*, *A. fumigatus*, and *Cladosporium*

From the Department of Allergy of Hospital General Universitario Gregorio Marañón, Madrid, Spain

Address correspondence and reprint requests to Francisco Javier Ruiz Hornillos, Department of Allergy of Hospital General Universitario Gregorio Marañón, C/ Doctor Castelo n° 46, 28007 Madrid, Spain

E-mail address: jrhornillos@gmail.com

Copyright © 2007, OceanSide Publications, Inc., U.S.A.

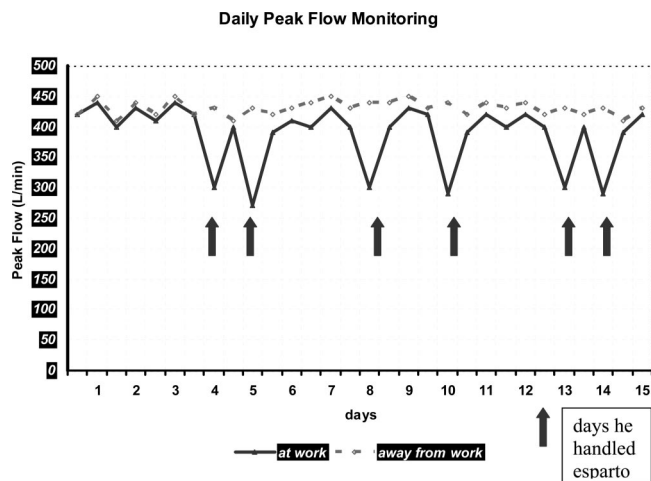


Figure 1. The PEF was measured twice a day during 15 working days (solid line) and 15 off-work days (discontinue line). During the working period, days 4, 5, 8, 10, 13, and 14, he handled esparto (arrow). The peak flow rate revealed a 30% fall as well as a daily variability of 20% the days he had handled esparto. PEF values remained normal and stable during off-work days.

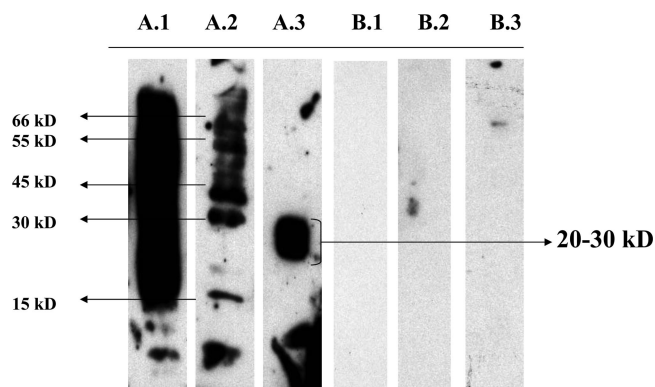


Figure 2. An IgE Immunoblot was performed with esparto dust extract (A.1), *A. fumigatus* extract (A.2), and *Lolium* pollen extract (A.3). Immunoblot with esparto *A. fumigatus* and *Lolium* pollen extracts were inhibited by esparto (B.1, B.2, and B.3, respectively). The allergens present in *A. fumigatus* and *Lolium* extract cross-reacted with esparto allergens.

herbarum. Total serum IgE measured 713 kU/L. Specific IgE antibodies to *A. fumigatus* and *C. herbarum* (CAP system; Pharmacia, Uppsala, Sweden) were negative. Precipitating antibodies to fungi and esparto were negative.

IgE immunoblotting with esparto extract revealed multiple bands with affinity for the patient's IgE (Fig. 2), not found in 10 different controls. Specific IgE immunoblotting also showed five bands of 66, 55, 45, 30, and 15 kDa in the *A. fumigatus* extract and one of 20–30 kDa in the *Lolium* extract (Fig. 2).

The patient's serum was preincubated with esparto's proteins for 2 hours at 37°C before performing the same IgE immunoblot. This immunoblot inhibition as-

say revealed a cross-reaction of the *Lolium* and *A. fumigatus* allergens with esparto extract (Fig. 2). The patient did not consent to undergo a specific bronchial provocation test. We recommended that the patient avoid handling stucco.⁷ He continued working in the construction industry avoiding contact with this material. During the following 2 years the patient remained free of symptoms with no need for medication.

DISCUSSION

Esparto is a wild herbaceous plant that belongs to the evergreen grass family. It grows in areas of the Mediterranean countries (Spain, Morocco, and Algeria) and in North and South America. After a manufacturing process it has a wide variety of uses in the textile industry (carpets, canvas shoes, baskets, coats, or cords), in the building industry for decorative stucco plates used on walls and ceilings, and for decorative work. During this manufacturing process the plant may become contaminated with certain molds when in the presence of favorable humidity and temperature conditions.

In 1961 Rodriguez-Adrados⁸ suggested esparto as a cause of a respiratory disease, which in 1984 was characterized as an HP-like syndrome.¹ The esparto contamination with *A. fumigatus* has been shown to be the cause of other HP cases,^{9,10} and has been associated with one case of allergic asthma caused by esparto inhalation.⁶

We report a case of occupational asthma in a patient with subclinical sensitization to pollens, including grass. The causative relation to esparto (inferred by history) was verified by PEF monitoring¹¹ according to the criteria of Liss and Tarlo.¹² During the PEF monitoring, a significant decrease in respiratory function was detected the days when he was exposed to esparto.

The immunoblot analysis revealed the presence of several allergens in the esparto extract. Part of them were coincident to the ones present in the *Lolium* pollen extract. The clinical relevance of these gramineae proteins is uncertain because this patient had no symptoms during the pollen season. Difference in gramineae pollen and esparto dust-air concentrations may account for the symptoms developed during esparto exposure. Other detected allergens cross-reacted with *A. fumigatus* antigens already described as a cause of esparto-induced asthma.⁶ This is not uncommon because *A. fumigatus* is a frequent contaminant of esparto samples.^{9,10} It is interesting to note that the same substance encountered at the workplace caused two different lung conditions, *viz.*, HP¹⁻⁵ and asthma,⁶ and no personal history of atopy was present in the cases of HP.

We may conclude that the sensitizing agent, and, thus, what caused the asthma, was the dust derived

from esparto and also that the pathogenic mechanism is mediated by IgE antibodies. Proteins of *A. fumigatus* as well as cross-reacting proteins from this gramineous plant and *Lolium* pollen allergens may be responsible for the disease. It would be left slope to clarify the route of sensitization, whether *Lolium* pollen allergens sensitized the patient during work or previous seasonal sensitization produced IgE antibodies with affinity to esparto. In conclusion, the dust derived from esparto may produce IgE-mediated occupational asthma through proteins of the plant itself and its fungi contaminants.

REFERENCES

1. Hinojosa Macias M, Sánchez Cano F, Martín Muñoz F, et al. Pneumonitis caused by hypersensitivity to esparto grass (stipatosis). *Med Clin (Barc)* 82:214–217, 1984.
2. Flandes J, Heili S, Gomez Seco J, et al. Hypersensitivity pneumonitis caused by esparto dust in a young plaster worker: A case report and review of the literature. *Respiration* 71:421–423, 2004.
3. Cruz MJ, Morell F, Roger A, et al. Hypersensitivity pneumonitis in construction plasterers (espartosis): Study of 20 patients. *Med Clin (Barc)* 120:578–583, 2003.
4. Hinojosa M. Stipatosis or hypersensitivity pneumonitis caused by esparto (*Stipa tenacissima*) fibers. *J Investig Allergol Clin Immunol* 11:67–72, 2001.
5. Quirce S, Hinojosa M, Blanco R, et al. *Aspergillus fumigatus* is the causative agent of hypersensitivity pneumonitis caused by esparto dust. *J Allergy Clin Immunol* 102:147–148, 1998.
6. Baz G, Hinojosa M, Quirce S, and Cuevas M. Occupational asthma caused by esparto grass (*Stipa tenacissima*) fibers. *Allergy* 54:86–87, 1999.
7. Slavin RG. The allergist and the workplace: Occupational asthma and rhinitis. *Allergy Asthma Proc* 26:255–261, 2005.
8. Rodríguez-Adrados J. "Espartosis" o enfermedad profesional por inhalación de polvo de esparto. *Rev Clin Esp* 82:184–189, 1961.
9. Gamboa PM, Urbaneja F, Olaizola I, et al. Specific IgG to *Thermoactinomyces vulgaris*, *Micropolyspora faeni*, and *Aspergillus fumigatus* in building workers exposed to esparto grass (plasterers) and in patients with esparto-induced hypersensitivity pneumonitis. *J Investig Allergol Clin Immunol* 15:17–21, 2005.
10. Moreno-Ancillo A, Dominguez-Noche Carmen Gil-Adrados A, and Cosmes P. Familial presentation of occupational hypersensitivity pneumonitis caused by *Aspergillus*-contaminated esparto dust. *Allergol Immunopathol (Madr)* 31:294–296, 2003.
11. Miranowski AC, and Grammer LC. Occupational immunologic lung disease. *Allergy Asthma Proc* 25:S36–S37, 2004.
12. Liss GM, and Tarlo SM. Peak expiratory flow rates in possible occupational asthma. *Chest* 100:63–69, 1991. □

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.