

Occupational Rhinitis Due to Inhalation of Chicken Meat Protein

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Occupational rhinitis is 2-4 times more common than occupational asthma. Degree of exposure is considered the main risk factor for developing this type of reaction [1].

Occupational allergy due to inhalation of animal protein has been reported in workers in animal facilities and laboratories, as well as in animal farm workers [1]. There have been few reports of occupational allergy in butchers due to inhalation of meat protein [2] or to animal dander handled during the course of their work, since the allergen involved in such cases was not identified.

We report the case of a 58-year-old white man who worked as a butcher. He had a 4-year history of symptoms of nasal congestion, sneezing, and copious rhinorrhea, mainly in the morning, with a good response to topical intranasal corticosteroids, which he used intermittently.

During a 4-month period without working, the patient was asymptomatic. When he returned to work, his symptoms reappeared, generally when he was handling meat, mainly chicken. His condition was not accompanied by bronchial or cutaneous symptoms, even though he did not wear gloves. He reported good tolerance to ingestion of meat, whether from birds or mammals, raw or cooked.

Prick tests were performed with extracts of mite, pollen, fungus spores, animal dander, feathers, and egg proteins (Bial-Aristegui and Laboratorios Leti); the results were negative for all extracts. Prick by prick tests were performed with raw chicken, beef, pork, and lamb; the results were positive.

Protein extracts were made from both raw and cooked meats (rabbit, pork, lamb, beef, chicken, duck, turkey, ostrich, and quail [Bial-Aristegui]) by delipidation, homogenization in phosphate-buffered saline, centrifugation, dialysis, and lyophilization. Prick tests were performed with these raw and cooked extracts; positive results were obtained with raw meat extracts and negative results with cooked meat extracts.

A nasal challenge test was performed using anterior active rhinomanometry according to the recommendations of the Rhinoconjunctivitis Committee of the Spanish Society of Allergy and Clinical Immunology [3]. The test involved

instillation of the allergen solution on the inferior turbinate using a syringe (0.1 mL) and assessment of nasal airflow resistance. We obtained positive results for raw chicken extract at a concentration of 2 mg/mL, measured as a 100% increase in airway resistance, and negative results for raw beef extract at a concentration of 10 mg/mL. In 5 healthy controls, a nasal challenge test with chicken extract was negative, reaching a concentration of 10 mg/mL.

Total serum IgE levels were 98 IU/mL. Serum specific IgE levels were measured using the enzyme allergosorbent test against raw and cooked meat extracts (HYTEC Specific IgE EIA kit, HYCOR Biomedical Ltd). Determination of specific IgE was negative to cooked meat extracts (<0.35 kU_A/L) and positive to raw meat extracts from chicken (5.6 kU_A/L, class 2), pork (0.6 kU_A/L, class 1), beef (0.7 kU_A/L, class 2), rabbit (0.7 kU_A/L, class 2), and lamb (0.8 kU_A/L, class 2). Specific IgE against α -gal was negative (<0.35 kU_A/L) (ImmunoCAP, ThermoFisher).

SDS-PAGE immunoblotting revealed an IgE-binding band with a molecular mass of 36-37 kDa in all the assayed raw meat extracts (Figure). No bands were detected when the assay was performed with cooked meat extracts.

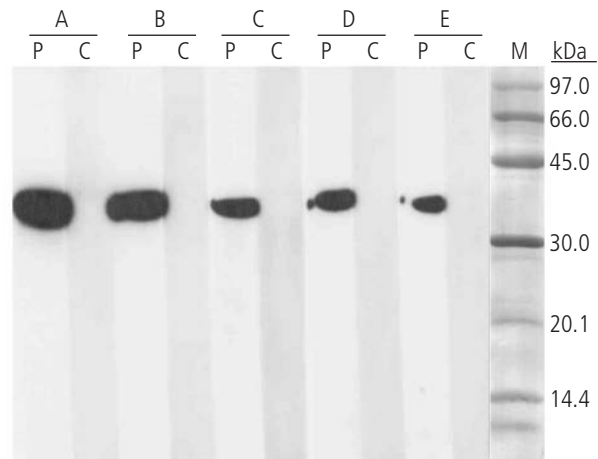


Figure. SDS-PAGE immunoblotting results. A, Raw chicken meat extract. B, Raw beef meat extract. C, Raw pork meat extract. D, Raw lamb meat extract. E, Raw rabbit meat extract. Lane P, patient serum; Lane C, control serum (pool of sera from nonatopic subjects); Lane M, molecular mass marker.

The IgE-binding bands detected in the extracts from raw beef, pork, and chicken were extracted from the gel, and proteins were identified by mass spectrometry using tandem mass spectrometry (MS/MS), as previously described [4]. The sequence of internal peptides was obtained. Analysis of protein databases revealed the IgE-binding band to be glyceraldehyde 3-phosphate dehydrogenase (GPDH) in all 3 extracts.

We recommended the patient to avoid handling chicken meat, although this was not possible for him because his butcher's shop was a family business. His symptoms only appear when he has been cutting chicken continuously for 2 or 3 hours and resolve with topical intranasal corticosteroids.

Meat allergy is very rare despite high consumption. It is mainly reported for cooked meat. The literature contains a few cases of occupational asthma induced by handling compounds used in the manufacture of meat products such as aniseed [5] and carmine [6]. A case caused by the inhalation of proteins of mammalian meat was not accompanied by allergy due to ingestion [2].

In the case we report, the patient had symptoms of occupational rhinitis without bronchial involvement that were triggered by sensitivity to chicken meat protein. The patient tolerated meat from poultry and mammals, and the sensitizing protein was GPDH.

The allergenic character of inhaled GPDH has been described for various allergens, such as wheat [7], latex [8], and the spores of fungi (*Aspergillus versicolor*) [9]. Furthermore, in a study on occupational allergy to fish proteins in fish processing factory workers [10], serum specific IgE was detected for sardine GPDH, thus proving the ability of this protein to act as an inhaled sensitizing agent. We observed that the protein was present in the meat of birds and mammals and report these as new allergenic sources. Sensitization was by inhalation, as demonstrated in the studies cited above.

In conclusion, we report the case of a butcher with occupational rhinitis caused by inhalation of chicken meat proteins. The patient tolerated ingestion of meats. GPDH was the sensitizing protein and was probably the cause of the allergic symptoms and cross-reactivity with other meats.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

1. Moscato G, Vandenplas O, Van Wijk RG, Malo JL, Perfetti L, Quirce S, Walusiak J, Castano R, Pala G, Gautrin D, De Groot H, Folletti I, Yacoub MR, Siracusa A. EAACI position paper on occupational rhinitis. *Resp Research*. 2009;10:16.
2. Sánchez A, Andrés J, Reinares C, Mallo A, Aguilera L, Sánchez I. Occupational Allergy in a Butcher due to Cow and Mutton's Meat. *Allergy*. 1997;52 (37):213 (poster 688).
3. Dordal MT, Lluch-Bernal M, Sánchez MC, Rondón C, Navarro A, Montoro J, Matheu V, Ibáñez MD, Fernández-Parra B, Dávila I, Conde J, Antón E, Colás C, Valero A. (SEAIIC Rhinoconjunctivitis Committee). Allergen-Specific Nasal Provocation Testing: review by de Rhinoconjunctivitis Committee of the Spanish Society of Allergy and Clinical Immunology. *J Invest Allergol Clin Immunol*. 2011;21(1):1-12.
4. Pastor C, Cuesta-Herranz J, Cases B, Perez-Gordo M, Figueredo E, De las Heras M, Vivanco F. Identification of major allergens in watermelon. *Int Arch Allergy Immunol*. 2009;149(4):291-8.
5. Fraj J, Lezaun A, Colás C, Duce F, Domínguez MA, Alonso MD. Occupational asthma induced by aniseed. *Allergy*. 1996;51(5):337-9.
6. Ferrer A, Marco FM, Andre C, Sempere JM. Occupational asthma to carmine in a butcher. *Int Arch Allergy Immunol*. 2005;138(3):243-50.
7. Sander I, Rozynek P, Rihs HP, van Kampen V, Chew FT, Lee WS, Kotschy-Lang N, Merget R, Brüning T, Raulf-Heimsoth M. Multiple wheat flour allergens and cross-reactive carbohydrate determinants bind IgE in baker's asthma. *Allergy*. 2011;66(9):1208-15.
8. D'Amato A, Bachi A, Fasoli E, Boschetti E, Peltre G, Sénéchal H, Sutra JP, Citterio A, Righetti PG. In-depth exploration of *Hevea brasiliensis* latex proteome and "hidden allergens" via recombinatorial peptide ligand libraries. *J Proteomics*. 2010;73(7):1368-80.
9. Benndorf D, Müller A, Bock K, Manuwald O, Herbarth O, von Bergen M. Identification of spore allergens from the indoor mould *Aspergillus versicolor*. *Allergy*. 2008;63(4):454-60.
10. van der Ventel ML, Nieuwenhuizen NE, Kirstein F, Hikuam C, Jeebhay MF, Swoboda I, Brombacher F, Lopata AL. Differential responses to natural and recombinant allergens in a murine model of fish allergy. *Mol Immunol*. 2011;48(4):637-46.

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