
Allergic Rhinoconjunctivitis Due to *Pediculus humanus capitis*

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Pediculus humanus capitis (PH) is a hematophagous, hemimetabolous obligate ectoparasite of humans that lives on the scalp [1,2]. It feeds exclusively on blood and causes pediculosis, a contagious parasitosis that is prevalent throughout the world [1-4]. The prevalence of pediculosis is estimated to be 1%-3% in industrialized countries [1]. In rural areas this figure is believed to be considerably higher, particularly in persons aged 3-13 years, ranging from 13.3% to 49% [3,4]. Pediculosis manifests as pruritus with or without eczema due to irritation of the scalp caused by substances in the saliva of the parasite [1,2]. The parasite is not believed to transmit diseases.

PH differs from other hematophagous ectoparasites in that it spends its entire life cycle on its host. Pets are not vectors. The adult can live for some 30 days, and during this period each adult female can lay 50-100 eggs. It can live without feeding for 2 to 4 days but will probably become nonviable due to dehydration long before death [1,2].

Although the first reported case suggesting an allergic reaction linked to contact with PH dates back to 1984 [5], there has been only 1 case to date, in which a specific IgE-mediated reaction to louse body proteins in an infested patient manifested as allergic asthma [6].

The patient was a 36-year-old woman with no personal history of interest, who, starting in adolescence, had experienced recurrent episodes of palpebral edema and rhinoconjunctivitis immediately upon exposure to locations where there were people infested with lice. The symptoms remitted within 30-60 minutes of the exposure ending.

She reported frequent close contact (airborne and through the skin of her fingers) with lice at home while helping to remove the parasites from the hair of her 4 younger sisters, who were regularly infested. As for family history, she reported having a brother with similar symptoms who had not been assessed.

Skin tests were performed with common airborne allergens (mites, dog and cat epithelia, airborne fungi, and

local pollen). The live adult PH samples were collected at an establishment dedicated to the eradication of lice from the scalps of its customers by natural means (ie, without applying chemical products). The ectoparasites were crushed and suspended in phosphate-buffered saline for 2 hours at 4°C. After centrifugation, the supernatant was dialyzed and then lyophilized. The protein concentration was determined using the Bradford method [7]. SDS-PAGE and Western blot were performed as previously described by Laemmli [8] and Towbin et al [9]. Briefly, the ectoparasites were separated under reducing conditions by SDS PAGE in Bio-Rad Miniprotein II gels (Hercules) and then transferred to polyvinylidene difluoride membranes. The membranes were incubated overnight with the patient's serum (dilution 1:5), washed, and then treated with IgE mouse antihuman IgE Fc-HRP (dilution 1:1000, 2 hours; Southern Biotech). Detection of IgE-binding components was evaluated with chemiluminescence according to the manufacturer's instructions (PerkinElmer).

The specific *in vivo* tests used were the skin prick test and specific nasal provocation test (NPT), which were performed according to the recommendations of the Rhinoconjunctivitis Committee of the *Sociedad Española de Alergología e Inmunología Clínica* (Spanish Society of Allergology and Clinical Immunology) [10], with lice extract at 1/1000 and 1/100 wt/vol of the concentration used in the skin prick test.

The results of skin prick tests with common local airborne allergens were negative, while those of skin prick tests with PH extract were positive (7×5 mm). The results of skin prick tests performed in 5 atopic patients with rhinoconjunctivitis and 5 nonatopic controls were negative.

NPT with PH extract was also positive, and the patient immediately presented with rhinorrhea and heavy nasal congestion, volleys of sneezes, and intense ocular pruritus, followed by a sensation of oropharyngeal fullness, dysphagia, and altered tone of voice only a few minutes after administration of the second dose of PH extract (1/100 wt/vol).

Examination revealed edema of the uvula requiring parenteral antihistamines, corticosteroids, and, eventually, adrenaline. The patient recovered gradually. Acoustic

rhinometry revealed a 70% reduction in the sum of volumes (V2-V6) of both nasal fossae following administration of the PH extract. Blood pressure, pulmonary auscultation, pulse oximetry, baseline spirometry, and exhaled nitric oxide values remained unchanged.

In the Western blot analysis of the ectoparasites, the patient's IgE detected bands of around 78, 45-74, 28, 18-20, and 13 kDa (Figure).

We report the first documented case of allergy to PH body proteins with nasal and ocular symptoms in a nonatopic, noninfested patient. The specific etiological involvement of an airborne allergen was demonstrated by means of a positive NPT result with PH extract [10].

The patient's serum recognized several louse body proteins with molecular weights of 75, 45-47, 28, 18-20, and 13 kDa. The protein located between 18 and 20 kDa could correspond to the allergenic band previously described by Fernandez et al [6].

In the case we report, the number of PH body proteins the patient's serum was able to recognize was higher than that reported by Fernandez et al [6] and although we cannot be completely certain, the most likely mechanism or route of sensitization is the airborne route, since the patient denies having been infested with lice herself, although she does report transepidermal contact via the skin of her fingers in the process of removing PH and nits from her sisters' hair.

The global prevalence of PH infestation is high. In addition, in our area, there are an increasing number of establishments dedicated to its elimination by natural means with manual extraction of the lice, thereby exposing employees to sustained direct contact with infested customers as their sole activity. Therefore, we believe there is a strong possibility of new cases in which patients will present allergic diseases linked to sensitization to PH. We therefore recommend that allergists be alert to the diagnostic possibility of this "occupational" and domestic condition. The employees of these establishments should be advised to protect themselves against airborne and transepidermal exposure when working (mask, glasses, and gloves).

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

Previous Presentations

Data from this study were presented in poster format at the XXXI SEAIC Congress.

References

1. Roberts RJ. Clinical practice. Head lice. *N Engl J Med*. 2002;346(21):1645-50.
2. Madke B, Khopkar U. Pediculosis capitis: an update. *Indian J Dermatol Venereol Leprol*. 2012;78(4):429-38.

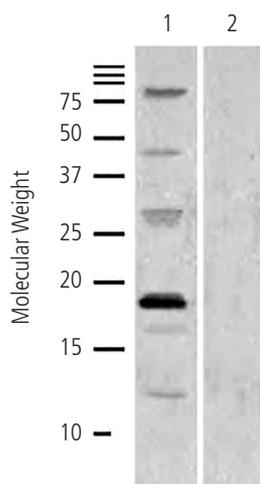


Figure. Western blot of patient's serum tested against *Pediculus humanus capitis*. Lane 1, Patient's serum; Lane 2, Nonatopic patient's serum.

3. Muhammad Zayyid M, Saidatul Saadah R, Adil AR, Rohela M, Jamaiah I. Prevalence of scabies and head lice among children in a welfare home in Pulau Pinang, Malaysia. *Trop Biomed*. 2010;27(3):442-6.
4. Bosely HA, El-Alfy NM. Head lice infestations (Anoplura: Pediculidae) in Saudi and non-Saudi school-aged children. *J Egypt Soc Parasitol*. 2011;41(1):131-40.
5. Lafeber A. An allergic reaction from contact with *Pediculus humanus capitis* (head lice). *Ned Tijdschr Geneesk*. 1984;128(39):1860-1.
6. Fernández S, Fernández A, Armentia A, Pineda F. Allergy due to head lice (*Pediculus humanus capitis*). *Allergy*. 2006;61(11):1372.
7. Bradford MM. Rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Anal Biochem*. 1976;72:248-54.
8. Laemmli UK. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature*. 1970;227(5259):680-5.
9. Towbin H, Staehelin T, Gordon J. Electrophoretic transfer of proteins from polyacrylamide gels to nitrocellulose sheets: procedure and some applications. *Proc Natl Acad Sci USA*. 1979;76(9):4350-4.
10. Dordal MT, Lluch-Bernal M, Sánchez MC, Rondón C, Navarro A, Montoro J, et al. Allergen-specific nasal provocation testing: review by the rhinoconjunctivitis committee of the Spanish Society of Allergy and Clinical Immunology. *J Investig Allergol Clin Immunol*. 2011;21(1):1-12.

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