



Asthma Caused by African Hedgehog: A Report of Two Cases

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Abstract

Background: There are very few published studies involving hedgehogs as an allergenic source, being urticarial reactions the most frequently described. The presence of hedgehogs at homes is spreading widely throughout the population and in the last 2 years two publications have demonstrated the presence of different hedgehog's protein families as responsible for both respiratory and cutaneous symptoms.

Methods: We present 2 patients with asthmatic symptoms after direct contact with hedgehogs at home. African pygmy hedgehog urine and bedding extracts were prepared and a prick-test was carried out with the extract. SDS-PAGE IgE immunoblotting assays were also performed for both patient's serum.

Results: Skin prick tests carried out showed positive results to hedgehog urine and in the first case also to bedding. The SDS-PAGE revealed in the first case an IgE-reactivity with proteins with apparent molecular weight of approximately 40 kDa which could correspond to an elastase belonging to the acidic mammalian chitinase-like elastase family and in the second case revealed proteins with apparent molecular weights between 30 and 60 kDa which may concur with lipocalins and albumins.

Conclusion: To our knowledge this is the second report of hedgehog hypersensitivity which confirms the presence of acidic mammalian chitinase-like elastase family, lipocalins and albumins members as the relevant allergens.

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Introduction

According to the European Community Health survey back in the early 90's [1], 4.5% of the population between 20 and 44 years old suffer from asthma. In Spain, the new results of Alergológica 2015 [2] determine asthma as the second cause of assistance to an allergy clinic (21.1% of all patients). Investigating the cause of this illness is not always easy, requiring a very deep anamnesis.

Nowadays having other exotic animals as pets rather than dogs and cats is spreading widely throughout the population. Hedgehogs are more commonly becoming household pets, being African pygmy hedgehogs (*Atelerixalbiventris*) the most common. Very few publications regard hedgehogs as the origin of an allergic reaction and of these, urticarial reactions [3] are the most frequently described. In 2016 three cases of hedgehog allergy were published, demonstrating a carboxypeptidase, chitinase-like and chymotrypsin-like elastase family members as the relevant allergens [4].

Previously, in 2015 another publication reported a patient with asthma caused by two proteins which could correspond to lipocalins (25-27 kDa) and albumins (67 kDa) families, according to their molecular weight [5].

Case Presentation

Case 1

A 41 year old Caucasian woman was referred by internal medicine to carry out an allergologic study after requiring one month of hospitalization due to an asthmatic crisis. She had previous medical history of diffuse multinodular goiter without active treatment; 20 cigarettes/year smoker until one month before hospitalization and she had been diagnosed of allergic rhinitis cause by pollen hypersensitivity and urticaria related to *Anisakishy* per sensitivity 3 years before this episode. No known family history of asthma.

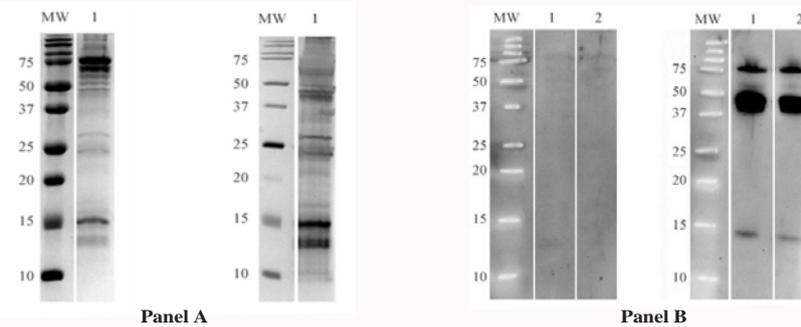


Figure 1: Panel A: Left: SDS-PAGE with Coomassie dye; Right: silver dye.

MW: Molecular Weights. Lane 1 shows in both cases binding to different molecular weight proteins.

Panel B: Left: Immunoblotting assays with a non-allergic patients' serum (Lane 1 and 2). No antigenic recognition can be seen. Right: Immunoblotting assay with patient from case 1's serum in which Ig E recognition is revealed, being more intense near 40 kDa and more subtle at 75 kDa and 15 kDa. The molecular weight markers (in kDa) are shown on the left.

She reported no previous respiratory symptoms, beginning 5 months before attending our consulting room with respiratory problems manifesting as moderate persistent rhino conjunctivitis, dyspnea, dry cough, and wheezing requiring sustained treatment with inhaled corticosteroids, long term bronchodilators and frequent bronchodilator rescue medication. She also related daily transparent runny nose which improved being away from home. However, despite the medication, the clinical situation required medical emergency assistance and hospitalization.

The physical examination showed a normal cardiac and pulmonary auscultation and only a slight congestive nasal mucous membrane, without any visible polyps.

During hospitalization levels of alfa-1-antitripsine and a blood panel were performed (both with levels according to normal values), serum total IgE, with a result of 537.7 UI/ml and specific IgE to grass pollen and house dust mites which were all negative. The pulmonary function test revealed a forced volume vital capacity FVC of 104%, a forced expiratory volume in 1 second (FEV1) of 86.9%, FEV1/FVC of 63% and a forced expiratory flow between 25% and 75% (MMEF 25-75) of 91.2% of normal, with a significant response after bronchodilatation test (FEV1 increase of 21%). The chest CT scan showed no pathology.

Prick testing was performed with a standard battery of aeroallergens including pollen (grasses, olive, Plain tree, Cynodon, Cupressus, Arizonica, Artemisia, Chenopodium, acacia, ash tree and Salsolaspecies), house dust mites (Dermatophagoidespteronysinus, Dermatophagoidesfarinae), animal dander (cats and dogs), fungi (Alternaria and Aspergillus species) and Anisakis, with positive results for Anisakis (9 mm × 5 mm) and artemisia (4 mm × 4 mm).

A new pulmonary function test including bronchodilatation test and fraction of exhaled nitric oxide were also carried out, showing a normal respiratory function with a negative bronchodilatation test and a fraction of exhaled nitric oxide (FENO) < 5 ppb.

The patient lived in an urban residence without any hobbies with allergy risk. She had owned an African pygmy hedgehog for the last 2 years. She reported one episode of hand itching, eyelid angioedema and tearing after holding the hedgehog and rubbing her eyes. She therefore had given the hedgehog to a member of her family, one month before attending our consulting room with a significant clinical improvement once avoiding contact with the hedgehog. She recounted no contact with other animals.

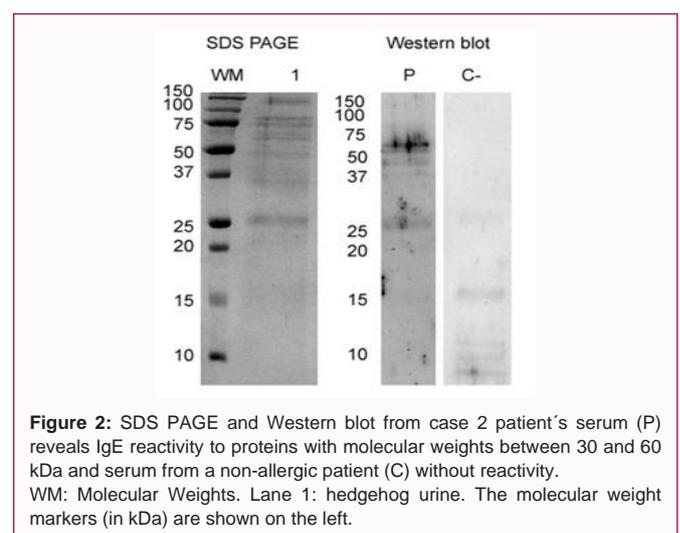


Figure 2: SDS PAGE and Western blot from case 2 patient's serum (P) reveals IgE reactivity to proteins with molecular weights between 30 and 60 kDa and serum from a non-allergic patient (C) without reactivity.

WM: Molecular Weights. Lane 1: hedgehog urine. The molecular weight markers (in kDa) are shown on the left.

New prick test were carried out with an extract of the hedgehog's urine (6x6 mm) and bedding (11x7 mm). An SDS-PAGE IgE immunoblotting assays with the patients' serum was also performed, revealing an IgE reactivity with proteins with molecular weight of approximately 40 kDa (Figure 1).

Case 2

A 52 year old Caucasian female patient without previous medical history or hobbies with allergy risk recounted a one year history of moderate persistent dyspnoea, cough and rhinitis without clinical response despite continuous treatment with inhaled corticosteroids and long term bronchodilators. She clearly described symptomatic worsening at home where she had an African pygmy hedgehog since two years before symptomatic onset. She personally cleaned the cage and bedding, suffering worsening of the dyspnoea in every occasion. She had no other pets or contact with animals.

Prick testing revealed negative results for grasses, olive tree, Plain tree, Cupressus Arizonica, Plantain, Chenopodium species, house dust mites, animal dander (cats, dogs and rabbit), fungi (Alternaria and Aspergillus species) and were only positive to hedgehog's urine extract (6 mm x 6 mm). The same prick tests were performed in ten random patients from our clinic who were used as negative controls, having all of them negative results to hedgehog urine.

A pulmonary function test revealed FVC of 100.7%, FEV1

of 121%, FEV/FVC of 92% and MMEF25-75 of 156% of normal. However, the FENO resulted in 128 ppb. The test was repeated 2 months after avoiding the hedgehog contact with a result of 30ppb, after this period, the patient recounted being asymptomatic. SDS-PAGE IgE immunoblotting assays with the patients' serum were performed and revealed IgE reactivity to proteins with apparent molecular weights between 30 and 60 kDa (Figure 2). The levels of specific IgE against hedgehog urine from the patient's serum was quantified obtaining a result of 0.97 kU/L

Discussion

To our knowledge, we present the second cases of patients with demonstrated allergy to African pygmy hedgehog. In the first case, the pattern of IgE reactivity is similar to the case described by Gonzalez et al. [4] revealing a protein from the acidic mammalian chitinase-like elastase family. In the second case, IgE immunoblotting showed IgE reactivity to proteins that may correspond to lipocalins and albumins members, as described in the publication by Nuñez et al. [5]. Animal allergy is usually limited to the animal's fur except for a few exceptions in which we consider other options as it occurs with protein Can f5 in dogs. The appearance of new cases showing the same proteins in hedgehog allergy which have no relation to fur as the cause of the symptoms also demonstrates the importance of searching for different possible origins when approaching pet allergy. On the other hand, these cases illustrate the importance of a sound anamnesis, considering any possible allergenic source as the cause of the patient's respiratory symptoms. In the first case, some allergy testing to common inhalant allergens were previously performed, yielding negative results and being the patient labelled as "intrinsic asthmatic". In the second case, the primary care physician started the patient on anti-asthmatic medication but did not consider the possibility of deriving her for allergologic assessment. Since owning exotic pets is an increasing trend in our society [6], both primary care and specialized care physicians should be aware of this potential allergenic source and include specific questions in the anamnesis of patients newly presenting with asthma or having unexplained worsening of existing asthma.

Conflict of Interest Statement

All of the authors declare having received scientific help from Diater laboratory by the fulfilment of the in vitro allergy study. Fernando Pineda is actually an employer at Diater laboratory.

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