Occupational rhinitis due to coati allergy and cross-reactivity with dog serum albumin

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The coati, or nasua, is a medium-sized omnivorous mammal native to South and Central America and belonging to the Carnivora order, Caniformia suborder, and Procyoninae family. It is characterized by its elongated nose and long tail of a similar length to the rest of its body. Coati is considered an exotic species in Spain and it´s found only in zoos, though exotic animals are often kept as pets and used for other leisure- and work-related activities, even when doing so is prohibited. Workplace exposure to sensitizing agents is the primary factor for the development of IgE-mediated sensitization and occupational rhinitis [1].

We report the case of a 33-year-old man with a history of rhinoconjunctivitis and asthma due to dog-allergen exposure at home since 2016, for which he underwent dog-epithelium immunotherapy for 3 years. He remained symptom-free for 1 year following this treatment, using antihistamines only when coming into contact with coarse-haired dogs and requiring no asthma medication. However, the patient has been working in a zoo since the last two years. He spent one year working maskless with coatis, presenting nasal itching, rhinorrhea, nasal congestion, and sneezing within minutes of contact.

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Following a diagnosis of workplace moderate rhinitis in accordance with the ARIA guidelines, the patient was prescribed antihistamines and nasal corticosteroids. No bronchial symptoms were reported. His symptoms remitted out of work such as on weekends or vacation. The patient was transferred to another area of the zoo (the aquarium), after which he experienced total resolution of symptoms.

Pulmonary function tests revealed normal spirometry values, and a nonspecific methacholine bronchial challenge was negative. Skin prick testing (SPT) with a battery of common aeroallergens (pollens, dust mites, molds, and animal danders) (Roxall®) showed a positive response (wheal ≥3 mm) to dog dander. The results of blood tests and differential white blood cell count (200 eosinophils/mm^3) were within normal limits. Total IgE was 42 UI/mL.

Written informed consent was obtained from the patient for all *in vitro* and *in vivo* studies.

Serum allergen-specific IgE was measured using the Siemens Immulite 2000/Xpi® (Erlangen, Germany) and ImmunoCAP-Phadia® (Sweden) immunoassay analyzers; values over 0.35 kU_A/L were considered positive. The result for dog dander was 4.3 kU_A/L, dog epithelium:14.3 kU_A/L, rCan f 1: 1.4 kU_A/L, rCan f 3: 3.5 kU_A/L, rCan f 4: 1.61 kU_A/L and for rCan f 6 was 0.79 kU_A/L. Specific serum IgE was negative for all other aeroallergens, rCan f 2 and rCan f 5.

Small, round balls of coati feces containing urine were obtained from animal bedding material. A feces-urine protein extract was prepared by homogenization in phosphate-buffered saline (20% wt/vol), dialysis, and lyophilization. The protein content was 16.3% (W/W) according to Bradford [2]. No SPT was performed with the feces-urine extract for sanitary reasons.

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Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) was performed as described elsewhere [3]. IgE immunoblotting revealed IgE-binding bands of 69 and 50 kDa in the coati extract. Two main bands of 69 and 50 kDa, and some much less intense bands of 45, 39, 36, 23, 20, and 19 kDa, were detected in the dog extract (**Figure 1a**).

SDS-PAGE immunoblotting-inhibition using coati extract in the solid phase showed total IgE binding inhibition when the patient's serum was preincubated with dog-dander extract and dog serum albumin, quasi-total inhibition with the coati feces-urine extract, partial inhibition with cat serum albumin, and no inhibition with pig serum albumin, ovalbumin, or *Helianthus annuus* pollen extracts (the last two inhibition phases were used as negative controls) (**Figure 1b**). The degree of inhibition observed in the immunoblotting-inhibition assay reflects the evolutionary proximity of the proteins used in the assays: dog and coati belong to the same suborder (Caniformia) and order (Carnivora), cat and dog belong to the same order (Carnivora) but different suborders, and pig and dog belong to the same class (Mammals) but not the same order.

The most common pet allergy is allergy to cats and dogs. Daily exposure to pets is a potential risk factor for allergic disease, and this problem is increasingly common, especially in some European countries and in the United States [4,5].

Allergic sensitization to furry animals can be induced not only by direct or indirect exposure but also by a cross-reaction mechanism involving certain families of allergenic proteins [6]. Serum albumins, which are proteins of 66-69 kDa, represent the major component of proteins in the circulatory system of mammals; their role is to control colloid osmotic pressure and ligand transport. Although their diffusion and cross-reactivity are high in mammals, the relevance of serum albumins in clinical practice is

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relatively low. Nevertheless, some serum albumins appear in the official allergen database (WHO/IUIS; www.allergen.org), such as Can f 3 (dog), Fel d 2 (cat), Bos d 6 (cow), Sus s 1 (pig), and Cav p 4 (Guinea pig), and some case reports have shown that albumins are involved in respiratory allergic reactions [7, 8] and in food allergy due to cross-reactivity, as in the case of pork-cat syndrome [9].

We present a case of probable IgE-mediated occupational allergy to coati demonstrated through *in vitro* studies, suggesting that the allergens involved are proteins of 50 and 69 kDa belonging to serum albumin allergens. Owing to the patient's history of allergy to dog allergens, the total IgE binding inhibition produced by dog-dander extract and dog albumin, together with the no total IgE binding inhibition produced by urine-feces coati extract (homologous inhibition), we suspect that primary sensitization to dog serum albumin predisposed the patient to an allergic reaction to coati serum albumin due to cross-reactivity.

To our knowledge, no other cases of allergy to coati have been published to date. Clinicians should be aware of this new exotic pet allergy and its diagnostic approach, particularly given the increased worldwide interest in less common furry animals for various work and leisure-time activities. Additionally, early and accurate diagnosis of occupational rhinitis is crucial to prevent the development of occupational asthma. Although more documented cases are needed, the findings of this report may lead to the introduction of preventive measures for workers who come into contact with coatis and may justify warnings issued for dog-allergic zoo visitors. Moreover, it is advisable for patients sensitized to serum albumins to avoid contact with other mammals, as they may also experience symptoms.

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Conflicts of interest

All authors declare that there is no conflict of interest.

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FIGURE LEGENDS

Figure 1a. **SDS-PAGE Immunoblotting**. A) Coati feces-urine extract; B) Dog extract. Lane P: Patient's serum, Lane C: Control serum (pool of sera from non-atopic subjects), Lane M: Molecular mass marker.

Figure 1b. SDS-PAGE Immunoblotting-inhibition. Coati feces-urine in the solid phase. Lane C: control serum (pool of sera from non-atopic subjects), Lanes 1–7: Patient's serum previously incubated with extracts from coati feces-urine (lane 1), from dog extract (lane 2), from dog serum albumin (lane 3), from cat serum albumin (lane 4), from pig serum albumin (lane 5), from ovalbumin (lane 6), and from *Helianthus annuus* pollen (lane 7).