

A case of transient pork-cat syndrome in a child due to albumin sensitization

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Pork-cat syndrome is an unusual condition in which patients allergic to cat epithelium develop allergic symptoms after the ingestion of pork-meat. Primary sensitization is presumed to be caused by inhaled Fel d 2 (cat serum albumin), with the patient presenting predominantly respiratory symptoms (mild-moderate rhinitis/asthma) [1], and subsequent reactions to pork due to cross-reactivity between Fel d 2 and pork serum albumin (Sus s 1) [2]. Despite being one of the most frequently named food allergy syndromes along with others, such as egg-bird and latex-fruits syndrome, there are few cases described in the literature of patients with pork-cat syndrome [3, 4]. Most of the cases described in the literature of this syndrome occur in older adolescents or young adults [5]. So far, we have found no cases reported in toddlers [6].

We present the case of a 15-month-old infant who presented with perioral erythema immediately after eating smoked pork loin, which resolved without the need for medication within 1-2 hours. He tolerated well-cooked pork meat, and had no problems with meat from other mammals, always well-cooked, or milk. The patient had no pets at home, but had occasional contact with a cat, presenting mild rhinitis. We performed skin prick tests (SPT) (ALK Allergologist Laboratorium A/S, Horsholm, Denmark) with different foods, as well as possible related allergens, and prick by prick with smoked pork loin. Total IgE and specific IgE (ImmunoCap®, Thermo Fisher Scientific, Massachusetts, United States) to the different allergens were also measured. A raw smoked loin extract (L.E.) was prepared by

homogenization in phosphate-buffered saline (15% wt/vol), dialyzation and lyophilization. Ten ml of the cat serum (Nextmune S.L., Madrid, Spain) were concentrated in 30-KDa spin filter devices to obtain an albumin-rich serum extract (ARSE). To know the primary sensitizing allergen ELISA inhibition assays using LE and ARSE in the solid phase, and LE and ARSE at 1 µg/ml and 25 µg/ml as inhibitors, were performed as described in Gadermaier et al [7]. All the results are shown in Table 1 and Table 1 online-only supplemental file. The patient was diagnosed with pork-cat syndrome and a diet with avoidance of raw pork was recommended, leaving the diet free for well-cooked pork. At 1-year follow-up he tolerated pork in all its forms, including raw pork meat. SPT, total and specific IgE and ELISA inhibition were also repeated (Table 1 and Table 1 online-only supplemental file). The tolerance of raw pork meat coincided with the decrease in specific IgE sensitization to both serum albumins (SA), which was confirmed the next year.

Pork-cat syndrome is one of the different types of red meat allergy [1]. Although historically considered rare reactions, the consumption of red meat has increased in recent decades, so that allergic reactions to red meat are becoming more frequent [2, 5]. There are three main mechanisms described as responsible for allergic reactions to red meat: primary beef allergy, causing rapid reactions due to Bos d 6 sensitization (bovine SA), many of them presenting reactions with milk as well; α -Gal syndrome, presenting late IgE-mediated reactions to galactose- α -1,3-galactose (α -Gal); and pork-cat syndrome due to cross reactions between different SA [5]. Depending on the responsible allergen, the management of pork meat allergy may vary.

Serum albumin is a multifunctional protein with some of its functions related to its structure and sequence stability [8]. However, it is a flexible protein, able to change its conformation to bind ligands, serving as a carrier protein [8]. Pork SA is thermolabile and can denature with cooking [8], in keeping with this reaction mostly occur with under cooked or raw pork, and tolerance to well cooked pork is common [2, 6]. It is found in many animal products of the human diet, as well as in animal dander [8]. The possibility of SA-mediated allergy remission in many foods is widely known [9], so although the main recommendation for these patients is avoidance diet [6, 10], it might be reasonable to think that this type of allergy could also subside, as some authors have already suggested [9]. Nevertheless, to date, there are no submission cases reported.

We present a case of pork-cat syndrome in a 15-month-old infant due to sensitization to albumin with progressive remission of this sensitization and final tolerance to pork, as well as resolution of symptoms on contact with cat. In contrast to the normal pattern in older children or adults [1], the primary sensitization in this case appears to be the ingestion of smoked pork loin. The skin tests against this animal were negative from the beginning, which means that extracts containing allergens other than the major ones (to avoid under-diagnosis) are essential to make an accurate diagnosis of the food allergy.

Doing so will lead to an improvement in providing better recommendations for avoidance (e.g. raw meat intake) and future management.

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Conflicts of interest

The authors have no conflict of interest to declare.

References

1. Dávila I, Domínguez-Ortega J, Navarro-Pulido A, Alonso A, Antolín-Amérigo D, González-Mancebo E, et al. Consensus document on dog and cat allergy. *Allergy*. 2018 Jun;73(6):1206-22.
2. Wilson JM, Platts-Mills TAE. Meat allergy and allergens. *Mol Immunol*. 2018 Aug;100:107-12.
3. Dewachter P, Jacquenet S, Beloucif S, Goarin JP, Koskas F, Mouton-Faivre C. Pork-cat syndrome revealed after surgery: Anaphylaxis to bovine serum albumin tissue adhesive. *J Allergy Clin Immunol Pract*. 2019 Sep-Oct;7(7):2450-2.
4. Barradas Lopes J, Labrador-Horrilo M, Bartolomé B, Cunha L. The Role of Molecular Allergens in the Diagnosis of Cat-Pork Syndrome: An Unusual Case Report. *Acta Med Port*. 2022 May 2;35(5):388-91.
5. Wilson JM, Platts-Mills TAE. Red meat allergy in children and adults. *Curr Opin Allergy Clin Immunol*. 2019 Jun;19(3):229-35.
6. Yamada S, Matsubara K, Chinuki Y, Hori M, Masaki T. [EARLY CHILDHOOD-ONSET PORK-CAT SYNDROME DUE TO SENSITIZATION BY BOTH CATS AND DOGS -A CASE REPORT]. *Alerugi*. 2019;68(9):1141-7.
7. Gadermaier E, James LK, Shamji MH, Blatt K, Fauland K, Zieglmayer P, et al. Epitope specificity determines cross-protection of a SIT-induced IgG4 antibody. *Allergy*. 2016 Jan;71(1):36-46.

8. Posthumus J, James HR, Lane CJ, Matos LA, Platts-Mills TA, Commins SP. Initial description of pork-cat syndrome in the United States. *J Allergy Clin Immunol*. 2013 Mar;131(3):923-5.
9. Chruszcz M, Mikolajczak K, Mank N, Majorek KA, Porebski PJ, Minor W. Serum albumins-unusual allergens. *Biochim Biophys Acta*. 2013 Dec;1830(12):5375-81.
10. Savi E, Rossi A, Incorvaia C. Cat-pork syndrome: a case report with a three years follow-up. *Eur Ann Allergy Clin Immunol*. 2006 Dec;38(10):366-8.

Table 1. Skin tests results, analytical determinations and symptomatology over the years.

	First visit	Year 1	Year 2
Symptoms			
Raw pork meat	OAS	None	None
Cooked pork meat	None	None	None
Cat	MR	None	None
Skin prick test (mm)			
Pork meat	6	0	0
Cat dander	0	0	0
Prick by prick raw pork meat	NP	0	NP
IgE (KU/L)			
Total IgE	81	57	122
sIgE pork meat	6.20	1.33	1.07
sIgE Sus s 1	7.55	1.83	1.34
sIgE cat	0.22	NP	NP
sIgE Fel d 1/Fel d 2	0 / 3.62	NP / 0.46	NP / 0.40
ELISA inhibition (%)			
- LE (1 / 25 µg/ml)			
o Coated LE	60 / 85	69 / 91	NP
o Coated ARSE	57 / 79	66 / 86	NP
- ARSE (1 / 25 µg/ml)			
o Coated LE	27 / 35	30 / 37	NP
o Coated ARSE	65 / 80	72 / 95	NP

ARSE: albumin rich serum extract, LE: loin extract, MR: mild rhinitis, NP: not performed, OAS: oral allergic syndrome, sIgE: specific IgE.