

Contact Angioedema and Rhinoconjunctivitis Caused by *Dendrobaena* species and *Sarcophaga carnaria* Used as Fishing Bait

J García-Loria,^{1,*} R Rodríguez-Pérez,^{2,*} A Iglesias,¹ I Moneo,² ML Caballero²

¹Department of Allergology, Hospital Puerta de Hierro, Majadahonda, Madrid, Spain

²Department of Immunology, Hospital Carlos III, Madrid, Spain

*These authors contributed equally to this article.

■ Abstract

The flesh fly *Sarcophaga carnaria* is commonly used as fishing bait. Immunoglobulin (Ig) E-mediated reactions caused by the handling of this bait have been reported. The earthworm *Dendrobaena* species is increasingly being used as fishing bait but there have been no reported cases of allergy to this species to date.

We studied a 26-year-old amateur angler who presented rhinoconjunctivitis, urticaria, and angioedema on handling *S. carnaria*. He started to use *Dendrobaena* species instead but developed the same symptoms. The aim of this study was to identify the allergens involved in the patient's clinical reactions.

The study was performed using immunoglobulin (Ig) E immunoblotting and immunoblotting inhibition assays. The patient's serum detected allergens from *Dendrobaena* species (of an apparent molecular weight of approximately 150, 60, 37, 24, 21 and 19 kDa) and *S. carnaria* (approximately 70 kDa and a smear ranging from 50 to 40 kDa). The patient was diagnosed with allergy to both *Dendrobaena* species and *S. carnaria*. This is the first case describing *Dendrobaena* species as an allergic agent.

Key words: Allergy. *Dendrobaena*. Fishing bait. IgE. *Sarcophaga carnaria*.

■ Resumen

La mosca *Sarcophaga carnaria*, se usa como cebo de pesca. Se han descrito reacciones IgE-mediadas causadas por su manipulación. La lombriz *Dendrobaena* sp. ha sido introducida como cebo de pesca. Hasta ahora no hay descritos casos de alergia por su manipulación.

Presentamos el caso de un pescador aficionado, de 26 años, que presentó rinoconjunctivitis, urticaria y angioedema al manipular *S. carnaria*. Al utilizar *Dendrobaena* presentó los mismos síntomas. El objetivo fue identificar los alérgenos implicados.

El estudio se realizó mediante IgE-immunoblotting y ensayos de inhibición. El suero del paciente detectó alérgenos de *Dendrobaena* (peso molecular aparente alrededor de 150, 60, 37, 24, 21 y 19), y de *S. carnaria* (alrededor de 70 y una banda difusa entre 50 y 40 kDa). El paciente fue diagnosticado de alergia a *Dendrobaena* y *S. carnaria*.

Este es el primer caso describiendo a *Dendrobaena* sp. como un agente sensibilizante.

Palabras clave: Alergia. *Dendrobaena*. Cebo de pesca. IgE. *Sarcophaga carnaria*.

Introduction

Allergy caused by handling of worms and maggots as fishing bait has been previously described. The common earthworm *Lumbricus terrestris* and maggots such as the flesh fly *Sarcophaga carnaria*, the bee moth larvae *Galleria mellonella*, and *Asticot* maggots (such as the fly larvae *Protophormia terraenovae*) have been reported as sensitizing agents responsible for rhinoconjunctivitis, contact urticaria, and asthma among anglers [1-8].

We present the case of a patient with allergy to both *S carnaria* and *Dendrobaena* species used as fishing bait. *S carnaria* (kingdom, Animalia; phylum, Arthropoda; class: Insecta; order, Diptera; family, Sarcophagidae) is found worldwide and commonly used as fishing bait. However, the unpigmented reddish earthworm *Dendrobaena* species (kingdom, Animalia; phylum, Annelida; class, Oligochaeta; order, Haplotaxida; family, Lumbricidae) was only recently introduced as fishing bait. Its use is growing because of its low cost, its manageable size, and its biological characteristics (high resistance to both low temperature water and hook injury).

There are published cases of immunoglobulin (Ig) E-mediated bronchial asthma, rhinoconjunctivitis, and urticaria caused by the handling of *S carnaria* larvae as fishing bait [9-12]; there have, however, been no reports of allergy to *Dendrobaena* species to date.

The aim of this study was identify the allergens involved in the clinical reactions developed by our patient on handling *S carnaria* and *Dendrobaena* species.

Case Description

A 26-year-old glassworker and amateur fisherman without a history of allergy presented rhinoconjunctivitis; contact urticaria on the hands, forearms, and neck; facial erythema; and angioedema after a year of handling *S carnaria* as fishing bait. The patient decided to replace the bait with *Dendrobaena* species, but he developed the same symptoms. He was completely asymptomatic when he avoided contact with these 2 species. Informed consent for the present study was obtained from the patient.

Skin prick tests were performed with a standard series of common airborne allergens (ALK-Abelló, Madrid, Spain). Histamine dihydrochloride (1 mg/mL) and saline solution were used as positive and negative controls, respectively. A response was considered positive if the largest wheal diameter was at least 3 mm greater than that produced by the negative control. Skin prick-to-prick tests were performed with *Dendrobaena* species and *S carnaria*. Determination of specific IgE to tropomyosin was performed using the CAP system (Phadia, Uppsala, Sweden).

To identify the allergens involved in the patient's allergy, we prepared extracts from *Dendrobaena* species (adult) and *Sarcophaga carnaria* (larvae). Briefly, 1 g of each was homogenized in a mortar with 5 mL of phosphate buffered saline and centrifuged at 4500 g for 15 minutes. The protein concentration of the supernatants obtained was determined

using the Protein Quantification Kit-Rapid (Fluka Chemie AG, Buchs, Switzerland).

Aliquots of protein (15 µg) from the supernatants were analyzed by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) performed in 12% polyacrylamide gels and IgE immunoblotting with the patient's serum, as previously described [13]. The pellets were resuspended in 1 mL of SDS-PAGE loading buffer and were also analyzed by SDS-PAGE and IgE immunoblotting to check whether any of the proteins were allergens.

IgE immunoblotting inhibition assays were performed by preincubating the patient's serum for 3 hours at room temperature with the corresponding extract (15 µg of protein).

Skin prick tests were positive to *Cupressus arizonica*, grass pollen (*Phleum pratense*, *Lolium perenne*, *Dactylis glomerata*, *Poa pratensis*, *Cynodon dactylon*) and weeds (*Plantago lanceolata*, *Artemisia vulgaris*, *Taraxacum vulgare*, and *Chenopodium album*). Skin prick-to-prick tests were positive to *Dendrobaena* species and *S carnaria*. The determination of specific IgE to tropomyosin by CAP was negative. Total IgE was 1065 kU/L. The Table shows the clinical data of the patient.

The SDS-PAGE and IgE immunoblotting results for the *Dendrobaena* species and *S carnaria* extracts are depicted in Figure 1. IgE immunoblotting revealed that the patient's serum detected several allergens from *Dendrobaena* species and *S carnaria*.

The allergens detected in *Dendrobaena* species had an apparent molecular weight of approximately 150, 60 and 37 kDa in the pellet and of approximately 24, 21 and 19 kDa in the supernatant. In the case of *S carnaria*, the allergens detected in both the pellet and the supernatant had an apparent molecular weight of approximately 70 kDa and a smear ranging from 50 to 40 kDa.

We performed IgE immunoblotting inhibition assays between *Dendrobaena* species and *S carnaria* extracts to study possible cross-reactions. As shown in Figure 2A, the 150- and 60-kDa allergens detected by the patient's serum in the pellet from *Dendrobaena* species were inhibited when the serum was preincubated with a mixture of pellet and supernatant extracts of *S carnaria*. On the other hand, no inhibition was observed in the extracts from *S carnaria* when the serum was preincubated with the *Dendrobaena* species extracts, although the 50- to 40-kDa smear seemed weaker than when the uninhibited serum was used (Figure 2B).

Worms and insect larvae used as live fishing bait are sensitizers which have the potential to cause asthma, rhinoconjunctivitis, and urticaria when handled by anglers [14]. We have studied a case of allergy to 2 phylogenetically distant species: the worm *Dendrobaena* species and the insect *S carnaria*, both used as fishing bait. The patient presented the same symptoms when he handled both species. There have been several published cases of IgE-mediated reactions caused by the handling of *S carnaria* larvae, although no allergens have been described. To our knowledge, there has only been 1 published case of *S carnaria*-related allergy in which allergens with a molecular weight of 70, 34, 20, and 12 kDa are mentioned [15]. IgE immunoblotting performed with the patient's serum detected a 70-kDa allergen in both the pellet and the supernatant from *S carnaria* but it did not detect the other 3 allergens.

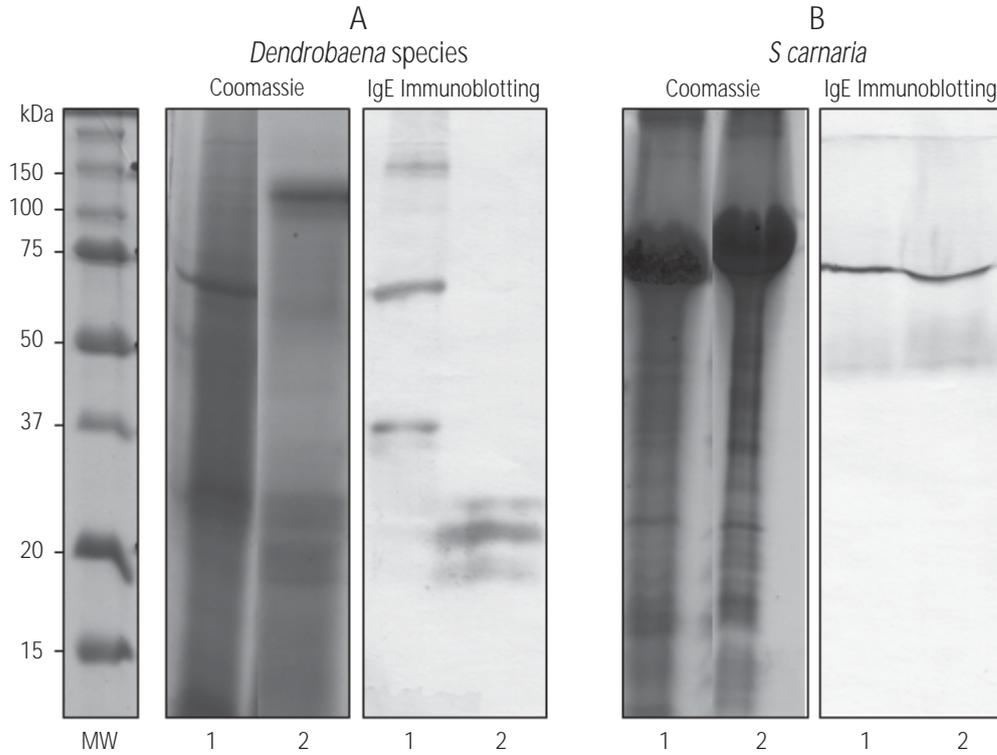


Figure 1. Protein separation by sodium dodecyl sulfate polyacrylamide gel electrophoresis and Coomassie staining of the extracts obtained from *Dendrobaena species* (A) and *Sarcophaga carnaria* (B), and immunoglobulin (Ig) E immunoblotting performed with the patient's serum. Lane 1, pellet; lane 2, supernatant. MW indicates molecular-weight markers.

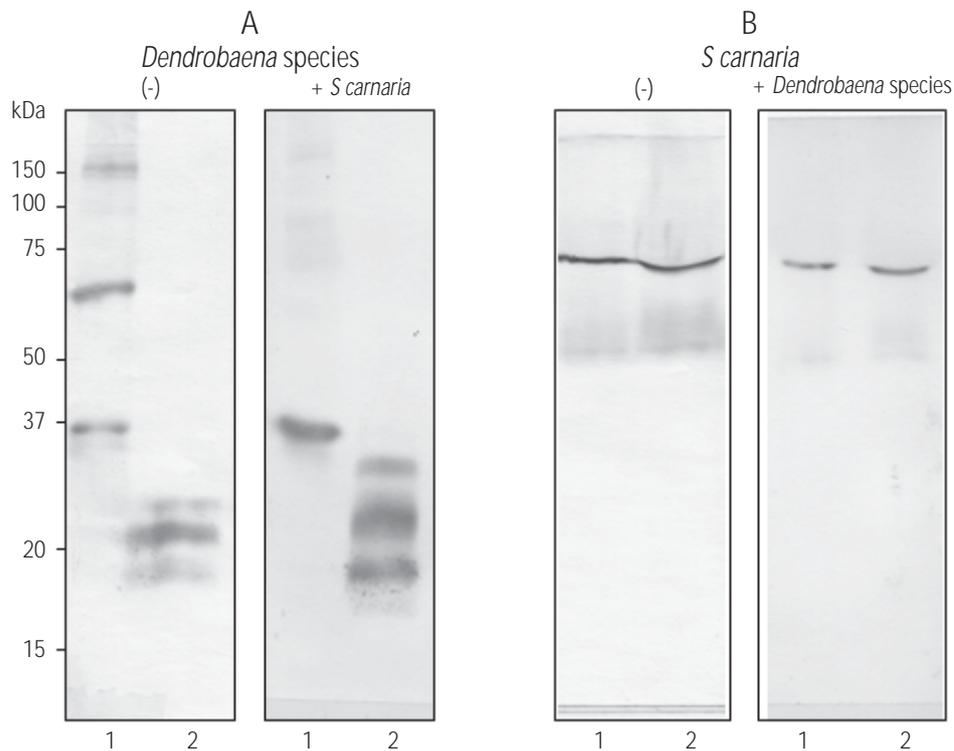


Figure 2. Immunoglobulin (Ig) E immunoblotting inhibition assay performed with *Dendrobaena species* and *Sarcophaga carnaria*. A, *Dendrobaena species*; IgE immunoblotting performed with patient's serum not inhibited (-) and inhibited (+) with *S carnaria*. B, *S Carnaria*; IgE immunoblotting performed with the patient's serum not inhibited (-) and inhibited (+) with *Dendrobaena species*. Lane 1, pellet; lane 2, supernatant.

Table. Clinical Data for the Patient Studied

Allergens	SPT, mm	PPT, mm	CAP, kU/L
Environment			
<i>Dermatophagoides pteronyssinus</i>	negative		
<i>Dermatophagoides farinae</i>	negative		
<i>Cupressus arizonica</i>	6x5		
Grass	6x5		
Weeds	5x5		
<i>Plantago lanceolata</i>	negative		
<i>Alternaria alternata</i>	negative		
<i>Cladosporium herbarum</i>	negative		
<i>Penicillium notatum</i>	negative		
<i>Aspergillus fumigatus</i>	negative		
Dog and cat dander	negative		
Fishing bait			
<i>Dendrobaena</i> species	n/a	9x6	
<i>Sarcophaga carnaria</i>	n/a	5x5	
Other			
Shrimp tropomyosin (rPen a 1)			0.06

Abbreviations: CAP, serum-specific determination by the CAP method; n/a, not available; PPT, prick-to-prick testing; SPT, skin prick testing (mean wheal diameter).

In one report of allergy to *S Carnaria* used as fishing bait described by Valsecchi et al [12], the patient changed to *Lumbricus terrestris* and developed no further allergic reactions, suggesting an absence of cross-reactivity between live fishing baits belonging to the phyla Annelida and Arthropoda (Diptera). Our patient was sensitized to *S carnaria* but he developed the same symptoms when he replaced this bait with *Dendrobaena* species.

Our results indicate that there is some cross-reactivity between *S carnaria* and *Dendrobaena* species because extracts from *S carnaria* were able to inhibit the 150- and 60-kDa allergens detected by the serum's patient in the pellet from *Dendrobaena* species, but not any of the other allergens. On the other hand, *Dendrobaena* species did not inhibit any of the allergens in *S carnaria*. These results suggest that our patient has a double sensitization to both fishing baits.

In short, while several cases have been reported of IgE-mediated reactions caused by the handling of *S carnaria* larvae and *Lumbricus terrestris* as fishing bait, this is the first report describing *Dendrobaena* species as an allergenic agent.

References

- McMorrow NY, Goodman GM, Moeller KR, Knutsen AP, Salvin RG, Dykewicz MS. Fisherman's rhinitis: IgE mediated sensitivity to earthworms (*Lumbricus terrestris*). J Allergy Clin Immunol. 1993; 93: 301.
- Virgili A, Ligrone L, Bacilieri S, Corazza M. Protein contact dermatitis in a fisherman using maggots of a flesh fly as bait. Contact Dermatitis. 2001; 44: 262-3.
- Tripodi S, Falangiani P, Perinelli T, Dell'Omo F, Cristaldi A. Allergy to fishing bait. Allergy. 2002; 57: 653.
- Siracusa A, Marcucci F, Spinozzi F, Marabini A, Pettinari L, Pace ML, Tacconi C. Prevalence of occupational allergy due to live fish bait. Clin Exp Allergy. 2003; 33: 507-10.
- Porcel S, Cámara C, Rodríguez A, Fletes C, Jiménez S, Rodríguez E, Alvarado M, Hernández J, Pereira L, Cobo R. IgE-mediated hypersensitivity to common earthworm. Characterization of allergens evolved. Allergy Clin Immunol Int. 2005; 17: 246-8.
- Madero MF, Enriquez-Matas A, Fernández-Nieto M, Sastre B, Del Pozo V, Pastor C, Quirce S, Sastre J. Characterization of allergens from the fish bait *Galleria mellonella*. J Allergy Clin Immunol. 2007; 119: 1021-2.
- González I. Rhinoconjunctivitis and asthma provoked by Asticoid maggots. Allergol Immunopathol (Madr) 1999; 27: 232-235.
- Porcel S, Pineda F, Frontera E, Rodríguez E, Ramos A, Sánchez A, Rodríguez A, Jiménez S, Alvarado M, Medina V, Rodríguez M, Hernández J. *Protophormia terraenovae*. A new allergenic species in amateur fishermen of Cáceres, Spain. Allergol Immunopathol (Madr) 2009; 37: 68-72.
- Zucchi J, Ingrosso W. Asthma bronchiale da sensibilizzazione a larve di mosca carnaria. Riv Pat Clin Tuberc Pneumol 1980; 51: 287-91.
- Sgambato F, Pedicini A, De Rienzo D, Falagiani P. Allergia inalatoria a larve di Mosca carnaria. Caso clinico. Boll Ist Sieroter Milan. 1987; 15: 25-28.
- Siracusa A, Verga A, Bacoccoli R, Fabbri A, Felicioni D. L'asma da bigattini (larvae Della Mosca carnaria): Studio clinico e immunologico. Med Lav. 1989; 80: 489-97.
- Valsecchi R, Santini M, Leghissa P. Contact urticaria and asthma from *Sarcophaga carnaria*. Contact Dermatitis. 2009; 61: 186-7.

13. Moneo I, Caballero ML, Gómez F, Ortega E, Alonso MJ. Isolation and characterization of a major allergen from the fish parasite *Anisakis simplex*. *J Allergy Clin Immunol*. 2000; 106: 177-82.
14. Siracusa A, Bettini P, Bacocoli R, Severini C, Verga A, Abbritti G. Asthma caused by live fish bait. *J Allergy Clin Immunol*. 1994; 93: 424-30.
15. Valero AL, Pérez C. Alergia a cebos de pesca. Barcelona: UCB Pharma, 2004.

■ *Manuscript received August 16, 2010; accepted for publication, November 16, 2010.*

■ **María Luisa Caballero**

Departamento de Inmunología, Hospital Carlos III
Sinesio Delgado, 10. 28029 Madrid, Spain
E-mail: micsoto@hotmail.com