

Perplexing cases of allergy to salami

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Clinical Implications

- In a patient presenting a perplexing allergy to salami, we suggest considering mold as an aetiology.
- When a patient presents with eosinophilic esophagitis, clinicians should also consider ingested molds as a causal agent.

TO THE EDITOR:

Patients can often present with perplexing allergies to processed foods that in other simpler component forms they can tolerate. In general, further investigation of the ingredients list to isolate the offending agent is necessary. Salamis and some washed rind cheeses (such as raclette cheese) have molds used in their skins and rinds for preservation or to add certain tastes and textures. It must not be forgotten that these molds can and do cause allergic reactions.

Salami is a fermented, cured sausage. During the drying and curing phase the skin of the salami is often sprayed with a *Penicillium* species mold starter to promote flavor and to try to prevent harmful bacteria from multiplying. The type of mold used is different in various production regions (Illtud Llyr Dunsford [Charcutier Ltd], personal communication, June 26, 2012). Salami has also been found to contain house dust mites (HDMs) that can occasionally thrive during the curing process.

We present a 5-year-old boy with atopic dermatitis, seasonal allergic rhinitis, and pollen-food syndrome and no history of β -lactam allergy who developed urticaria and swollen eyelids shortly after eating Salami Tipo Milano (Ticino, Switzerland), a generic supermarket brand of salami that he had not previously ingested. Second, a 10-year-old boy with peanut allergy, seasonal allergic rhinitis, atopic dermatitis, and sensitisation to HDM, and no history of β -lactam allergy developed retrosternal pain and the sensation of food blockage after eating Salametto Milano (Rapelli SA, Ticino, Switzerland). He had previously experienced similar feelings after eating raclette cheese. Both children tolerated the foods listed as ingredients in these salamis (including pork, beef, salt, skimmed milk powder, sugar, spices, pepper, garlic, ascorbic acid, sodium nitrite, potassium nitrite).

In the first boy, skin prick tests with standard solutions (ALK-Abello, Hørsholm, Denmark) to pork, milk, and wheat were negative. Prick-to-prick testing with the salami meat was negative, but testing with the skin of the salami was positive with a 5-mm wheal. After correspondence, the manufacturers stated that there was mold in the salami skin which they identified as *Penicillium chrysogenum/notatum*. Specific IgE to *P chrysogenum/notatum* was positive at 1.24 kU/L. Skin prick test and specific IgE were negative to HDMs and other molds.

In the case of the second boy, an endoscopy showed eosinophilic esophagitis, with histology showing more than 15 eosinophils per high-powered field. Skin prick testing was negative to the foods listed as ingredients in the salami and *Aspergillus*. Prick-to-prick testing was negative to salami meat, but positive to the skin of the salami with a 9-mm wheal. On investigation *P chrysogenum/notatum* was again present in the salami skin. Specific IgE results in this boy were *P notatum* IgE 12.7 kU/L, *Dermatophagoides pteronyssinus* 2.32 kU/L, *Dermatophagoides farinae* 3.02 kU/L, *Acarus siro* 0.4 kU/L, and *Glycophagus domesticus* <0.35 kU/L.

The mold on these salami skins is the strain of *Penicillium* first discovered by Alexander Fleming¹ in 1928 and named *Penicillium rubrum* but was later identified in the 1930s as *P notatum*. When further work was done on *P notatum*, it was found to be identical to the previously characterised *P chrysogenum*. Because *P chrysogenum* is the older name, the correct title for this mold is *P chrysogenum*; nevertheless, they are often used interchangeably in the literature. *P chrysogenum* went on to be manufactured into the drug penicillin for treatment of festering wounds during the Second World War (1939-1945).

The main allergen in *P notatum* is Pen n 13. It is an alkaline serine protease that shares 39% identical residues with other molds and has been designated in group 13 of the fungal genera.^{1,2} It has similar binding epitopes to *Penicillium citrinum*, and all the serine protease family possess similar protein structure and strong cross reactivity. Skins, or casings, of salami-like sausages are commonly sprayed with *Penicillium* starter cultures to promote flavor development and to inhibit the growth of undesirable molds. Mold growth on the surface of dry cured meat products is the result of their tolerance to low water activity, low pH, and high salt concentration.³

A known link exists between occupationally exposed workers and the development of respiratory and skin symptoms from the molds on salami sausages.⁴ Several case studies were reported of people in charcuteries who work closely with salami and develop allergic skin reactions, either IgE or non-IgE mediated.^{4,5} In addition, cases of salami factory workers are reported to develop occupational asthma from aerosolised mold in inadequately ventilated factories,⁶ and a mouse model suggested that inhaled *P chrysogenum* could be implicated in the pathogenesis of asthma.⁷ To our knowledge there are no reports of the ingestion of salami that causes reactions secondary to the cultured molds. However, several cases are described of HDMs present in salami causing allergic reactions in patients.^{8,9}

Note that the second patient, who was sensitized to both *P notatum* and HDM, manifested esophageal symptoms. The role of aeroallergens has been discussed in eosinophilic esophagitis, but there are no reports of patients with eosinophilic esophagitis and esophageal symptoms linked to ingested rather than inhaled molds or aeroallergens.

When clinicians are presented with patients who have experienced allergic reactions to salami, the causal agent is often thought to be pork itself,¹⁰ or milk and wheat used as binding agents or in the salami casing and often not recognized in the ingredient list. We suggest using skin prick tests to the salami skin and specific

IgE for *Penicillium*, as well as HDMs, as a sensible next step in these confusing cases. We would not simply recommend performing specific IgE for *P notatum* because of geographic variation in mold starter cultures. Similarly, when investigating and diagnosing eosinophilic esophagitis, we also suggest that the ingestion of molds be considered as a cause.

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No funding was received for this work. J. Wassenberg and Y. Perrin contributed to the original idea and review of the manuscript; S. Ludman wrote the manuscript and performed the literature review; and J.-C. Caubet contributed literature and review of the manuscript.

Conflicts of interest: The authors declare that they have no relevant conflicts of interest.

Received for publication August 31, 2012; revised September 26, 2012; accepted for publication October 5, 2012.

Available online December 3, 2012.

Cite this article as: Ludman S, Perrin Y, Caubet J-C, Wassenberg J. Perplexing cases of allergy to salami. *J Allergy Clin Immunol: In Practice* 2013;1:97-8. <http://dx.doi.org/10.1016/j.jaip.2012.10.002>.

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2213-2198/\$36.00

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<http://dx.doi.org/10.1016/j.jaip.2012.10.002>

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