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Letter to the Editor

A case of food allergy due to three different mushroom species

Dear Editor,

Mushrooms are a common food item worldwide and some species are commonly consumed depending on the geographical area. Shiitake (*Lentinula edodes*), Matsutake (*Tricoloma matsutake*), Maitake (*Grifola frondosa*), and Shimeji (*Lyophyllum decastes*, *Hypsizygus ulmerius*) are popular mushrooms consumed in East Asia, including Japan, Korea, and China, and food allergy caused by these mushrooms have been reported in these regions. We herein present a rare case which is immediate type of allergy due to three kinds of mushroom allergens by IgE immunoblotting.

An 18-year-old Japanese female had a 10-year history of recurrent episodes of Quincke edema and urticaria after consuming each intake of Shiitake or Maitake or Shimeji mushrooms. She had never worked at the mushroom plantations and had no other history of asthma and hypersensitivity pneumonitis related by fungal antigen. Before visiting our hospital, she experienced severe anaphylaxis after consuming dumplings and pasta, and was treated at the emergency room of another hospital. After recovering from her anaphylaxis, she visited our hospital in order to determine to know the cause of her allergy. A prick-by-prick test was performed with a positive control of 10 mg/ml histamine (Torii Pharma, Tokyo, Japan) and a negative control of saline.¹ Samples of raw Maitake, Shiitake, Shimeji, and Shiitake allergen (Torii Pharma) were used for the skin test. The prick-by-prick test produced the following wheal sizes: Maitake, 8 mm × 8 mm (+3); Shiitake, 4 mm × 4 mm (+2); Shimeji, 5 mm × 4 mm (+2); and Shiitake allergen, 14 mm × 10 mm (+3). The positive control produced a wheal 9 mm × 7 mm (+3) after 15 min of test (Fig. 1). The two healthy volunteers were negative for the same samples.

The raw and boiled 26 µg proteins (10 min at 70 °C) from Maitake, Shiitake, and Shimeji were used in SDS-polyacrylamide gel electrophoresis. Fractionated protein bands varying from 3.5 kDa to 160 kDa in molecular weight were visualized using Blue SafeStain (Invitrogen®, Carlsbad, CA, USA) (Fig. 2a). IgE immunodetection was performed as described in our previous report.¹ First, western blotting with the patient's serum detected a 15 kDa antigen for both raw and boiled Shiitake (Fig. 2b, lane 1, 4), an 10 and 11 kDa antigen for both raw and boiled Shimeji (Fig. 2b, lane 2, 5), and an 8 and 9 kDa antigen for both raw and boiled Maitake (Fig. 2b, lane 3, 6). But boiled sample was decreased IgE detected protein. None of these antigens was detected in a healthy control (Fig. 2c). Based on

the patient's clinical symptoms, the prick-by-prick test results, and IgE immunodetection findings, allergy to three species of mushroom was diagnosed. In interesting, Shiitake and Shimeji antigens were heat-resistant, but Maitake antigen was decomposed by heating.

Mushroom allergy has been reported in both Japan² and Europe.^{3,4} In contrast to the present case, most of the previous cases were diagnosed based on the symptoms and prick-by-prick test results. Only a few previous cases were diagnosed based on IgE immunodetection^{2,5} due to the difficulty of detecting an allergy to certain species of mushroom. Despite Shimeji

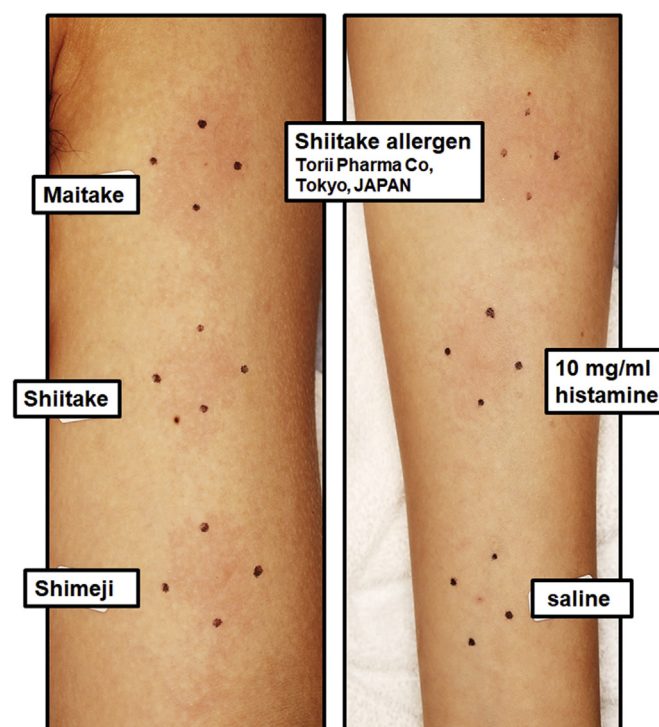


Fig. 1. Prick-by-prick test for three mushrooms (15 min). Wheal sizes: Maitake, 8 mm × 8 mm (+3); Shiitake, 4 mm × 4 mm (+2); Shimeji, 5 mm × 4 mm (+2); and Shiitake allergen, 14 mm × 10 mm (+3). The positive control produced a wheal 9 mm × 7 mm (+3) after 15 min of test. The two healthy volunteers were negative for the same samples.

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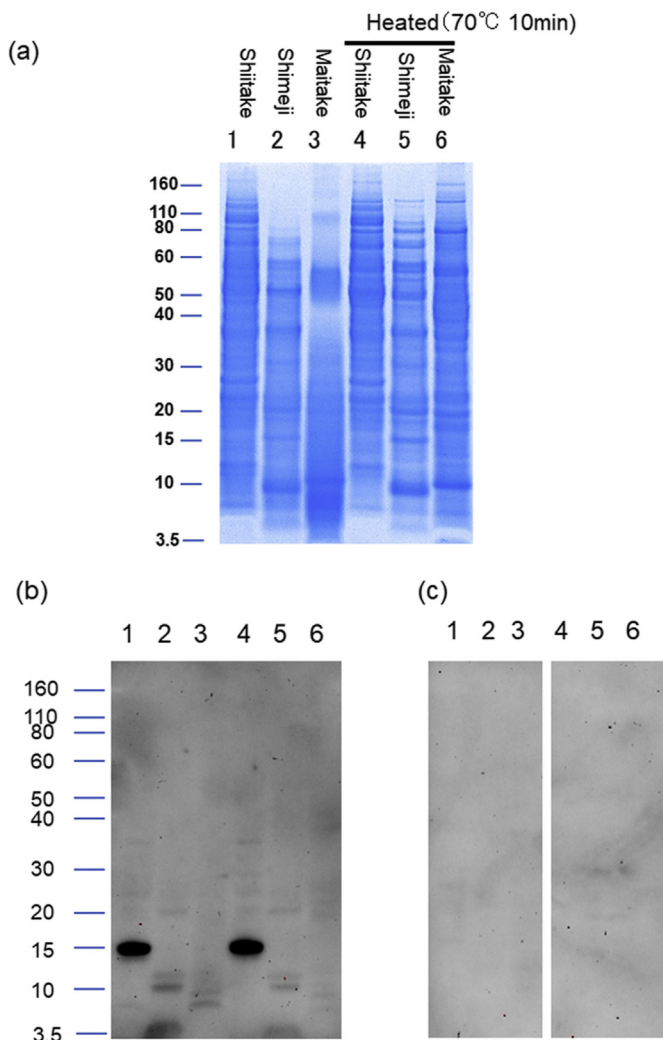


Fig. 2. (a) SDS-polyacrylamide gel electrophoresis (SDS-PAGE). Gel stained with Colloidal Blue Coomassie. (b) Immunoglobulin E (IgE) immunoblotting. Lane 1 = raw Shiitake, lane 2 = raw Shimeji, lane 3 = raw Maitake, lane 4 = heated Shiitake, lane 5 = heated Shimeji, lane 6 = heated Maitake. Blotted membrane was reacted with 10% serum from to patient. (c) Immunoglobulin E (IgE) immunoblotting. Lane 1 = raw Shiitake, lane 2 = raw Shimeji, lane 3 = raw Maitake, lane 4 = heated Shiitake, lane 5 = heated Shimeji, lane 6 = heated Maitake. Blotted membrane was reacted with 10% serum from a healthy control. The results showed that a 15 kDa antigen for both raw and boiled Shiitake (lane 1, 4), an 10 and 11 kDa antigen for both raw and boiled Shimeji (lane 2, 5), and an 8 and 9 kDa antigen for both raw and boiled Maitake (lane 3, 6). But boiled sample was decreased IgE detected protein. None of these antigens was detected in a healthy control.

and Shiitake belonging to the same genus, the allergenic proteins detected by IgE immunodetection differed in the species (Fig. 2b). The present case shows the rare occurrence of an allergy to three species of mushroom. But, since it may be the same allergen, it must be analyzed by using an inhibition assay in future. Mushrooms have been known to cause false positive results.⁶ Prick-by-prick test and the presenting symptoms may be insufficient for a definitive diagnosis of mushroom allergy. It is hoped that in the future, a full range of mushroom-specific IgE antibodies will become commercially available for the diagnosis of mushroom allergy.

Conflict of interest

The authors have no conflict of interest to declare.

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