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CASE REPORT OPEN ACCESS

Food protein-induced enterocolitis syndrome due to buckwheat: A case report

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Abstract
Buckwheat is a rare causative food for food protein-induced enterocolitis syndrome (FPIES). To date, it is unknown what laboratory data patients with FPIES caused by buckwheat show. We report a 4-year-old female with FPIES caused by buckwheat and the laboratory results. Skin prick, specific IgE antibody, and basophil activation tests were negative; however, the lymphocyte stimulation test (LST) revealed a 10.2-fold increase in activation compared with the negative control. In an open-label oral food challenge (OFC) of 80 g boiled buckwheat noodles, 3 hours after ingestion, vomiting occurred four times in a 2-hour duration. Therefore, we diagnosed the patient with FPIES caused by buckwheat. Her neutrophil count, C-reactive protein, and thymus and activation-regulated chemokine were elevated after the OFC. Moreover, the patient had a positive reaction to the LST, which may theoretically be useful in diagnosing non-immunoglobulin E-mediated gastrointestinal food allergies. FPIES caused by buckwheat is rare; however, we found that the same laboratory results were observed in a comparison of FPIES cases caused by other foods.

Introduction

Food protein-induced enterocolitis syndrome (FPIES) is a subtype of non-immunoglobulin E (IgE)-mediated gastrointestinal food allergies that typically result in recurrent vomiting after ingestion of the causative food without specific IgE involvement.[1] Although many foods can cause FPIES, buckwheat is a rare causative food, of which only one case has been reported.[2] Recently, it was reported that lymphocyte stimulation test (LST) and thymus and activation-regulated chemokine (TARC) levels after ingestion of causative foods may be useful in the diagnosis of FPIES.[3-6] However, it is unknown whether the patients with FPIES caused by buckwheat had the same changes in these laboratory test values due to small number of cases. We report a patient with FPIES caused by buckwheat and the laboratory findings, including LST and TARC results.

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Case Report

A 4-year-old girl was referred to our hospital after experiencing two episodes of recurrent vomiting 4–5 hours after ingesting buckwheat noodles. She had not been allergic to any food other than buckwheat and had no history of bronchial asthma or atopic dermatitis. The patient had a family history of seasonal allergic rhinitis. A physical examination revealed no eczema. Blood tests revealed values of total IgE <1.5 IU/mL and buckwheat-specific IgE antibody titer <0.10 U_A/mL (Thermo Fisher Diagnostics, Tokyo, Japan). The skin prick test using commercial buckwheat extract (1:10 ratio; Torii Pharmaceutical, Tokyo, Japan) was negative, and the basophil activation test (BML, Tokyo, Japan) using boiled buckwheat-noodles as a sample, showed an activation rate of 3.3% (positive control, 25.1%; negative control, 3.0%). LST (BML, Tokyo, Japan) showed a 10.2-fold increase in activation compared with the negative control (155,095 cpm in phytohemagglutinin-stimulated culture; 72 cpm in negative control; 733 cpm in buckwheat-noodle).

In an open-label oral food challenge (OFC) of 80 g boiled buckwheat noodles performed 2 weeks later, 3 hours after ingestion, vomiting occurred four times in a 2-hour duration. Since the patient showed pallor, a decreased activity level, and diarrhea without skin or respiratory symptoms, we diagnosed FPIES caused by buckwheat based on consensus guidelines.[1] The patient was administered intravenous fluids and recovered by the following day. The results of blood tests pre-OFC, 6 hours, and 24 hours post-OFC, showed that neutrophil count, neutrophil to lymphocyte ratio, C-reactive protein (CRP), and TARC were elevated (Table 1). No abnormalities in electrolytes or acid–base balance were observed. The neutrophil count and the neutrophil-lymphocyte ratio peaked at 6 hours post OFC, but CRP and TARC levels were higher at 24 hours after OFC. The ratio of 24 hours post-OFC to pre-OFC TARC levels[4] was 7.2. The patient had no fever after the OFC, and her physical condition was normal the next day. Buckwheat has been eliminated from her diet and she had no recurrence of the same symptoms when followed up after 1 year.

Written informed consent from the parents of the patient was obtained for the publication of this report.

Discussion

Although buckwheat is grown worldwide, only one case of FPIES caused by buckwheat has been reported.[3] Almost all acute adverse reactions to buckwheat are IgE-mediated, with positive skin prick tests or elevated specific IgE antibody levels.[7] Therefore, little is known about FPIES reactions caused by buckwheat. The skin prick, specific IgE antibody, and basophil activation tests were negative, indicating that no evidence of IgE-mediated buckwheat allergy was observed in our patient. In contrast, the increased neutrophil count observed in this patient at 6 hours post-OFC was consistent with the classic criterion of FPIES reported by Powell et al.[8] These results led us to conclude that our patient's symptoms indicated FPIES. It has been reported that TARC and CRP levels increase after the FPIES symptoms.[4] Our patient had a similar course, suggesting that the same reactions occur in FPIES caused by buckwheat patients as in other foods. However, the fact that they require up to 24 hours to detect and cannot predict OFC positivity preliminarily is a limitation.

Patients with FPIES have rapidly increased in number of reports in recent years,[9] and laboratory markers are needed to predict the results of OFC. In our patient, LST showed a high stimulation index. LST, which reflects sensitized lymphocyte responses, may theoretically be useful in diagnosing non-IgE-mediated gastrointestinal food allergies.[6] The usefulness of LST in patients with FPIES has been reported,[10] but it has been pointed out that standardization and clarification of the mechanism are needed. At present, while there is no evidence that LST replaces OFC, it may be one of the tests that can be performed in vitro.

Table 1 Results of blood tests performed pre-OFC, 6 hours, and 24 hours post-OFC.

	Pre-OFC	6 h post-OFC	24 h post-OFC
WBC (cells/mm^3)	7,700	14,200	6,800
Neutrophil (cells/mm^3)	1,840	10,593	3,050
Lymphocyte (cells/mm^3)	4,920	2,812	3,230
NLR	0.37	3.77	0.94
Eosinophil (cells/mm^3)	270	156	170
Thrombocyte (/mm^3)	300,000	308,000	262,000
pH	7.353	7.371	7.434
Bicarbonate (mmol/L)	21.0	20.0	24.3
Methemoglobin (%)	0.8	0.6	1.0
CRP (mg/dL)	0.06	0.07	0.54
TARC[a] (pg/mL)	305	590	2,197
TARC ratio[b]		1.7	7.2

[a]Reference range of TARC is <743.
[b]The ratio of post-OFC to pre-OFC TARC levels.
CRP; C-reactive protein, NLR; neutrophil-to-lymphocyte ratio, OFC; oral food challenge, TARC; thymus and activation-regulated chemokine, WBC; white blood cell.

The limitation of this report is that it is unclear whether the findings in our patient can be generalized. Further case accumulation is needed.

Conclusion

We reported a patient with FPIES caused by buckwheat. It should be emphasized that allergic reactions may occur after ingestion of buckwheat and a negative result for a specific IgE antibody test. FPIES caused by buckwheat is rare; however, we found similar laboratory results when comparing FPIES cases caused by other foods.

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