

BUCKWHEAT ALLERGY: ANALYSIS OF 22 CASES RECORDED BY THE ALLERGY VIGILANCE NETWORK (2002-2006)

E. Beaudoin (1, 2), P. Sergeant (2), J. Flabbee (2), M. Morisset (2),
G. Kanny (2), D.-A. Moneret-Vautrin (2)

Twenty-two cases of severe anaphylaxis associated with buckwheat (*fagopyrum esculentum*) were declared by the Allergy Vigilance Network between 2002 and 2006: 13 females and 9 males (mean age: 30 years). The prevalence of buckwheat anaphylaxis out of 489 cases of food anaphylaxis was 4.5%. Symptoms were anaphylactic shock (11 cases), serious systemic reactions (7 cases), laryngeal angioedema (3 cases) and pre-lethal (or sub-lethal?) acute asthma (1 case). Anaphylaxis was induced by oral challenge in one patient. 77% patients were in hospital from several hours up to four days, but epinephrine was used in only 40% of cases. Half the people suffered repeated episodes. In four cases, buckwheat flour was a masked allergen. The authors list all kinds of food that might contain buckwheat (eviction died on www.cicbaa.org). They underline the relationship between frequent buckwheat consumption and the prevalence of allergy. They emphasize that there is no compulsory labelling.

INTRODUCTION

The first case of food allergy reported by Smith in 1909 was strange and remarkable for many reasons. The author described a patient who presented with immediate and recurring signs of hypersensitivity after eating food in which buckwheat was sometimes a masked allergen. Furthermore, skin tests involving scratching the skin of the patient's arm and placing on it a buckwheat seed or buckwheat flour triggered a reaction syndrome. Lastly, re-challenge by placing buckwheat on the tip of the patient's tongue was followed by an intense reaction with marked dysphonia (1). After this first case, many others were identified and several studies published (2,3,4,5,6,7,8,9,10). We report on 22 cases of severe food allergy involving buckwheat declared to the Allergy Vigilance Network between 2002 and 2006.

(1) Service d'Allergologie - Centre Hospitalier Jean Monnet - 3, avenue Robert Schumann - 88 021 EPINAL Cedex.

(2) Service d'Immunologie Clinique et d'Allergologie - CHU de Nancy - Hôpital Central - 29, avenue de Lattre de Tassigny - 54 035 Nancy.

Our thanks to allergologists who declared at least one case of buckwheat allergy (in order of notification): F. Queron Rabier (Châtellerault), Martine Morisset (Nancy), B. Wallaert (Lille), K. Breuil (Poitiers), C. Gallen (Narbonne), Gisèle Kanny (Nancy), Geneviève Vidal (L'Aigle), Francine Jacson (Epinal), L. Bensignor (Vendôme), V. Mercier Plotton (Montbrison), C. Douillet (Montereau), D. Mongin (Boulogne), Etienne Beaudouin (Epinal), P. Nicolas (Poissy), S. Hassoun (Challans), F. Louis-Donguy (Nice), M.P. Chataignault, (Poitiers), Fanny Codreanu (Nancy), J.P. Mallet (Saint-Nazaire), S. Lyasu (Arlon).

ALLERGY VIGILANCE NETWORK DATA (2002-2006)

By December 31, 2006, 384 allergologists had joined the Allergy Vigilance Network and 489 cases of severe anaphylaxis were declared between 2002 and 2006. Twenty-two (22) involved buckwheat, i.e. 4.5%. Mean patient age was 30 years (22 months to 46 years), and predominantly female (13 women, 9 men). Eleven cases of anaphylactic shock were recorded (5.3% of all anaphylactic shocks), seven serious systemic reactions (3.1% of all serious systemic reactions), three cases of laryngeal angio-edema (6.6% of all laryngeal angio-edema cases) and one case of serious acute asthma (5.8% of all serious acute asthma cases). Forty percent (40%) of the patients (9/22) required adrenalin, whilst hospitalizing, from a few hours to four days, was required 17 times (77%). Various foods were incriminated: pancakes (10), flat cakes (4), bread (3), hamburger (1), gingerbread (1), cereals (1), crozets (1) and one reaction occurred in hospital during re-challenge to flour. Finally, in 50% of cases, signs recurred, and four patients knew they were allergic to buckwheat, reminding us that buckwheat can be a masked allergen.

DISCUSSION

Buckwheat: origins, culture, use

Buckwheat belongs to the family of polygonaceae, like rhubarb, sorrel and knotweed (11).

In regional French cooking, buckwheat, commonly known as black wheat, is also called: "*froment noir*" (Burgundy), "*sarradin*" (Isère), "*tourtrelle*" (Ariège), "*bouquet*", "*bouquette*", "*buaille*" and "*buail*" (11). Buckwheat is not a cereal and does not contain gluten, so it can be eaten by people with gluten intolerance (12,13).

Buckwheat, unknown in ancient times, originated in Asia and was introduced into Europe in the mid 15th century, first to the Mecklenburg area of Germany and thence to Normandy and Brittany in France. Its name is derived from the black color of the seeds and also alluded to the non-Christian peoples of the East, Spain and Africa (11). It was often the food of the poor who could not afford wheat or rye. In the mid 19th century, buckwheat covered 750,000 hectares in France. This had decreased to 260,000 just before the start of the Second World War. By the 1980s it was a marginal crop, with only 5,000 hectares (11). Now, at the beginning of the 21st century, it is popular once again, and nearly 40,000 hectares are cultivated, demonstrating a return to regional farming and a will to re-adopt traditional practices.

The international production of buckwheat in 2004-5 was estimated at 2.8 million tons; that of wheat being around 550 million tons. Four countries produce nearly 90% of the world's output: China (52%), Russia (22%), Ukraine (10%) and France (4.8%). Most buckwheat is consumed locally, which explains why international exports do not exceed 180,000 tons, three quarters coming from China, followed by Ukraine, the USA and Canada. Conversely, the biggest importer is Japan (50%) followed by the European Union and Russia (14).

Buckwheat is a hardy crop and grows in well-drained, acid soil. Sown in June, it matures in 120 days and is harvested during the second half of September before the first frosts. The dark seeds, that look like beech nuts (*fagus*) and give buckwheat the name *fagopyrum*, are collected. The most cultivated species is *fagopyrum esculentum* but others are too, such as *fagopyrum tataricum* (Tartary buckwheat), *fagopyrum emarginatum* or emarginated buckwheat (15).

A nutty flour that cannot be used to make bread, but which is used for pancakes (Brittany), *blinis* (Slavic pancakes), buns, biscuits, flat cakes, pasta and noodles (*sobas* in Japan, *crozets* in Savoie, *pizzocheris* in Switzerland and Italy) can be obtained from buckwheat seeds after the black, inedible husks have been removed. The milled, grilled seeds are called kasha and are used in traditional cooking (sauces, soups and stews). Non-grilled seeds can be used in desserts and to accompany fish. Beer and whisky are also made from buckwheat. It is an excellent nectar plant and the honey is used to make gingerbread and nougat (15).

Buckwheat is also used as animal feed (pigs, poultry, horses, etc.).

Traditionally, it can be used as an organic fertilizer: if not harvested, it is dug back 4 to 6 weeks after sowing (15). In Asia, the pods are placed in pillows and cushions to guarantee health and intelligence for children. A third of the pillows in Korea contain buckwheat pods. These can be bought over the internet, with sales lines claiming a return to natural and traditional customs, but such pillows might be contaminated by endotoxins, acarins and seeds (16).

Epidemiology of buckwheat allergy

There are no specific studies on the prevalence of buckwheat allergy except in Japan, where it is regularly eaten as sobas. A Japanese survey based on a questionnaire given to nurses working in Yokohama primary schools counted 194 cases amongst 92,680 children, i.e. a frequency of 0.22%. The most common signs were urticaria or pruritus (70%), asthma (26%) and shock (4%) (6). Another, more recent, study of 1,420 food allergy cases in nearly 500 Japanese hospitals, placed buckwheat amongst the five most frequent food allergens; together with egg, milk, wheat and peanut (17). In Korea, sensitization to buckwheat found by skin-testing school children and adults, was estimated at 5% (16). In 2003 in Belgium, Mairesse found a 2.7% rate of sensitization to buckwheat amongst 737 patients examined during an allergy consultation (18). In France we have the data provided by the CICBAA which estimated the prevalence of food allergens in adults and children (19). For adults aged over 15 years, allergy to buckwheat represents 2.4% of 287 cases, and seven cases out of 511 food allergies. For children under one year (147 children and 2,008 food allergies), no allergy was reported. Frequency amongst children aged from one to three years was evaluated at 0.2% (359 children, 591 food allergies) and for children aged between three and 15 years 0.6% (468 children, 727 food allergies) (19).

Clinical signs of food allergy to buckwheat

Clinical signs do not differ from the usual clinical manifestations of food allergy. Immediate hypersensitivity reactions occur during or after meals, with angioedema, urticaria or even anaphylactic shock. One fatal case was reported concerning an eight year old child, who ate some sobas just before swimming (20). Respiratory, asthma-like signs may occur after ingestion (4).

Buckwheat is a masked allergen. If present in a food, an allergic accident may occur: amongst the 22 cases of buckwheat allergy declared by the Allergy

Vigilance Network, half were recurrences and four patients were known to be allergic to buckwheat. Labelling regulations are obviously defective since buckwheat is not included in the list of foodstuffs which must be declared.

The route of sensitization may be gastrointestinal or respiratory, since buckwheat is not only a domestic allergen present in pillows (16,18,21), but also an occupational allergen. One case of occupational rhinitis and one of occupational asthma were reported for patients working in a pasta and bread factory and a pancake restaurant (21, 22, 23, 24, 25). Hence, sensitization by inhalation may trigger food allergy (5).

Buckwheat allergens

The buckwheat allergens involved in food allergy are varied and thermostable. A protein with a molecular weight of 19 kDa may be a major allergen since it is recognized by the specific IgE in 78% of the sera of 19 patients allergic to buckwheat (against 8% in the non-allergic control group) (26). In this study, the authors specified that proteins with molecular weights of 24, 19, 16 and 9 kDa were implicated in over 50% of patients allergic to buckwheat. Other studies incriminate proteins 16, 19 and 24 kDa as the major buckwheat allergen (27, 28).

Diagnostic procedure

As with other food allergies, diagnosis depends on a series of examinations, starting with clinical history, followed by skin prick tests with native food and assay of circulating specific IgE. In 2003, Sohn set the threshold for specific IgE at 1.26 kU/l, as determined by the Phadia® CAP system method, to avoid the need for re-challenge (29). The authors specified that the sensitivity and specificity of this test were 93.10% and 93.33%, respectively. The predictive positive value (PPV) was 79.75% and the negative predictive value (NPV) was 97.96%. In those cases where a diagnosis is not established, oral re-challenge may be performed in hospital, under close medical monitoring and after the patient has given informed consent. During allergy testing, allergy to latex must be investigated. Primary sensitization to latex has been reported since 1998 (30).

If allergy to buckwheat is established an eviction diet is proposed. This involves knowing all the foodstuffs likely to contain buckwheat, bearing in mind that this masked allergen is not in the list of foodstuffs that it is compulsory to declare (European directive No. 2003/89). An emergency kit, the contents of which depend on the clinical symptoms experienced, is also proposed.

CONCLUSION

The frequency of food allergy to buckwheat should not be under-estimated, since 22 cases were recorded by the Allergy Vigilance Network over five years and represent 4.5% of declared severe allergies. The renewed popularity of buckwheat, often as a masked ingredient, may contribute to the significant emergence of this food allergy in the near future.

References

1. Smith H.-L. - Buckwheat poisoning with report of case in man. *Arch Intern Med* 1909; 3:350-9.
2. Nakamura S., Yamaguchi M. - Studies on buckwheat allergen. Report 2: clinical investigation on 169 cases with the buckwheat allergen gathered from country of Japan. *Allerg Immunol* 1974/1975;20/21:457-65.
3. Davidson A.-E., Passero M.-A., Settignano G.-A. - Buckwheat-induced anaphylaxis: a case report. *Ann Allergy* 1992;69:439-9.
4. Bessot J.-C., Kopferschmitt M.-C., Pauli G., Pradalier A., Vincent D., Cohen-Jonathan C. - Réactions anaphylactiques à la farine de blé. *Rev Fr Allergol* 1995;35:444-6.
5. Wüthrich B., Trojan A. - Wheatburger anaphylaxis due to hidden buckwheat. *Clin Exp Allergy* 1995;25:1263.
6. Takahashi Y., Ichikawa S., Aihara Y., Yokota S. - Buckwheat allergy in 90 000 schoolchildren in Yokohama. *Arerugi* 1998;47:26-33.
7. Leynadier F. - Anaphylaxis. 3 clinical cases. *Allerg Immunol* 2001;33:409-11.
8. Schiffner R., Przybilla B., Burgdorff T., Landthaler M., Stolz W. - Anaphylaxis to buckwheat. *Allergy* 2001;56:1020.
9. Bourrier T., Noormahomed T., Coache M., Albertini M., Boutte P. - Un cas d'allergie au sarrasin chez l'enfant. *Rev Fr Allergol* 2003;43:530-2.
10. Baruteau J., Sadani G., Jourdan C., Morelle K., Broué-Chabbert A., Rancé F. - Allergie au sarrasin: à propos d'une observation chez l'enfant et revue de la littérature. *Rev Fr Allergol* 2005;45:422-5.
11. Lachiver M. - Dictionnaire du monde rural. Les mots du passé. Editions Fayard. Paris. 1997.
12. Wieslander G. - Review on buckwheat allergy. *Allergy* 1996;51:661-5.
13. Wieslander G. - Buckwheat allergy. *Allergy* 2001; 56:703-4.
14. Agriculture et Agro-alimentaire Canada. - Sarrasin et graine de lin. *Le bulletin bimensuel* 2005;18:18. www.agr.gc.ca
15. Du Pontavice B. - Le blé noir. Coop Breizh. Spézet. 2005, France.
16. Lee S.-Y., Lee K.-S., Hong C.-H., Lee K.-Y. - Three cases of childhood nocturnal asthma due to buckwheat allergy. *Allergy* 2001;56:763-6.
17. Imai T., Iikura Y. - The national survey of immediate type of food allergy. *Arerugi* 2003;52:1006-13.
18. Mairesse M., Ledent C. - Asthme nocturne au sarrasin. *Rev Fr Allergol* 2003;43:527-9.
19. Moneret-Vautrin D.-A., Kanny G., Morisset M. - Les allergies alimentaires de l'enfant et de l'adulte. 2006. Edition Masson. Paris. 155 p.
20. Noma T., Yoshizawa I., Ogawa N., Ito M., Aoki K., Kawano Y. - Fatal buckwheat dependent exercise-induced anaphylaxis. *Asian Pac J Allergy Immunol*, 2001; 19:283-286.
21. Fritz S.-B., Gold B.-L. - Buckwheat pillow-induced asthma and allergic rhinitis. *Ann Allergy* 2003;90:355-8.
22. Park H.-S., Nahm D.-H. - Buckwheat flour hypersensitivity: an occupational asthma in a noodle maker. *Clin Exp Allergy* 1996;26:423-7.

23. Valdivieso R., Moneo I., Pola J., Munoz T., Zapata C., Hinojosa M., Losada E. - Occupational asthma and contact urticaria caused by buckwheat flour. *Ann Allergy* 1989;63:149-52.
24. Göhte C.-J., Wieslander G., Anker K., Forsbeck M. - Buckwheat allergy: health food, an inhalation health risk. *Allergy* 38:155-9.
25. Choudat D., Villette C., Dessanges J.-F., Combalot M.-F., Fabries J.-F., Lockhart A., Dall'ava J., Conso F. - Asthme professionnel à la farine de sarrasin. *Rev Mal Respir* 1997;14:319-21.
26. Park J.-W., Kang D.-B., Lim C.-W., Ko S.-H., Yum H.-Y., Kim K.-E., Hong C.-S., Lee K.-Y. - Identification and characterization of major allergens buckwheat. *Allergy* 2000;55:1035-1041.
27. Tanaka K., Matsumoto K., Akasawa A., Nakajima T., Nagasu T., Ikura Y., Saito H. - Pepsin-resistant 16-kD buckwheat protein is associated with immediate hypersensitivity reaction in patients with buckwheat allergy. *Int Arch Allergy Immunol* 2002;129:49-56.
28. Matsumoto R., Fujino K., Nagata Y., Hashiguchi, Ito Y., Aihara Y., Takahashi Y., Maeda K., Sugimura K. - Molecular characterization of 10-kDa buckwheat molecule reaction to allergic patients' IgE. *Allergy* 2004;59:533.
29. Sohn M.-H., Lee S.-Y., Kim K.-E. - Prediction of buckwheat allergy using specific IgE concentration in children. *Allergy* 2003;58:1308-10.
30. De Maat-Becker F., Stapel S.-O. - Cross-reactivity between buckwheat and latex. *Allergy* 53:538-9.



Press Releases

ASTHMA MANAGEMENT ASSOCIATED WITH BETTER LONG-TERM CONTROL

MILWAUKEE — Effective asthma management strategies, especially regular use of inhaled corticosteroids, long-acting beta-agonists and asthma specialist care, are independently associated with better long-term asthma control. These findings are featured in the November 2006 Journal of Allergy & Clinical Immunology (JACI).

Previously, poor asthma control has been thought to be related to severe asthma, and proper asthma control was thought to be related to effective management, but concrete data to support these hypotheses is limited.

In this study, "Determinants of future long-term asthma control," Michael Schatz, MD, MS, FAAAAI, and colleagues sought to identify independent possible determinants of future long-term asthma control among asthma severity, management, demographic and comorbidity predictors. They surveyed a random sample of 2,250 health maintenance organization members aged 18 to 56 years with persistent asthma and tracking pharmacy data on medication dispensings.

Predictors for poor long-term control in this study included more than two dispensings of oral corticosteroids in the prior year, a history of any asthma hospitalizations, any unscheduled visits for asthma in the past year, smoking, chronic obstructive pulmonary disease (COPD), lower educational level and being African American or male. Predictors for better long-term asthma control were regular specialist care and regular use of inhaled corticosteroids and long-acting beta-agonists.

■ The study found:

- > A significant improvement in long-term control with increasing number of asthma management strategies, even after adjusting for the other predictors of long-term control.
- > Long-term asthma control was significantly and inversely related to all severity-related asthma use measures tested.
- > Long-term control was significantly and directly related to all management characteristics.
- > Long-term control was significantly and inversely related to smoking and COPD but not to reflux.
- > Poor long-term control was significantly related to younger age, lower educational level and being African American or male, but not income level.

Based on these findings, indicators of asthma severity and other patient characteristics are inversely related to future asthma control, but effective management strategies are associated with improved asthma control even after accounting for these high-risk characteristics.

The AAAAI is the largest professional medical specialty organization in the United States representing allergists, asthma specialists, clinical immunologists, allied health professionals and others with a special interest in the research and treatment of allergic disease. Allergy/immunology specialists are pediatric or internal medicine physicians who have elected an additional two years of training to become specialized in the treatment of asthma, allergy and immunologic disease. Established in 1943, the AAAAI has more than 6,000 members in the United States, Canada and 60 other countries. The AAAAI serves as an advocate to the public by providing educational information through its Web site at www.aaaai.org.

EDITOR'S NOTE: To receive a copy of the study or to request an interview with an asthma expert, contact Natalie Lemke (nlemke@aaaai.org) at (414) 272-6071. For more information and access to the archive of past JACI news releases, visit the Media Center of the AAAAI Web site, www.aaaai.org