

Isolated Rice-Induced Shock: Two Case Reports and a Review of the Literature

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ABSTRACT

Hypersensitivity reaction isolated to rice protein is a rare occurrence. Presented here are two case reports with a review of the previous literature on the subject. The data included suggests that rice-induced shock is not an Ig-E mediated phenomenon. The most common consistent finding in children with rice-induced shock was blunting of the villous border on intestinal biopsy. Double-blinded placebo-controlled food challenge remains the gold standard in the diagnosis of food-related reactions. (*Pediatr Asthma Allergy Immunol* 1999; 13[2]:93–96.)

INTRODUCTION

ADVERSE FOOD REACTIONS are a relatively common problem in childhood that affects roughly 8% of children younger than 3 years of age.⁽¹⁾ The most common inciting proteins include cow's milk, egg, peanut, soy, and wheat, which account for roughly 85% of hypersensitivity reactions.⁽²⁾

Intolerance to rice is quite rare in the Western diet. In fact, rice is often listed as a hypoallergenic food. There are six reported cases of isolated rice intolerance in the literature since 1977. We present two additional cases and review the findings of the previous six.

CASE REPORTS

Case 1

M.G. is an 8-month-old girl who was the product of a normal full-term gestation born via normal spontaneous vaginal delivery, weighing 7 pounds, 10.5 ounces. There were no neonatal complications. She was fed Enfamil (Mead Johnson Nutritionals, Evansville, IN) with iron from birth, which was tolerated without complications. At the age of 3.5 months, she was given rice cereal in her bottle. She immediately vomited the rice without further complications. Five days later she was again given a spoonful of rice mixed with Enfamil and she vomited for 2.5 hours. Another 5 days later her mother again tried rice, this time with fruit. The infant vomited shortly after ingestion and was then put in bed. Two hours later she was found in bed, listless and covered with vomitus. She continued to vomit recurrently, requiring fluid resuscitation at her primary care physician's office.

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Ten days later, the mother gave the child a chicken noodle dinner that contained rice flour. The infant again vomited for 2 hours and became listless. From this point forward, rice was assiduously avoided. Two weeks prior to evaluation in the allergist's office, M.G. was fed Hawaiian Delight (Gerber's Product Company, Freemont, MI) baby food, which contains rice flour. The infant again began vomiting and became listless almost immediately.

M.G. did not have hematemesis, bloody diarrhea, skin reaction, or localized mucosal swelling with any of the episodes. She tolerated all other foods without difficulty including milk, soy, wheat, and citrus. Family history was negative for atopic dermatitis or food allergy.

Physical examination in the allergist's office found clear skin, excellent color, and benign cardiovascular, chest, and abdominal exams. Allergy skin prick testing was performed for rice, wheat, soy, cow's milk, and egg white. All were negative.

The infant's mother was told to monitor the child closely and avoid all rice-containing foods. A food challenge test was recommended in the hospital with an intravenous line in place once the child was 2 to 3 years old.

At age 15 months, while at home, M.G. inadvertently consumed a spoonful of cooked table rice. No reaction occurred. Twenty-four hours later, the child's mother again gave her Hawaiian Delight. The child tolerated it without difficulty. She is currently healthy and thriving, tolerating all foods.

Case 2

C.L. was aged 3 years, 3 months at presentation to the pediatric allergist's office. After a full-term pregnancy, he was born via normal spontaneous vaginal delivery. At 2 months of age, C.L. was given rice cereal. He vomited shortly thereafter but this was attributed to his reflux. His mother discontinued rice for 2 more months and then again added it at age 4 months; C.L. again vomited. Two weeks later, rice cereal was attempted for a third time. This time the infant vomited and became more lethargic and required a visit to his pediatrician.

Suspecting a food allergy, his mother discontinued rice at this time. However, at age 6 months, C.L. was inadvertently given baby food containing rice. The infant began vomiting within 1 hour. He continued to vomit for several hours and became listless and lethargic. He was brought to the emergency department where he was found to be hypotensive. He required intravenous fluid resuscitation. Work-up, including an evaluation for sepsis, malabsorptive syndrome, and child abuse yielded no abnormal results.

Since this occurrence, C.L.'s parents have been vigilant about excluding rice and rice flour from his diet. He has always tolerated all other foods including milk, soy, peanut, and citrus without difficulty. He has had normal growth and development throughout life and has no evidence of atopic tendencies.

Family history revealed seasonal allergies in C.L.'s father. Physical examination was completely normal. Skin prick testing in the office was negative for reaction to rice, cow's milk, soy, wheat, corn, and peanut. A rice challenge was performed in the hospital at age 3 years, 10 months. The baby cereal with rice that had caused the worst reaction was tolerated without sequelae. C.L. continues to thrive, tolerating all foods.

REVIEW OF THE LITERATURE

There have been six cases reported in the literature of gastrointestinal reactions isolated to rice.⁽³⁻⁵⁾ There have been several cases reporting gastrointestinal reactions to rice in addition to another protein.⁽⁶⁾ The true pathogenesis for the reaction has yet to be defined but some interesting trends can be elicited by review of these cases.

In their article in 1978 describing an infant allergic to both rice and soy, Strunk et al.⁽⁵⁾ found that the infant tested had a decreased CH50, C3, and C4 after a rice challenge at 5 months of age. No conversion products of C3 or factor B were found in peripheral blood. *In vitro* rice and soy extracts lowered complement levels in the index child's serum and also in two control sera. This decrease in complement did not persist when a rice challenge was done at 13 months of age however a feeding challenge of rice at that time produced the same clinical picture of diarrhea, flushing, and vomiting. The significance of the decreased

RICE-INDUCED SHOCK

serum complement at 5 months of age is therefore difficult to interpret. This same case showed a large increase in serum histamine levels after rice challenge at 13 months of age. No further data is presented about histamine levels in previous or subsequent challenges. Finally, anti-rice immunoglobulin E (IgE) antibody was present in serum but there was not an increase in serum IgE levels.⁽⁵⁾

In 1992, Borchers et al.⁽⁷⁾ reported one case of anaphylactoid gastrointestinal reaction produced by rice. They found no typical markers of directed IgE. Both radioallergosorbent test (RAST) and pin-prick test were negative. They postulated either sensitization of lymphocytes via exposure to intact rice protein absorbed either as macromolecules or secondary to mucosal barrier disruption due to viral-induced injury.⁽⁸⁾

In 1996, Cavataio et al.⁽³⁾ Published four cases of isolated rice intolerance. Work-up in all four had negative RAST tests. One child had a slightly positive skin prick test for rice. All had guaiac-positive stools.

Six weeks after the initial event, all four children were retested using a double-blind placebo-controlled food challenge (DBPCFC). All failed the rechallenge, and intestinal biopsy showed a range from simple infiltration with thickening of the villi to shortening and fusion of villi, secondary to more extensive damage.⁽³⁾

DISCUSSION

Adverse reaction to the ingestion of rice by infants is extremely rare. In a multicentered trial, bona fide adverse reactions to rice studied via DBPCFC challenge occurred in 2 of 481 (0.4%) positive challenges.⁽²⁾

Review of the literature demonstrates that in all cases of rice-induced enteropathy reported, RAST tests were negative. Skin prick testing was slightly positive in 1 of 8 cases. IgE levels in serum were never elevated. Villous changes were found in all infants who had an intestinal biopsy after rice challenge.⁽³⁻⁶⁾

These findings taken together suggest that rice hypersensitivity is not IgE-mediated. The lethargy and hypotension seen in the reaction are more likely due to a systemic hypovolemia from vomiting and bowel edema causing diarrhea and further fluid loss. Furthermore, peripheral vasodilatation would result from high serum histamine levels as was demonstrated in the case report by Strunk, et al.⁽⁵⁾

The association of decreased serum complement levels in young infants in association with rice-induced enteropathy is of unknown importance because it did not persist, whereas the reaction to rice did persist.⁽¹⁶⁾

Finally, all cases with intestinal biopsy demonstrated a blunting of the villous border which can account for the diarrhea found in many of the cases.^(3,6) Interestingly, in the two cases presented here, vomiting, not diarrhea, was the precipitating problem promoting fluid loss, hypovolemia, and hypotension.

These cases demonstrate that a particularly severe intolerance to rice protein can exist despite rice's reputation as a hypoallergenic food. It appears that reactivity wanes with age. DBPCFC is the gold standard when considering the diagnosis of food allergy, and should be undertaken if allergy to rice is suspected.

The exact immunopathogenetic mechanism for rice-induced shock still remains a mystery. The most recent studies may implicate tumor necrosis factor- α secretion from mononuclear cells as the causative agent of secretory diarrhea and hypotension.⁽⁸⁾ However, it is odd that in these two cases, vomiting and not diarrhea was the major manifestation of the reaction. More work needs to be done on the non-IgE-mediated food hypersensitivities.

Please note that the rarity of this phenomenon allows for the continued use of rice as a supplement in oral rehydration therapy, and for its use as the primary cereal introduced into most children's diets. However, it is important to keep rice intolerance in a broad differential of potential food intolerance despite its reputation as a hypoallergenic food.

REFERENCES

1. Bock SA. Prospective appraisal of complaints of adverse reactions to foods in children during the first 3 years of life. *Pediatrics* 1987; 79:683-688.
2. Bock SA, Sampson HA, Atkins FM, Zeiger RS, Lehrer S, Sachs M, Bush RK, Metcalfe D. Double-blind, placebo-controlled food challenge (DBPCFC) as an office procedure: A manual. *J Allergy Clin Immunol* 1988; 82:986-997.

GIOMBETTI AND SCHWARTZ

3. Cavataio F, Carroccio A, Montalto G, Iacono G. Isolated rice intolerance: Clinical and immunologic characteristics in four infants. *J Pediatr* 1996; 128:558–560.
4. Borchers SD, Li B, Friedman RA, McClung J. Rice-induced anaphylactoid reaction. *J Pediatr Gastroenterol Nutr* 1992; 15:321–324.
5. Strunk RC, Pinna JL, John J, Hanson RC, Blazovich JL. Rice hypersensitivity associated with serum complement depression. *Clin Allergy* 1978; 8:51–58.
6. Vitoria JC, Camarero C, Sojo A, Ruiz A, Rodriguez-Soriano J. Enteropathy related to fish, rice, and chicken. *Arch Dis Child* 1982; 57:44–48.
7. Borchers SD, Li B, Friedman RA, McClung J. Rice-induced anaphylactoid reaction. *J Pediatr Gastroenterol Nutr* 1992; 15:321–324.
8. Heyman M, Darmon N, Dupont C et al. Mononuclear cells from infants allergic to cow's milk secrete tumor necrosis factor alpha, altering intestinal function. *Gastroenterology* 1994; 106:1514–1523.

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1. 1999. Literature WatchLiterature Watch. *Pediatric Asthma, Allergy & Immunology* **13**:3, 159-161. [[Citation](#)] [[PDF](#)] [[PDF Plus](#)]