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Food Protein-Induced Enterocolitis Syndrome: 16-Year Experience

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What's Known on This Subject

FPIES is most commonly caused by cow's milk and soy. Reports of misdiagnosis are common, with no helpful discriminating laboratory features and reactions mimicking more-common pediatric conditions, such as sepsis and abdominal emergencies.

What This Study Adds

This series highlights the extent of misdiagnosis, which results in unnecessary investigations and treatments for children with FPIES. Decreased body temperature and post-reaction thrombocytosis emerge as additional features of FPIES.

ABSTRACT

OBJECTIVE. The goal was to examine the demographic characteristics, causative foods, clinical features, treatments, and outcomes for children presenting with acute food protein-induced enterocolitis syndrome.

METHODS. This was a retrospective study of children with food protein-induced enterocolitis syndrome who presented to the Children's Hospital at Westmead (Sydney, Australia) over 16 years.

RESULTS. Thirty-five children experienced 66 episodes of food protein-induced enterocolitis syndrome. The mean age at initial presentation was 5.5 months. Children frequently experienced multiple episodes before a correct diagnosis was made. Twenty-nine children reacted to 1 food, and 6 reacted to 2 foods. Causative foods for the 35 children were rice ($n = 14$), soy ($n = 12$), cow's milk ($n = 7$), vegetables and fruits ($n = 3$), meats ($n = 2$), oats ($n = 2$), and fish ($n = 1$). In the 66 episodes, vomiting was the most common clinical feature (100%), followed by lethargy (85%), pallor (67%), and diarrhea (24%). A temperature of $<36^{\circ}\text{C}$ at presentation was recorded for 24% of episodes. A platelet count of $>500 \times 10^9$ cells per L was recorded for 63% of episodes with blood count results. Only 2 of the 19 children who presented to an emergency department with their initial reactions were discharged with correct diagnoses. Additional investigations of food protein-induced enterocolitis syndrome episodes presenting to the hospital were common, with 34% of patients undergoing abdominal imaging, 28% undergoing a septic evaluation, and 22% having a surgical consultation. Prognosis was good, with high rates of resolution for the 2 most common food triggers (ie, rice and soy) by 3 years of age.

CONCLUSIONS. Misdiagnosis and delays in diagnosis for children with food protein-induced enterocolitis syndrome were common, leading many children to undergo unnecessary, often painful investigations. Decreased body temperature and thrombocytosis emerge as additional features of the syndrome. *Pediatrics* 2009;123:e467–e472

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Key Words

food protein-induced enterocolitis syndrome, vomiting, diarrhea, misdiagnosis

Abbreviations

IgE—immunoglobulin E
ED—emergency department
CHW—Children's Hospital at Westmead
FPIES—food protein-induced enterocolitis syndrome
SPT—skin prick test

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FOOD PROTEIN-INDUCED ENTEROCOLITIS syndrome (FPIES) is an uncommon, pediatric, non-immunoglobulin E (IgE)-mediated disorder triggered by the ingestion of certain food proteins. Its pathophysiologic features remain poorly understood, although food protein stimulation of T cells in the gastrointestinal mucosa is thought to be the most likely mechanism.^{1,2} The diagnosis of FPIES remains a clinical one. Children present ~2 hours after ingestion of a food protein with profuse vomiting and/or diarrhea.³ Associated features may include pallor, lethargy, cyanosis, metabolic acidosis, and neutrophilia.^{3–6} Rapid recovery within a few hours is the rule, although up to 20% of children present in hypovolemic shock necessitating fluid resuscitation.^{4,7,8} Tolerance to the triggering food develops in most children by 3 years of age.

Because of the absence of cutaneous or respiratory stigmata, the time delay from food ingestion to reaction, and the moribund appearance of many children at presentation, FPIES cases often are initially considered to be attributable to sepsis, a metabolic disorder, or a surgical abdominal emergency.^{9–12} Adding to the diagnostic confusion is the fact that an acute-on-chronic form of the condition has been described, in which children who initially suffer from chronic vomiting, diarrhea, and failure to thrive when continuously exposed to the offending food may develop

acute FPIES if the food is reintroduced after a period of exclusion.¹³ The aims of this study were to describe the demographic features, causative agents, clinical features, treatments, and outcomes for children presenting with acute FPIES.

METHODS

A retrospective case note study was undertaken with children who presented with acute FPIES at a major pediatric tertiary center, the Children's Hospital at Westmead (CHW) in New South Wales, Australia, during a 16-year period (1992–2007). The FPIES diagnosis was established by pediatric allergists, after referral from pediatricians, pediatric surgeons, or emergency physicians. Children were referred to the allergy service through 2 possible routes, that is, by consultant pediatricians for the allergy clinic or through the emergency department (ED) of the CHW, either directly or after transfer from another hospital.

Cases of FPIES were identified from the hospital medical record database by using the International Classification of Diseases, Ninth Revision code for allergic gastroenteritis and colitis (code 558.3) and the International Classification of Diseases, 10th Revision code for allergic and dietetic gastroenteritis and colitis (code K52.2) and from electronically stored, departmental letters written by allergists. The search option in Microsoft Word (Microsoft, Redmond, WA) was used to scan letters for key words (ie, food protein, enterocolitis, vomiting, diarrhea, and FPIES), to identify potential cases.

The diagnosis of FPIES was based on the criteria proposed by Sicherer and co-workers,^{4,8} that is, (1) repeated exposure to the incriminated food elicited repetitive vomiting and/or diarrhea within 24 hours, without any other cause for the symptoms; (2) symptoms were limited to the gastrointestinal tract; and (3) removal of the offending protein from the diet resulted in resolution of symptoms and/or a food challenge elicited vomiting and/or diarrhea within 24 hours after administration of the food. Information on the first and any subsequent episode of FPIES was recorded. Episodes did not include positive inpatient challenges.

A skin prick test (SPT) for the causative food was performed in the majority of cases, using either a commercial allergen extract (Hollister-Stier Laboratories, Spokane, WA) or, if extract was not available, the fresh food (eg, oats; prick-prick test). SPT results were considered to be positive if the mean wheal size was ≥ 3 mm.

Data were analyzed by using Minitab for Windows (Minitab Inc, State College, PA). Continuous data were described as either mean $\pm$ SD or median and range (if not normally distributed). Differences between groups for categorical variables were determined by using either the χ^2 test or Fisher's exact test. The Mann-Whitney *U* test and Student's *t* test were used for comparisons of nonparametric and parametric continuous variables, respectively. *P* values of $<.05$ were considered significant. The study was approved by the ethics committee at the CHW.

TABLE 1 Characteristics of Children Presenting With FPIES (N = 35)

Demographic features	
Male, n (%)	20 (57)
No. of episodes	66
Age at initial FPIES presentation, mean $\pm$ SD, mo	5.5 $\pm$ 2.4
Atopic disease at time of initial FPIES presentation, n (%)	
≥ 1 atopic disease ^a	20 (57)
Eczema	18 (51)
Preexisting IgE-mediated food allergy	4 (11)
Asthma	1 (3)
Eosinophilic esophagitis	1 (3)

^a Atopic diseases include eczema, IgE-mediated food allergy, asthma, and eosinophilic esophagitis.

RESULTS

Demographic Characteristics

Thirty-two children fulfilled the criteria set by Sicherer and co-workers.^{4,8} Another 3 children were included in the study despite having only a single episode of FPIES and no diagnostic challenge. Their reactions were typical of FPIES, with all 3 children developing profuse vomiting, lethargy, and pallor 1 to 4 hours after ingesting cow's milk (*n* = 2) or lamb (*n* = 1). In all 3 cases, there was no other explanation for the presentation, all children had negative SPT results for the causative food, and all experienced improvement when the food was eliminated from the diet. The demographic characteristics of the 35 children are summarized in Table 1, and more-detailed information on each patient is provided in the Appendix. Four children with FPIES (soy, *n* = 3; rice, *n* = 1) had experienced IgE-mediated reactions to cow's milk (age, mean $\pm$ SD: 3.4 $\pm$ 0.5 months) before their initial presentation with FPIES (age, mean $\pm$ SD: 4.9 $\pm$ 0.9 months). The reactions to cow's milk were generalized urticaria (*n* = 2), generalized urticaria plus vomiting (*n* = 1), and angioedema, generalized urticaria, wheeze, and stridor (*n* = 1).

The first point of contact with the CHW allergy service for 26 children (74%) was through the allergy clinic, whereas the remaining 9 children (26%) came through the CHW ED. The 35 children had 66 episodes of FPIES. The number of children diagnosed as having FPIES steadily increased over the 16-year period, compared with the relatively constant New South Wales infant population <12 months of age (Fig 1). In the time period examined, the median number of reactions before a correct diagnosis of FPIES did not change substantially (Fig 1).

Episodes of FPIES

Multiple reactions before the diagnosis of FPIES were common (median: 2 episodes; range: 1–4 episodes). Ten children (29%) had 1 episode, 9 children (26%) had 2 episodes, 9 children (26%) had 3 episodes, and 7 children (20%) had 4 separate reactions before FPIES was diagnosed. Seven of the 10 children with a single episode proceeded to undergo a challenge, and all demonstrated a positive reaction to the causative food.

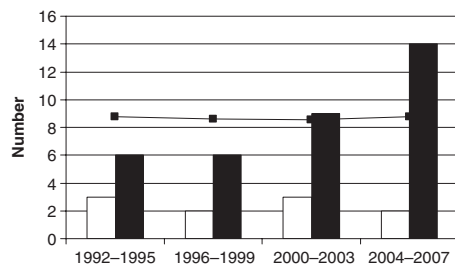


FIGURE 1

Cases of FPIES according to year of diagnosis. Black bars indicate the total number of children diagnosed as having FPIES, white bars indicate the median number of FPIES episodes before a correct diagnosis was made, and the black line indicates the total population of children <12 months of age ($\times 10^4$) in New South Wales.²⁴

Causative Foods

Rice was the most common individual food trigger, followed by soy and cow's milk (Table 2). Twenty-nine children (83%) reacted to a single food, whereas the remaining 6 reacted to 2 separate foods, for a total of 41 initial reactions. Children who reacted to 2 foods reacted to rice and soy ($n = 2$), rice and oats ($n = 1$), rice and sweet potato ($n = 1$), rice and banana ($n = 1$), and oats and sweet potato ($n = 1$). No child had reactions to both cow's milk and soy.

Data on the number of known exposures to the causative food before a reaction occurred were recorded for 33 of the possible 41 initial reactions. Twenty patients (61%) reacted at their first known exposure, 4 (12%) at their second exposure, 4 (12%) at their third exposure, and 5 (15%) at their fourth exposure to the food in question. For 39 of the 41 initial reactions, a SPT for the causative food was performed. One patient had a SPT result of 5 mm in response to cow's milk, whereas the SPTs for the causative foods yielded negative results in all other cases.

Clinical Signs

The mean documented time from ingestion of the food to the onset of FPIES was 1.8 hours (SD: 1.2 hours). In the 66 episodes, vomiting was the most common clinical feature, followed by lethargy, pallor, and diarrhea (Table 3). Temperature data were available for 25 episodes presenting to an ED. The initial recorded

TABLE 3 Characteristics of FPIES Episodes

Clinical features, (N = 66)	
Vomiting, n (%)	66 (100)
Lethargy, n (%)	56 (85)
Pallor, n (%)	44 (67)
Diarrhea, n (%)	16 (24)
Temperature of $<36^\circ\text{C}$, n (%) (N = 25)	6 (24)
Investigations performed, (N = 64)	
Abdominal imaging, n (%) ^a	22 (34)
Septic evaluation, n (%) ^b	18 (28)
Surgical consultation, n (%)	14 (22)
Electrocardiography, n (%)	5 (8)
Other, n (%) ^c	5 (8)
Electroencephalography, n (%)	4 (6)
Laboratory investigations	
Time between hospital visit and blood collection, median (range), h	1.2 (0.7–6)
Hemoglobin level, mean $\pm$ SD, g/L (N = 23)	123 $\pm$ 9
Hematocrit level, mean $\pm$ SD, L/L (N = 17)	0.4 $\pm$ 0.03
White blood cell count, mean $\pm$ SD, 10^9 cells per L (N = 24)	18.0 $\pm$ 9.1
White blood cell count of $>15 \times 10^9$ cells per L, n (%) (N = 24)	11 (46)
Platelet count, mean $\pm$ SD, 10^9 cells per L (N = 24)	506 $\pm$ 131
Platelet count of $>500 \times 10^9$ cells per L, n (%) (N = 24)	15 (63)
Neutrophil count, mean $\pm$ SD, 10^9 cells per L (N = 20)	10.1 $\pm$ 6.4
Lymphocyte count, mean $\pm$ SD, 10^9 cells per L (N = 20)	5.5 $\pm$ 2.6
Eosinophil count, mean $\pm$ SD, 10^9 cells per L (N = 17)	0.2 $\pm$ 0.3
Therapies administered at presentation	
Intravenous fluid resuscitation, n (%)	19 (29)
Antibiotics (administered orally or intravenously), n (%)	8 (12)
Oxygen, n (%)	6 (9)
Air or barium enema, n (%)	4 (6)
EpiPen prescribed, n (%) ^d	4 (11)
Parenterally administered epinephrine, n (%)	2 (3)
Laparotomy, n (%)	1 (2)

^a Abdominal imaging included abdominal radiography ($n = 18$), barium swallow testing ($n = 12$), and abdominal ultrasonography ($n = 5$); some children underwent multiple types of abdominal imaging after a reaction.

^b Septic evaluation included complete blood cell count and blood culture, chest radiograph, and/or lumbar puncture.

^c Other investigations included a Meckel scan ($n = 1$), echocardiography ($n = 1$), brain MRI ($n = 1$), Holter monitor testing ($n = 1$), and a urine metabolic screen ($n = 1$).

^d Of 35 children; EpiPen prescribed for FPIES reaction alone with no history of IgE-mediated food allergy.

temperature was $<36^\circ\text{C}$ for 6 episodes (24%), including 3 with temperatures of $<35^\circ\text{C}$. Temperatures between 36°C and 36.9°C were recorded for 18 episodes (72%), and 1 child (4%) had an initial temperature of 37.6°C . Decreased body temperature and diarrhea were associated with more-severe reactions. Patients with temperatures of $<36^\circ\text{C}$ were more likely to have received intravenous fluid resuscitation (83% vs 26%; $P = .02$), to have received a surgical consultation (83% vs 26%; $P = .02$), or to be transferred to a tertiary pediatric hospital (CHW) for further evaluation (83% vs 21%; $P = .01$), compared with those with temperatures of $\geq 36^\circ\text{C}$. Similarly, patients with diarrhea were more likely to have received intravenous fluids (42% vs 17%; $P = .03$), to have received a surgical consultation (50% vs 17%; $P = .03$), and to be transferred to CHW (70% vs 16%; $P = .001$), compared with those without diarrhea.

TABLE 2 Food Triggers of FPIES

Food	n (%)		Age at Initial FPIES Reaction, Mean $\pm$ SD, mo
	All Children (N = 35)	Children With Single-Food FPIES (N = 29)	
Rice	14 (40)	9 (31)	5.2 $\pm$ 0.8
Soy	12 (34)	10 (34)	5.4 $\pm$ 3.1
Cow's milk	7 (20)	7 (24)	4.1 $\pm$ 1.8
Oats	2 (6)	0 (0)	5.7 $\pm$ 1.0
Sweet potato	2 (6)	0 (0)	7.6
Banana	1 (3)	0 (0)	6.0
Fish	1 (3)	1 (3)	9.0
Chicken	1 (3)	1 (3)	8.0
Lamb	1 (3)	1 (3)	11.2

Investigations Performed and Treatments Received

Of the 66 episodes of FPIES, 39 (59%) presented to a hospital, with 25 patients (64%) being admitted overnight, with a median stay of 2 days (range: 1–9 days). Information concerning investigations ordered at the time of presentation was available for 64 episodes (Table 3). Thrombocytosis (platelet count of $>500 \times 10^9$ cells per L) was recorded in 63% of episodes for which a complete blood count was ordered (Table 3). Of those with a platelet count of $>500 \times 10^9$ cells per L, the median platelet count was 588×10^9 cells per L (range: $515\text{--}777 \times 10^9$ cells per L). There was no statistically significant difference between episodes with and without thrombocytosis with respect to the time delay between presentation to the hospital and blood collection and the following laboratory parameters at presentation: hemoglobin level, mean corpuscular volume, white blood cell count, neutrophil count, and hematocrit level (data not shown; $P > .05$ for all comparisons). The treatments administered in the cases that presented to the hospital are presented in Table 3.

Diagnosis of Initial Episodes

Of the 19 initial episodes that presented to an ED, a discharge diagnosis of FPIES was made in only 2 cases (11%). A diagnosis of food allergy was made in another 5 cases (26%). The remaining patients were discharged with diagnoses of viral infection/sepsis ($n = 4$; 21%), gastroenteritis ($n = 4$; 21%), or resolved intussusception ($n = 2$; 11%); in 2 cases (11%), the child was discharged without a diagnosis.

Challenges and Outcomes

Ten inpatient hospital challenges were performed to confirm FPIES, and 12 were conducted to determine tolerance. All 10 children who had a diagnostic challenge reacted. The challenge foods included rice ($n = 5$), soy ($n = 3$), fish ($n = 1$), and sweet potato ($n = 1$). The median time from the last FPIES reaction to the challenge was 3 weeks (range: 0–15 weeks). The median time to reaction was 1.5 hours (range: 0.8–2.5 hours). Intravenous fluid resuscitation was required in 6 cases, 3 patients received parenterally administered epinephrine, and 1 patient was given steroids.

Twelve children underwent challenges to ascertain tolerance. Nine children tolerated the food in question. The challenge foods included rice ($n = 5$), soy ($n = 6$), and chicken ($n = 1$). By 3 years of age, sensitivity to soy was lost for 5 (83%) of 6 children and sensitivity to rice was lost for 4 (80%) of 5 children. One child with chicken FPIES continued to be intolerant at 3 years of age.

DISCUSSION

This study revealed a number of significant findings regarding FPIES reactions, as follows. (1) Misdiagnosis and delays in diagnosis are very common, leading to a number of children undergoing additional, often painful investigations and prolonged hospital admissions. (2) Body temperature is decreased in a significant

proportion of cases. (3) Thrombocytosis is frequently present.

The increased number of cases may represent a true increase in FPIES and/or greater awareness of its existence by practitioners. The median number of episodes before a correct diagnosis did not change substantially over the 16 years, which does not suggest an increasing awareness of the condition by practitioners.

The frequent misdiagnosis of FPIES is not a new finding, with case reports often describing children experiencing multiple episodes and undergoing multiple investigations before a diagnosis of FPIES was considered.^{9,11,14} Our series highlights the extent of misdiagnosis, resulting in unnecessary investigations and treatments. Only 11% of children who presented to the hospital with their first reaction received correct diagnoses. Of patients with FPIES episodes presenting to a hospital, 34% underwent some form of abdominal imaging, 28% underwent a septic evaluation, 22% had a surgical consultation, and 6% had a barium or air enema performed. There are 2 reports of children with FPIES being mistakenly diagnosed as having intussusception, which led to nondiagnostic laparotomies.^{11,12} In the present series, 1 child underwent a laparotomy because of suspected intussusception but was later diagnosed as having rice FPIES, which emphasizes the fact that FPIES can masquerade as intussusception. These findings highlight the importance of drawing the attention of the pediatric community to this condition.

There have been 3 other series examining the relative prevalence of causative foods.^{4,7,8} In all 3 studies, cow's milk or soy was the most common trigger responsible for FPIES, in contrast to rice in our study. Rice was also found to induce more-severe reactions than cow's milk or soy, and these findings were presented elsewhere.¹⁵ In our study, a greater proportion of the cases referred by pediatricians were attributable to cow's milk or soy (cow's milk/soy, 62%; other food proteins, 28%), compared with those presenting through our ED (cow's milk/soy, 33%; other food proteins, 77%), although a smaller proportion of patients presented through our ED than in some other series.^{4,8} It might be expected that ED presentations would reflect a more-severe group of reactions.

FPIES reactions to both cow's milk and soy are common, being reported for 42% to 60% of children.^{4,6–8,16} In contrast, no child in our study had combined cow's milk and soy FPIES. This might be because only 3 of the 7 children with cow's milk FPIES were recommended to have soy milk. Similarly, only 2 of 12 children with soy FPIES were given a cow's milk formula. Continuation of breastfeeding or use of an extensively hydrolyzed formula, a goat's milk formula, or an elemental formula was recommended in the other cases.

The resolution of soy FPIES (83%) and rice FPIES (80%) by 3 years of age was greater in our series than in some previous reports. Sicherer et al⁴ found that only 2 (20%) of 10 children with typical soy FPIES attained clinical tolerance by 3 years of age, whereas Nowak-Węgrzyn et al⁸ reported that only 6 (27%) of 22 children

with soy FPIES and 3 (38%) of 8 children with combined solid food and soy FPIES outgrew their soy intolerance. The authors also noted that only 4 (40%) of 10 children with rice FPIES lost their sensitivity by 3 years of age. Our findings are in line with those of Fogg et al,⁷ in which 8 (67%) of 12 children with soy FPIES lost their sensitivity by 3 years of age (JM Spergel, PhD, personal communication, 2008). The reasons for these differences are unclear and do not seem to be related to differences in referral patterns, given that outpatient referrals were the main or only source of patients in all 3 studies. A recent prospective study of infantile FPIES by Hwang et al¹⁷ found that all patients with soy FPIES lost their sensitivity by 14 months of age.

The clinical features of FPIES in our study were similar to those reported by others.^{4,8} However, reduction of body temperature as a presenting feature was not described previously. In our series, 24% of episodes had an initial presenting temperature of <36°C and such cases were more severe, as reflected by the higher rates of intravenous fluid resuscitation, transfers to a tertiary hospital for evaluation, and requests for a surgical consultation. Reduction of body temperature has been reported for children presenting with conditions associated with significant circulatory volume loss, such as septic shock¹⁸ and severe gastroenteritis.¹⁹ Diarrhea was also associated with more-severe episodes, probably by exacerbating the fluid loss.

The management of an acute FPIES reaction involves intravenous fluid resuscitation for patients presenting in shock. Some practitioners have prescribed epinephrine kits to children.¹⁰ Four children in our study, with no concurrent IgE-mediated allergy, were prescribed an EpiPen (Commonwealth Serum Laboratories, Parkville, Australia) for the emergency treatment of FPIES. Epinephrine is not generally recommended for the treatment of FPIES, and such patients do not require epinephrine autoinjectors unless there is a concomitant IgE-mediated food allergy.¹³

Thrombocytosis and leukocytosis were common findings after FPIES reactions in our series. Thrombocytosis was mentioned only in a case report of acute cow's milk FPIES,¹² whereas leukocytosis has long been recognized as a common finding for patients presenting with acute FPIES.⁶ Reactive thrombocytosis in response to stimuli such as infections is not uncommon in young children and is considered to be a response to cytokines such as interleukin 6 and other hematopoietic growth factors.²² In the present situation, however, the response seems to be too rapid to be attributable to increased megakaryocytosis. The most likely explanation is a response to epinephrine induced by stress, which can shift platelets from the spleen into the circulation.²³ No child in our series had a preexisting condition known to cause thrombocytosis, such as iron deficiency anemia or a chronic inflammatory disorder. Furthermore, the high platelet counts seen were unlikely to be attributable to hemoconcentration, with no significant difference in hematocrit levels between children with and without thrombocytosis being observed.

CONCLUSIONS

Despite increasing numbers of children presenting to our hospital with FPIES, misdiagnoses and delays in diagnosis were common. Early diagnosis would ensure that appropriate dietary advice is given to families, thereby reducing the risk of repeated reactions, inappropriate investigations, and prolonged hospitalizations. Clinicians should be aware that foods that may be perceived as hypoallergenic, such as rice, are common triggers of non-IgE-mediated FPIES. Decreased body temperature and thrombocytosis emerge as additional features of FPIES.

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APPENDIX Characteristics of Patients With FPIES

Patient No.	Gender	Food Triggers	Age at Initial Episode, mo	Time to Symptoms at Initial Episode, h	Symptoms at Initial Episode	Recorded Temperature at Initial Episode, °C	SPT Result, mm	Intravenous Fluid Therapy at Initial Episode	Surgical Consultation at Initial Episode	Transfer to CHW at Initial Episode	ED Evaluation
1	M	Cow's milk	3.4	2	V, D		0	Yes	Yes		Yes (×1)
2	F	Soy	6.2	2	V, L, P	36.5	0	No	No	No	Yes (×2)
3	M	Rice	5.3	0.5	V, L, P	36.5	0	No	No	No	Yes (×1)
4	F	Cow's milk	3.6	2	V, L, P		0	Yes	Yes	No	Yes (×2)
5	F	Fish	9.0	2	V, L		0	No	No	No	No
6	F	Soy	3.0	0.5	V, L		0	Yes	No	No	Yes (×1)
7	F	Rice	5.4	2	V, D, L, P	35.7	0	Yes	Yes	Yes	Yes (×2)
8	F	Rice	4.6	NR	V, L, P	36.4	0	Yes	No	Yes	Yes (×1)
9	M	Cow's milk	3.6	2.5	V, D, L, P	34.7	0	Yes	Yes	Yes	Yes (×2)
10	F	Oats; rice	5.0; 5.0	2; 2	V, L; V		NR; 0	No; no	No; no	No; no	No; no
11	M	Cow's milk	7.0	0.5	V, L, P		0	No	No	No	No
12	F	Rice	5.0	0.3	V, L, P		0	No	No	No	No
13	M	Soy	5.8	2	V, L		0	No	No	No	Yes (×2)
14	M	Soy	3.1	6	V		0	No	No	No	Yes (×2)
15	F	Soy	5.5	1.5	V, D, L, P	37.6	0	No	No	No	Yes (×3)
16	M	Oats; sweet potato	6.4; 7.6	2; 1.5	V, L, P; V, D, L	36.8; 36.7	0; NR	Yes; yes	Yes; yes	No; no	Yes (×2); yes (×2)
17	M	Rice; banana	5.5; 6.0	6; 2	V, L, P; V, L	34.8; NR	0; 0	Yes; no	No; no	Yes; no	Yes (×1); no
18	M	Lamb	11.2	4	V, L, P		0	Yes	No	No	Yes (×1)
19	M	Rice	6.0	2	V, D, L		0	No	No	No	Yes (×1)
20	M	Soy; rice	5.5; 6.0	0.5; 2	V; V		0; 0	No; no	No; no	No; no	No; no
21	M	Soy	3.2	0.75	V, D, L, P	36.8	0	No	No	Yes	Yes (×1)
22	M	Soy; rice	3.0; 3.7	1; 1	V, L, P; V, L, P	NR; 36.6	0; 0	No; yes	No; yes	No; no	Yes; yes (×2)
23	M	Cow's milk	3.0	1	V, L		0	No	No	No	No
24	M	Soy	5.4	1	V, L	36.8	0	No	No	No	Yes (×1)
25	M	Soy	14.4	0.5	V, L, P		0	No	No	No	No
26	M	Rice	6.0	2	V, L		0	No	No	No	No
27	F	Soy	5.5	2	V, L, P	36.3	0	No	No	No	Yes (×2)
28	M	Rice	4.0	2	V, L, P		0	No	No	No	Yes (×1)
29	F	Soy	4.0	2	V, L, P		0	No	No	No	No
30	F	Rice; sweet potato	6.2; 7.6	2; 2.75	V, L; V	36.5; 36.7	0; NR	No; no	No; no	No; no	Yes (×3); yes (×1)
31	M	Cow's milk	2	3	V		5	No	No	No	No
32	F	Chicken	8.0	0.5	V, L, P		0	No	No	No	No
33	F	Cow's milk	6.0	NR	V		0	No	No	No	No
34	M	Rice	5.8	2	V, L, P	36.2	0	Yes	No	No	Yes (×1)
35	F	Rice	4.8	2	V, D, L		2	Yes	No	No	Yes (×2)

V indicates vomiting; D, diarrhea; L, lethargy; P, pallor; NR, not recorded.

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