

Summary of recent research evaluating growth and nutrition in children with food allergy requiring amino acid-based formulas

BACKGROUND: While there is known risk of nutrient deficiencies in children with food allergies, research into growth and nutrition in children eliminating multiple foods is limited. Amino acid-based nutrition is often required for children eliminating multiple food allergens and has been shown effective in the dietary management of eosinophilic gastrointestinal disorders (EGIDs). Most amino acid-based formulas are designed to be nutritionally complete, yet limited research has specifically studied children whose elimination diets require supplementing with them.

The Journal of Allergy and Clinical Immunology recently published a letter to the editor by a team from Johns Hopkins University School of Medicine. It reports outcomes of a cross-sectional study that investigated nutrient intake, nutrient status, and growth of children with multiple food allergies whose restricted diets were supplemented with amino acid-based nutrition. The study purpose, design and key outcomes are summarized below.

Key take away points:

- Children with multiple food allergies who need supplemental formula are at risk for low fiber intake – intake of most other nutrients was adequate.
- These data add to the understanding of the nutritional status of children with multiple food allergies who need amino acid-based formula.

Robbins KA*, Guerrero AL[†], Hauck SA[‡], et al. Growth and nutrition in children with food allergy requiring amino acid-based nutritional formulas. *J Allergy Clin Immunol.* 2014;134:1463-6.e5.

PURPOSE: This research investigated nutrient intake, nutrient status, and growth of children with diets restricted by multiple food allergies and supplemented with amino acid-based nutrition. Special focus was paid to choline, deficiency of which is known to occur in those with diets poor in choline-rich foods, e.g. dairy, egg and nuts.

DESIGN: Thirty-two children (mean 5.7 ± 0.8 years; range 0.8 to 15.8 years) were recruited into this cross-sectional study. All subjects followed elimination diets necessitated by two or more proven food allergies and required amino acid-based nutrition. Complete physical exam and anthropometric assessments were conducted, and dietary analysis included 3-day dietary records, administered by a research dietitian. Lab tests included measurements of calcium, phosphate, vitamin D and choline, among others. Measurements were compared to accepted reference standards.

RESULTS: Most subjects avoided milk (87.5%), egg (81.3%), soy (81.3%), wheat (59.4%), and/or peanut (87.5%), with 56.3% avoiding all 5 of these common allergens. Amino acid-based nutrition made up 17% to 100% of daily energy intake, exceeding 50% of calories for 42.3% of subjects. Subjects had decreased weight-for-age ($P = 0.045$) and height-for-age ($P = 0.001$) compared to NHANES 2007-2010 general population data. Most participants (81.5%) met adequate energy intake (>80% estimated energy needs), but **most (60.9%) did not reach recommended total daily fiber intake**. More than half (55.6%) of subjects had vitamin D intakes below 67% of recommended dietary allowance, which mirrored the 48.4% who had serum 25-OH vitamin D levels in “insufficient” or “deficient” ranges (see table 1). Percent energy intake from amino acid-based nutrition was found to positively correlate with choline z scores.

CONCLUSIONS: **Subjects were found to be at risk for low total daily fiber intake.** Insufficient vitamin D intakes and serum levels were noted, though most subjects reached adequate intakes of other nutrients. Participants were found to be smaller than children in the NHANES reference population, despite appropriate energy intake, consistent with prior research in similar food-allergic populations.

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NHANES = National Health and Nutrition Examination Survey.

Table 1. Study group characteristics. Adapted from Robbins et al, 2014.

	Subjects N=32 no. (%)
Avoiding top allergens:	
Milk	28 (87.5%)
Peanut	28 (87.5%)
Soy	26 (82.3%)
Egg	26 (82.3%)
Wheat	19 (59.4%)
All 5 top allergens	18 (56.3%)
Food allergies	
IgE mediated	8 (25.0%)
Non-IgE mediated	15 (46.9%)
Mixed IgE & Non-IgE mediated	9 (28.1%)
Comorbidities	
Eosinophilic esophagitis (EoE)	13 (40.6%)
Eosinophilic gastrointestinal disorder (EGID), not EoE	1 (3.1%)
Atopic dermatitis	17 (53.1%)
Daily caloric intake from amino acid-based formula (AAF) (N = 26):	
100% of calories from AAF	2 (7.7%)
76-99% of calories from AAF	4 (15.4%)
51-75% of calories from AAF	5 (19.2%)
25-50% of calories from AAF	12 (46.2%)
17-25% of calories from AAF	3 (11.5%)
Fiber intake for subjects over 2 years (N = 23): (Recommendation: Grams = Age in years +5)	
Adequate	9 (39.1%)
Below recommendation	14 (60.9%)
Vitamin D intake (N = 27):	
Adequate (consuming \geq 67% DRI)	12 (44.4%)
Below recommendation (<67% DRI)	15 (55.6%)
Above recommendation (\geq Tolerable upper limit)	0 (0%)
25-OH vitamin D (N = 31):	
Sufficient, \geq 32 ng/mL	16 (51.6%)
Insufficient, 20-31 ng/mL	11 (35.5%)
Deficient, <20 ng/mL	4 (12.9%)
Calcium laboratory values (N = 31):	
Within normal range	31 (100%)
Less than normal range	0 (0%)
Phosphate laboratory values (N = 31):	
Within normal range	31 (100%)
Less than normal range	0 (0%)
Gastrostomy tube	3 (9.4%)

CONSIDERATIONS:

The subjects studied were identified from a tertiary care center and therefore may have been more likely to experience nutritional concerns. While the study relied on a 3-day food record to assess intake, the impact of this limitation may have been minimized due to the limited variety in the children's diets. Further research could explore possible mechanisms underlying poor growth, possibly including corticosteroid use, gastrointestinal inflammation, and increased energy needs associated with comorbid conditions such as EGIDs and/or atopic dermatitis.

Adapted from full text, publicly available at <https://doi.org/10.1016/j.jaci.2014.08.053>