



Fat, Fiber & Pediatric MS

B Seminatore, J Graves, A Waldman, T Lotze, T Schreiner, A Belman, B Greenberg, B Weinstock-Guttman, G Aaen, J Mendelt-Tillema, J Hart, J Ness, J Rubin, L Krupp, M Gorman, L Benson, M Rodriguez, T Chitnis, S Mar, LF Barcellos, J Rose, S Roalstedt, T Simmons, T. Charles Casper, E Waubant, on behalf of the US Pediatric MS Network

Disclosures

- Authors have no disclosures relevant to the work.

Background

- Environmental factors increasingly recognized for risk of MS, yet dietary factors not extensively studied
- Caloric restriction in EAE mouse model suggest anti-inflammatory effect
- Fat and calorie intake associated with recurrence and disease progression, but no association with onset
- Pediatric MS offers opportunity to explore fat and fiber intakes as risk factors

Aim

- Investigate association between pediatric-onset MS and dietary total fat content and fiber intake

Study Design

- Multi-center case-control study
- 14 US enrolling sites, 1 data-coordinating center
- Patients enrolled in a study of genetic and environmental risk factors for pediatric MS
- Part of evaluation included food frequency questionnaire

Inclusion Criteria

Cases:

- Met McDonald MS criteria or CIS with ≥ 2 silent T2 lesions
- Onset before 18 years of age
- Less than 4 years duration

Controls:

- < 20 years of age
- Seen at general pediatric clinics at the same participating institutions
- Excluded if autoimmune diseases (other than eczema or asthma) or history of parental MS

Dietary Intake Measurements

- Block Kids Food Screener (NutritionQuest)
- Validated self-report questionnaire
- 41 general questions on food and beverage consumption and frequency during the previous week
- Validated against three 24-hr dietary recalls in children 10-17 years of age
- Subjects who provided answers of <500 or >5000kcal/day were excluded from analysis

HOW MANY DAYS LAST WEEK DID YOU EAT OR DRINK IT?

HOW MUCH IN ONE DAY?

None last week 1 day last week 2 days last week 3-4 days last week 5-6 days last week Every day last week

A little Some A lot

	None last week	1 day last week	2 days last week	3-4 days last week	5-6 days last week	Every day last week		A little	Some	A lot
Refried beans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Hamburgers, cheeseburgers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								1 small	1 large	2 large
Hot dogs, corn dogs, or sausage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								1	2	3
Lunch meat like boloney, ham, Lunchables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								1 slice	2 slices	3+ slices
Pizza or pizza pockets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Spaghetti or ravioli <u>with</u> tomato sauce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Macaroni and cheese	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Chicken, including nuggets, wings, tenders, also in sandwiches or stew	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Fish, fish sticks or sandwiches, tuna, shrimp	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Burritos or tacos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								1/2	1	2
Beef like roast, steak or in sandwiches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Meat balls, meat loaf, beef stew, Hamburger Helper	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Pork, like chops, roast, ribs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Popcorn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A little	Some	A lot
Snack chips like potato chips, Doritos, Fritos, tortilla chips	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								A few	Small bag	Large bag
Ice cream	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	▶	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								1 scoop	2 scoops	3 scoops

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Statistical Analysis

- Fat and fiber intakes compared between cases and controls
- Logistic regression models adjusted for:
 - gender
 - age
 - body mass index (BMI)
 - ethnicity
 - mother's highest educational degree as a proxy for socioeconomic status (SES)

Baseline Demographics

	Cases N = 174	Controls N = 337	All N = 511	P-value
Age (mean +/- SD)	15.2 (3.4)	13.9 (3.7)	14.4 (3.6)	< 0.01
BMI (mean +/- SD)	25 (6.4)	22 (6)	23 (6.3)	< 0.01
Disease duration at enrollment (years)	1.0 (1.2)			
Mother's highest educational degree				< 0.01
- None	22 (13%)	17 (5%)	39 (8%)	
- High school diploma / associate's degree	96 (55%)	138 (41%)	234 (46%)	
- Bachelor's / graduate degree	50 (30%)	143 (42%)	193 (38%)	
Gender - Female	110 (63%)	164 (49%)	274 (54%)	< 0.01
Race - White	101 (58%)	230 (68%)	331 (65%)	0.09
Ethnicity - Hispanic/Latino	51 (29%)	59 (18%)	110 (22%)	< 0.01

Daily baseline nutritional characteristics

(mean +/- SD)	Cases N = 174	Controls N = 337	All N = 511	P value
Total fiber (g)	10.6 (5.6)	11.1 (5.9)	10.9 (5.8)	0.36
Total fat (g)	53.8 (28.4)	53.6 (28.5)	53.6 (28.4)	0.99
% of total calories from fat	36.0 (6.1)	36.1 (5.5)	36.1 (5.7)	0.97
# patients with fiber intake < recommended	173 (99%)	334 (99%)	507 (99%)	0.70
# patients with total fat/ calories > recommended	168 (96.6%)	326 (96.7%)	494 (96.7%)	0.91

Recommendations for fat intake based on the Dietary Guidelines for Americans 2010 (Institute of Medicine).
Ages 4-18, recommended fat% of total calories 25-35%.

Recommendations for fiber intake based on the Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (2002).

Ages 4-8, recommended daily fiber intake 25g. Ages 9-13, (male) 31g/ (female) 26g. Ages 14-18, (male) 38g/ (female) 26g.

Multivariable Analysis

	OR	95% CI	P-value
Total fat (100g/day)	1.04	(0.48, 2.21)	0.93
Total calories from fat (%)	0.99	(0.95, 1.03)	0.60
Fat intake > recommended	0.50	(0.16, 1.62)	0.25
Fiber (g/day)	0.99	(0.96, 1.03)	0.59

Adjusted for gender, age, BMI, race, ethnicity, SES (mother's highest educational degree), and an interaction between age and race.

Strengths & Limitations

Strengths:

- Large population of pediatric cases of short disease duration
- Multi-center study with diverse population sampling
- Stringent case ascertainment
- Standardized validated questionnaire
- Multivariate analysis adjusted for known or potential confounders

Limitations:

- Food Screener does not exhaustively evaluate fat & fiber
- Includes food consumed after disease onset
- Potential unknown and unmeasured confounders

Discussion

- No association with risk of pediatric-onset MS and fat and fiber intake between cases and controls in univariate and multivariable analyses
- Does not preclude role as disease-modifier

Future Direction

- Additional nutrients as risk factors
- Dietary interaction with microbiome

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