Is There a Special Diet for Kids and Teens with IBD?

Lindsey Albenberg, D.O.
Guidelines?

ADA:
- Small snacks every 3-4 hours
- Low fiber foods during periods of symptoms
- 8 cups of fluid per day
- Eat foods with probiotics and prebiotics
- Take a multivitamin
- Add fiber when feeling well

ACG CPG:
- CD: Enteral nutritional therapy
- UC: No role for NPO/TPN, avoid milk in lactose intolerant individuals, low roughage for those with diarrhea

ASPEN:
- All IBD patients should undergo nutrition screening
- Enteral nutrition for those who require nutritional support
- Parenteral nutrition for patients who cannot tolerate enteral nutrition
- Fistula-associated CD – bowel rest + TPN

ESPEN:
- Enteral nutritional therapy for CD
- Parenteral nutrition may benefit undernourished patients
- Correct nutrient deficiencies

Etiologic Theories for IBD

Genetic Predisposition

Mucosal Immune System (Adaptive/Innate)

Environmental Triggers (Luminal Bacteria, Infection)
Present Medical Therapies for IBD

- **Aminosalicylates**
  - Decrease inflammation through inhibition of COX and lipoxygenase

- **Corticosteroids**
  - Block immune cell recruitment and regulation of NF-kappaB

- **Immunomodulators**

- **Biologics**
  - Block inflammatory cytokines (e.g., TNF-alpha and adhesion molecules)

- **Antibiotics**
  - Microbiota balance and anti-inflammatory properties

- **Enteral nutritional therapy**
  - Unknown mechanism

**Thiopurines**:
- Block lymphocyte proliferation and protein/nucleotide synthesis and lead to apoptosis of activated T-lymphocytes

**Methotrexate**:
- Block purine and pyrimidine synthesis and anti-inflammatory effects
Dysbiosis of Gut Microbiota in IBD

- Gut microbiota in patients with IBD are enriched for taxa belonging to the *Proteobacteria* and *Actinobacteria* phyla with a decrease in representation of *Firmicutes*.

Should We Be Immunosuppressing Our IBD Patients?

*Hypothesis*: IBD arises from inappropriate handling of intestinal bacteria
Is There a Relationship Between Diet, the Gut Microbiota, and IBD?

Clinical Relevance of Diet and IBD

Patients with IBD frequently identify dietary components that cause increased symptoms (lactose, gluten, etc.) and up to 75% follow restricted diets based on subjective intolerance and perceived worsening of disease.

Adapted from Limdi et al. Inflamm Bowel Dis. 2015
Diet is Associated with New Onset IBD

- High dietary intakes of total fats, PUFAs, omega-6 and meat were associated with an increased risk of CD and UC
- High fiber and fruit intakes were associated with decreased CD risk
- High vegetable intake was associated with decreased UC risk.

Dietary-fat-induced taurocholic acid promotes pathobiont expansion and colitis in Il102/2 mice

Devkota et al. *Nature* 2012;487:104
Dietary Emulsifiers Alter Microbiota Localization, Composition, and Pro-inflammatory Potential

Diet studies in humans with IBD

1. Eliminate Foods
2. Add anti-inflammatory substances or prebiotics
3. Enteral nutritional therapy
Enteral Nutritional Therapy For Crohn’s Disease (CD)

- A therapy which has been used for almost 4 decades
- Involves the use of a specific formula as nutritional therapy (food = medicine)
  - Replacing all or the majority of daily calories with formula and excluding or limiting food
- First-line treatment for Crohn’s disease in many parts of the world with similar or even better remission rates than medications

EN Therapy: Traditional Protocol

**Induction**
- 100% of calories come from formula. Only clear liquids and hard candies allowed (in moderation)
- Duration 4-12 weeks
- Oral or NG tube

**Maintenance**
- Repeated 4 week cycles of exclusive enteral nutrition every 3-4 months **OR**
- Transition to medical therapy with an immunomodulator (6-mp, azathioprine, methotrexate)
CHOP Enteral Nutritional Therapy Protocol

**Induction**
- 8-12 weeks
- 80-90% of estimated needs from formula
- 10-20% food
  - Need to be strict
  - Not all food considered equal
- NG tube/oral/combo

**Maintenance**
- Post induction to . . . ?
- Lower % calories from formula by 10-15%
  - ↓ # of days
  - ↓ volume
- Simultaneously increase % of calories from food
- Closely monitor!
Which formula to choose?
There is no magic formula!

<table>
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<tr>
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<th>Osmolite Abbott Nutrition</th>
<th>Modulen Nestle Health Science</th>
<th>Peptamen 1.5 Nestle Health Science</th>
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<td>Kcal/mL</td>
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<td>1</td>
<td>1.5</td>
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<td>CHO%</td>
<td>54%</td>
<td>57%</td>
<td>59%</td>
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<tr>
<td>CHO Source</td>
<td>Corn maltodextrin and corn syrup solids</td>
<td>Corn syrup, glucose, and sucrose</td>
<td>Corn maltodextrin and cornstarch</td>
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<tr>
<td>PRO%</td>
<td>16%</td>
<td>19%</td>
<td>18%</td>
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<tr>
<td>PRO Source</td>
<td>Casein and soy protein</td>
<td>Casein</td>
<td>Hydrolyzed whey protein</td>
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<tr>
<td>Fat%</td>
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<td>24%</td>
<td>33%</td>
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<tr>
<td>Fat Source</td>
<td>20% from MCT; 80% from canola oil and corn oil</td>
<td>25% from MCT; 75% corn oil and soy lecithin</td>
<td>70% MCT from coconut and/or palm oil; 30% from soybean oil</td>
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<td>FAT gm/1000 mL</td>
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<td>56</td>
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<td>Fe (mg/1000 mL)</td>
<td>14</td>
<td>10.8</td>
<td>27</td>
</tr>
<tr>
<td>Fiber?</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Vitamin D (IU/1000 mL)</td>
<td>305</td>
<td>1000</td>
<td>1000</td>
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Feeding tube or no feeding tube?

- Downsides of oral (drinking) nutritional therapy
  - Flavor fatigue
  - Difficult to tolerate the amount that is required
    - Up to 6-7 bottles per day
  - Expensive $$$

- Downsides of feeding tube
Polymeric Diet Alone vs. Steroids for Active Pediatric CD (Induction Therapy)

• Methods (n=37)
  – Prospective 10 week randomized controlled open-label trial
  – Newly diagnosed children receive:
    • polymeric formula (n=18) or steroids (n=19)
  – Primary outcomes at 10 weeks
    • Clinical remission (PCDAI≤10)
    • Mucosal healing
      – Decrease in both endoscopic and histologic scores by > 50% when compared to baseline

Polymeric Diet Alone vs. Steroids for Active Pediatric CD (Induction Therapy)

How Does Enteral Nutritional Therapy Work?

• Idea #1 - Regular diet is unable to adequately supply an essential nutrient
• Idea #2 - Regular diet contains something harmful that leads to inflammation
• Idea #3 – Diet alters the gut microbes
How Does Enteral Nutritional Therapy Work?

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PLEASE: Pediatric Longitudinal Study of Elemental Diet and Stool Microbiota Composition

90 Children with Active Crohn’s Disease

Treatment at Discretion of Treating Physician

Enteral Nutritional Therapy (n=38)  Anti-TNF Therapy (n=52)

Baseline: Stool Microbiome, Dietary recalls x 3, FCP, PCDAI

Week 1: Stool Microbiome, Dietary recalls x 3, FCP

Week 4: Stool Microbiome, Dietary recalls x 3, FCP

Week 8: Stool Microbiome, Dietary recalls x 3, FCP, PCDAI
Greater Mucosal Healing with More Restrictive Diet During Induction Phase

PLEASE Study: An 8-week Prospective Cohort Study Among Children with Crohn’s

Calprotectin Concentration at Week 8 (mcg/g)

- Partial Enteral Nutrition (n=16)
- Exclusive Enteral Nutrition (n=22)
- Anti-TNF (n=52)

Lee D et al. Inflamm Bowel Dis. 2015.
How Does Enteral Nutritional Therapy Work?

- Idea #1 - Regular diet is unable to adequately supply an essential nutrient
- Idea #2 - Regular diet contains something harmful that leads to inflammation
- Idea #3 – Diet alters the gut microbes
Loop vs. End Ileostomy
Fecal Diversion Heals Ileal Mucosa
Exposure to Ileal Contents Lead to Inflammation

Infusion of loop ileostomy effluent into distal ileum

Prior to infusion of ileal contents

Followin infusion of ileal contents

D’Haens GR. Gastroenterology 1998;114:262–267
How Does Enteral Nutritional Therapy Work?

• Idea #1 - Regular diet is unable to adequately supply an essential nutrient
• Idea #2 - Regular diet contains something harmful that leads to inflammation
• Idea#3 – Diet alters the gut microbes
Inflammation, antibiotics, and diet independently effect dysbiosis in CD.

Dysbiosis decreases with reduction in inflammation.

Exclusive enteral nutritional therapy has a rapid and independent effect on gut microbiota composition within one week.

This change was not observed in partial enteral nutritional therapy group.

Lewis JD et al. Cell Host & Microbe. 2015.
EMMI: Enteral Nutritional Therapy, Microbiome, and Metabolome in Ileostomy Contents

Fig. 4: Study outline
# = Whole food meal; * = DFD meal
Other diets for IBD

The FODMAPS Diet

<table>
<thead>
<tr>
<th>excess fructose</th>
<th>lactose</th>
<th>fructans</th>
<th>galactans</th>
<th>polyols</th>
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<tbody>
<tr>
<td>fruit</td>
<td>milk</td>
<td>vegetables</td>
<td>legumes</td>
<td>fruit</td>
</tr>
<tr>
<td>apple, mango,</td>
<td>milk from cows, goats or sheep, custard, ice cream, yogurt</td>
<td>asparagus, beetroot, broccoli, brussel sprouts, cabbage, eggplant, fennel, garlic, leek, okra, onion, shallots, spring onion, cereals</td>
<td>baked beans, chickpeas, kidney beans, lentils</td>
<td>apple, apricot, avocado, blackberry, cherry, lychee, nashi, nectarine, peach, pear, plum, prune, watermelon, vegetables, cauliflower, bell pepper, mushroom, sweet corn, sorbitol, mannitol, isomalt, maltitol, xylitol</td>
</tr>
<tr>
<td>nashi, pear, tinned fruit in natural juice, watermelon</td>
<td>soft unripened cheeses, such as cottage cheese, cream, mascarpone, ricotta</td>
<td></td>
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<td></td>
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<tr>
<td>sweeteners</td>
<td></td>
<td></td>
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<tr>
<td>fructose, high fructose corn syrup, concentrated fruit sources, large servings of fruit, dried fruit, fruit juice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>honey, corn syrup, fruisana</td>
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<tr>
<td>The Paleo Pyramid</td>
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</table>
The Specific Carbohydrate Diet

- Principle that specifically selected carbohydrates, requiring minimal digestion, are well absorbed and leave virtually none to be used for furthering microbial overgrowth in the intestine

- Exclusion diet (very restrictive)
- Mostly anecdotal evidence supporting efficacy
- Scientific literature includes only small, uncontrolled studies in children (7-10 patients)
- Concerns regarding growth and nutrition particularly in children

Partial EN + anti-inflammatory diet

- Sigall-Boneh and colleagues recently found that a combination of partial enteral nutritional therapy and a restricted diet could induce remission and mucosal healing in 70% of patients.

Curcumin and UC

• Natural phytochemical derived from the Indian spice turmeric
• Widely used for centuries in ayurvedic and traditional Chinese medicine to treat a range of inflammatory diseases
• In vitro studies demonstrate anti-inflammatory and antioxidative properties of curcumin in human lymphocytes and gut epithelial cell lines
• Recently shown to ameliorate murine experimental colitis
Curcumin and UC

- 50 adult patients with active mild-to-moderate
- Active disease on mesalamine and no response to mesalamine dose adjustment (oral + topical) randomized to receive curcumin capsules (3g/day) or placebo
- Primary outcome: rates of clinical remission and response by clinical disease activity index (SCCAI) at week 4

Dietary Fiber: Helpful or Harmful?

- Efficacy of dietary fiber was first investigated over 30 years ago
  - Beneficial effects on GI tract function
  - Production of the fiber metabolites short chain fatty acids (butyrate in particular)
- Still today, most IBD patients are advised to reduce fiber consumption
- Systematic review of RCT’s by Wedlake and colleagues in 2014 showed no effect of supplementation of dietary fiber in 12 studies on CD, possible weak effect in UC in 3/10 studies
- Importantly, no evidence that fiber intake should be restricted!

Wedlake et al. Inflamm Bowel Dis 2014.
What do I tell my patients?

• Enteral nutritional therapy is an effective therapy for certain patients with CD

• Other general messages
  – Red meat in moderation
  – The typical “Western” diet is probably not good.
    • Emulsifiers, preservatives, long shelf life
  – Fiber may be beneficial (fruits, vegetables, whole grains)
  – Less restrictive exclusion diets may be future therapies
Conclusions

• In the future, diet might be used to treat active IBD, maintain remission, or even prevent disease
• ENT has consistently demonstrated effectiveness in CD and so interest has turned towards exclusion diets
• Patients often create, in essence, their own exclusion diets based on foods that exacerbate symptoms. This does not treat inflammation in contrast to ENT.
• We need to better understand the mechanism of ENT so that less restrictive diets can be designed
• The future is promising!