

Dietary Therapies in Pediatric Inflammatory Bowel Disease

An Evolving Inflammatory Bowel Disease Paradigm

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KEYWORDS

- Pediatrics • Inflammatory bowel disease • Ulcerative colitis • Crohn disease
- Enteral nutrition • Prebiotics • Dietary therapy

KEY POINTS

- Western diets, typically high in fat and sugar and low in fiber, have been associated with increased risk of developing inflammatory bowel disease (IBD).
- Exclusive enteral nutrition is the most robustly evaluated exclusion diet and has been shown to be effective for induction of clinical remission and mucosal healing.
- Whole foods exclusion diets, such as the specific carbohydrate diet, are promising dietary interventions for the treatment of pediatric IBD.
- Repeated nutritional assessments and targeted interventions are critical to promote adequate growth in children with IBD.

INTRODUCTION

Inflammatory bowel disease (IBD) is a heterogeneous group of immune-mediated chronic inflammatory diseases affecting the gastrointestinal tract. Ulcerative colitis (UC) and Crohn disease (CD) are the 2 primary phenotypes of IBD. UC is characterized by contiguous, circumferential, isolated colonic mucosal inflammation extending proximally from the rectum, whereas the stereotypical inflammation seen in CD is patchy, transmural, and may affect the gastrointestinal tract at any location.

Globally, the incidence of IBD has been rapidly increasing, supporting the hypothesis that environmental factors play a critical role in the pathogenesis of IBD.^{1,2} Evidence of the strong environmental impact on disease development is supported

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by the observation of discordant incidence of IBD in industrialized compared with nonindustrialized countries, as well as the rising incidence of IBD in countries as they undergo demographic and economic development.^{3,4} Similarly, children emigrating from countries of low IBD-prevalence to countries of high-IBD prevalence develop the same risk of developing IBD as their peers who have resided in high-IBD prevalence areas for many generations.⁵ Among the potential environmental factors associated with the development of IBD, diet and its modulation of the intestinal microbiome are important areas of ongoing research that, because they are modifiable, make attractive targets for novel therapies.⁶

The etiologic factors of IBD are incompletely understood but recent data support the hypotheses that IBD results from a complex interplay of genetics, immune dysregulation, and environmental triggers. Current theories postulate that, in genetically predisposed individuals, pathologic alterations in the intestinal microbiome trigger an aberrant mucosal immune response, leading to the development of chronic intestinal inflammation. Such perturbations in the gut microbiome, often referred to as dysbiosis, are an essential factor in driving inflammation in IBD rather than merely a consequence of the chronic inflammation.⁷ Abundant evidence supports the integral role the intestinal microbiome plays in the pathogenesis of IBD.^{8–26} However, it is important to be aware of association versus causation in the study of these relationships.

Although advances in bioinformatics, genomics, and experimental models of IBD have identified how environmental factors, such as dietary exposures, contribute to the development of IBD, many questions remain. This article reviews the data supporting diet as a potential contributing factor in the pathogenesis of IBD and explores current knowledge on diet as a primary and adjunctive therapy for pediatric IBD.

ROLE OF DIET IN PATHOGENESIS OF INFLAMMATORY BOWEL DISEASE

Diet and nutrition play a critical role at many time points along the complex course of pediatric IBD, ranging from influencing the risk of developing disease to induction and maintenance of remission. In both retrospective and prospective cohort studies, specific dietary factors have been shown to either protect against or serve as risk factors for the development of IBD.^{4,27–30} Although such studies inherently introduce some element of bias because they are based on dietary recalls, additional studies have supported these findings and proposed potential biological mechanisms.

Throughout different stages of life, diet seems to have a major influence on microbial composition and function, as well as influence the risk of developing IBD.³¹ Early-life dietary exposures may play an important role in development of the intestinal microbiome and influence the risk of IBD. Infant diet has been shown to affect the composition of the intestinal microbiome and there seems to be an associated risk-reduction in development of IBD among infants who were breastfed.^{32,33} A potential biological mechanism has been sought by evaluating the intestinal microbial alterations in breastfed versus formula-fed infants. Exclusively breastfed infants have been found to have increased numbers of Actinobacteria, whereas formula-fed infants have higher levels of γ -Proteobacteria.^{34,35} Interestingly, intestinal microbiota of breastfed infants are significantly less diverse than formula-fed infants; however, their microbial genes demonstrated a more robust interaction with the host immune system, metabolism, and biosynthesis.³⁶ The cessation of breastfeeding and associated reduction in passage of maternal immunoglobulin (Ig)-A induces changes in the microbiome characteristic of an adult microbiome, including increased prominence of *Firmicutes* and *Bacteroidetes*; however, peak microbial diversity and microbiome stability is often not reached until adulthood.^{37–39}

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