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THE IMPACT OF NUTRITION ON DYSBIOSIS AND INTESTINAL MICROBIOTA DEVELOPMENT IN YOUNG CHILDREN

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Annotation

This thesis explores how nutrition influences the development of intestinal dysbiosis in children, focusing on the early formation of gut microbiota. It reviews current evidence on the impact of feeding methods, dietary components, and nutritional interventions. Key topics include the benefits of breastfeeding, effects of formula feeding, timing of complementary food introduction, and dietary strategies for managing dysbiosis. The study emphasizes the importance of evidence-based nutrition to support healthy microbiome development and prevent related health issues in pediatric populations.

Keywords: pediatric dysbiosis, intestinal microbiota, childhood nutrition, gut microbiome development, probiotics, prebiotics, breastfeeding, complementary feeding

Today, the significance of intestinal microbiota in pediatric health has emerged as one of the most rapidly evolving fields in modern medicine, fundamentally reshaping our understanding of child development and disease prevention. The establishment of a healthy gut microbiome during early life represents a critical determinant of long-term health outcomes, influencing immune system maturation, metabolic programming, and neurodevelopmental processes. Dysbiosis, characterized by an imbalance in the composition and function of intestinal microbial communities, has been increasingly recognized as a contributing factor to various pediatric disorders, including allergic diseases, inflammatory bowel conditions, obesity, and neurodevelopmental disorders. The development of a



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child's intestinal microbiota is closely linked to nutrition, starting in the womb and especially during the first thousand days of life. Factors like birth method, early feeding, and diet transitions shape microbial diversity and function. Modern research shows that nutrition can effectively modulate the gut microbiota, helping prevent or treat dysbiosis in children. Advances in precision nutrition and microbiome analysis are enhancing our understanding of how specific nutrients impact gut health and host-microbe interactions during early development.

The development of healthy intestinal microbiota in children is strongly influenced by early nutrition, with breastfeeding considered the gold standard. Human breast milk provides bioactive compounds-such as oligosaccharides, immunoglobulins, lactoferrin, and lysozyme-that support beneficial bacteria like *Bifidobacterium* and *Lactobacillus*, while inhibiting pathogens. Exclusively breastfed infants show greater microbial diversity and a more stable microbiome than formula-fed infants, with long-lasting effects.

The introduction of complementary foods marks a key phase in microbiome development. Dietary diversity and the timing of food introduction, including early exposure to allergenic foods, support microbial balance and immune tolerance. Diets like the Mediterranean pattern, rich in fruits, vegetables, and whole grains, are linked to increased beneficial bacteria and reduced inflammation.

Key nutrients, such as dietary fibers (inulin, fructooligosaccharides), act as prebiotics that fuel beneficial microbes and support gut integrity. Probiotics with well-researched strains have been shown to prevent antibiotic-associated diarrhea, reduce necrotizing enterocolitis in preterm infants, and ease functional gastrointestinal symptoms. Conversely, ultra-processed foods, excessive sugars, and artificial sweeteners negatively impact the microbiome, promoting harmful bacteria and inflammation. Antibiotic use, though sometimes necessary, is another major factor contributing to long-term dysbiosis. Emerging therapies for pediatric dysbiosis include personalized probiotic and prebiotic strategies, diet modifications, and in some cases, experimental approaches like fecal microbiota transplantation-particularly for recurrent *Clostridioides difficile* infections.

In conclusion, the connection between nutrition and microbiota development in children is a key element of pediatric health, demanding close attention in both



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clinical practice and public health. Early nutrition-especially breastfeeding, complementary feeding, and overall dietary quality-has a lasting impact on microbiome formation and long-term outcomes. Clinicians should emphasize diets rich in prebiotic fibers and fermented foods while reducing ultra-processed food and unnecessary antibiotic use. Future research should develop personalized nutrition strategies based on individual microbiome profiles and create standardized protocols for dysbiosis prevention and treatment. Integrating microbiome science into routine pediatric care holds great promise for improving child health and preventing chronic disease through targeted nutritional interventions.

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