Probiotics in Newborns and Children

Mary W. Lenfestey, MD[a], Josef Neu, MD[b,*]

KEYWORDS

• Probiotics • Children • Microbiota • Intestine

KEY POINTS

- The relationship between the gastrointestinal tract and the gut flora has been implicated in several different disease pathologies.
- Probiotics are microbe-containing supplements used to alter the gut flora, and there are claims that these can be used to alter the disease course for many different pathologies.
- Data to support or refute the efficacy of probiotic therapy are quite variable and depend on the underlying disease as well as the strain of probiotic used.
- This review serves to evaluate the relationship of probiotic therapy to several common pediatric ailments: necrotizing enterocolitis, inflammatory bowel disease, irritable bowel disease, diarrhea, constipation, and autism.

INTRODUCTION

Interest in probiotics among the public as well as medical professionals has markedly increased over the past 3 decades. The probiotic industry is large and is often highly motivated to aggressively market these agents. Numerous studies of varying quality are available to support the use of probiotics in children. However, significant confusion exists as to which circumstances probiotics may be most efficacious and safe. This review provides some of the relevant literature pertaining to the use of probiotics in children and a better evidence basis for clinical practice guidelines. While reading this review, it is important to understand that there are numerous probiotics with strain-specific effects. Because of this, it is critical that one does not extrapolate benefits or harms caused by one agent to others.

Disclosure statement: none (M.W. Lenfestey). Medela, research grant and scientific advisory board; Infant Bacterial Therapeutics, research grant and scientific advisory board; Nutricia, scientific advisory board (J. Neu).

[a] Division of Pediatric Gastroenterology, University of Florida, PO Box 100296, Gainesville, FL 32610, USA; [b] Department of Pediatrics, University of Florida, 6516 Southwest 93rd Avenue, Gainesville, FL 32608, USA

* Corresponding author.

E-mail address: neuj@peds.ufl.edu

Pediatr Clin N Am 64 (2017) 1271–1289

http://dx.doi.org/10.1016/j.pcl.2017.08.006

pediatric.theclinics.com

DEFINITION OF PROBIOTIC

The international Scientific Association for Probiotics and Prebiotics define probiotics as "live microorganisms that, when administered in adequate amounts, confer health benefits on the host."[1] Of critical importance is that probiotic products can be regulated differently. Regulated as a dietary supplement or food ingredient, they are generally intended for the healthy population. Examples of health claims would include benefits to general well-being or enhancement of natural resistance. It is common to see advertisements in the popular media that suggest such benefits. On the other hand, when the probiotic product is restricted to a population of patients whereby there is a medical claim, such as for the prevention of necrotizing enterocolitis (NEC), treatment of diarrhea, or prevention of preterm delivery, then it should be treated as a drug. When a probiotic product marketed as a drug, it must meet much more rigorous requirements. These requirements are often similar to those required by the pharmaceutical industry for development and assurance of purity of the product and supported by well-designed studies of safety and efficacy. Categories of health and medical claim legislations for these agents differ depending on the country[1] (**Table 1**).

MECHANISMS OF ACTION

Numerous mechanisms of action for probiotics are proposed. However, these should not be confused with the action of normal microbiota that is found in various niches of the body, such as the gastrointestinal tract. The commensal microbiota offer a well-tuned ecosystem during the healthy state that may be perturbed by diet, antibiotics, stress, and numerous other environmental factors. When these environmental factors are not overwhelming, the commensal microbiota exhibit plasticity and after a short period of adjustment generally return to the normal state.

Probiotic bacterial mechanisms of action include short chain fatty acid production, competitive exclusion of pathogens, colonization resistance, bile salt metabolism, enzyme activity, and immunologic effects.[2] It is beyond the scope of this review to discuss these mechanisms in detail. Rather, the authors provide evidence for the effects of individual probiotics that may play a role in health and disease in neonates, infants, and children.

PROBIOTICS AND NEONATAL NECROTIZING ENTEROCOLITIS

NEC is a devastating disease seen primarily in preterm infants that is extremely difficult to treat.[3] Because of the severity of this disease and its insidious onset, and because

Table 1
Definitions of agents

Probiotic	A supplement or food containing a sufficient number of viable microorganisms to alter microflora and has the potential for health benefit
Prebiotic	A nondigestible food ingredient that selectively stimulates favorable growth and/or activity of 1 or more indigenous probiotic bacteria
Synbiotic	A product containing both probiotics and prebiotics; synergy of a specific probiotic for a probiotic in the product not essential; may be separate supplements or added to food
Postbiotic	A metabolic byproduct generated by a probiotic microorganism that influences biological functions
Functional food	Any modified food that provides a health benefit beyond that ascribed to any specific nutrients it contains