

## Pre and Probiotics In Paediatrics

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### Abstract:

Microbes are all around us and play a significant role in both our overall health and the health of the planet. The interest in adding probiotics and prebiotics to nutritional goods has developed as a result of efforts to improve the internal microbial environment. Probiotic and prebiotic use and effectiveness should be supported by evidence-based medicine, just like with antibiotics. This clinical report's goal is to evaluate the medical applications of probiotics and prebiotics and to provide a summary of what is currently known regarding the health advantages of including them as dietary supplements in foods marketed to children, such as infant formula. The guidance in this report will help paediatric health care providers to make appropriate decisions regarding the usefulness and benefit of probiotics and prebiotics for their patients.

**Key Words:** Probiotics, Prebiotics, Synbiotic, Postbiotic, Functional food

### Introduction:

**Probiotic:** An oral supplement or a food product that contains a sufficient number of viable microorganisms to alter the microflora of the host and has the potential for beneficial health effects.[1-3]

**Prebiotic:** A non-digestible food ingredient that benefits the host by selectively stimulating the favorable growth and/or activity of 1 or more indigenous probiotic bacteria.[1-4]

**Synbiotic:** A product that contains both probiotics and prebiotics. Evidence or synergy of a specific prebiotic for a probiotic in the product is not essential. Synbiotics may be separate supplements or may exist in functional foods as food additives.[1-3]

**Postbiotic:** A metabolic byproduct generated by a probiotic microorganism that influences the host's biological functions.[5,6]

**Functional food:** Any modified food or food ingredient that provides a health benefit beyond that ascribed to any specific nutrient/nutrients it contains. It must remain a food, and it must demonstrate its effect in amounts normally expected to be consumed in the diet. Benefits may include functions relevant ant to improving health and well- being and/or

reduction of risk of dis- ease. Any food that contains probiotics or prebiotics is a functional food. An example of a functional food is live- culture yogurt that contains probiotic bacteria, prebiotics, and other dietary nutrients. Human milk may also be considered a functional food; it contains substantial amounts of oligosaccharides (prebiotics) and may contain some naturally occurring probiotic bacteria (103 of bifidobacteria per mL of expressed human milk, as reported in 1 study).[7]

### Probiotics:

Probiotic microorganisms are typically members of the genera Lactobacillus, Bifidobacterium, and Streptococcus.[1-3,8-14] These microorganisms, which are typically non-motile and come in a variety of morphologies, are fermentive, obligatory, or facultative anaerobic organisms. Lactic acid is frequently produced by them. They are able to dominate and outcompete potential harmful microorganisms in the human digestive tract due to their innate biological characteristics. It is now believed that these microbes produce minute molecular metabolic byproducts, including short-chain fatty acids like butyrate, that have a favorable regulatory effect on host biological processes.

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These metabolic byproducts—sometimes referred to as "postbiotics"—might have biological effects as immune modulators.[5,6,15] The probiotic bacteria *Lactobacillus rhamnosus* GG (LGG), *Bifidobacterium lactis*, and *Streptococcus thermophilus* got the most research to date. The Gram-negative, motile, non-lactic-acid generating bacteria like *Klebsiella*, *Pseudomonas*, *Serratia*, and *Proteus* species, which may also be a significant component of the flora in the human digestive tract, are biologically distinct from these probiotic bacteria. These potentially dangerous microorganisms may breach the gut epithelium and cause sickness in people.[16,17] Some yeasts and yeast byproducts, including the yeast *Saccharomyces boulardii*, have also been researched and widely utilized as probiotic agents. Separate probiotic bacteria can be administered and consumed as medicines or supplements. Additionally, they may be combined into, added to, or already be present in functional foods.

#### **Prebiotics:**

Prebiotics often take the form of oligosaccharides, which can be naturally occurring or added to food, beverages, and infant formula as dietary supplements.[4] Although indigestible to humans, their presence non the digestive system specifically promotes the growth of specific probiotic bacteria, particularly *Bifidobacteria* species, in the colon. Prebiotic oligo-saccharides typically include 10 or fewer sugar molecules and frequently have fructose chains with a terminal glucose. Fructo-oligosaccharides (FOSs), inulin, galacto-oligosaccharides (GOSs), and soybean oligosaccharides are a few types of prebiotic oligosaccharides. A composite oligosaccharide called inulin contains a number of FOS molecules. Dietary fiber is made up of complex polysaccharides that are also referred to as prebiotics.

Although dietary nucleotides don't exactly fulfill the definition of a prebiotic, they are prebiotic-like substances with direct and indirect effects on intestinal biology.[18] Some newborn formulas have

a small (7–20 mg/dL) addition of free nucleotides.[18] Contrarily, human milk contains a sizeable but variable amount of free nucleotides (up to 20% of nonprotein nitrogen) and oligosaccharides (14 g/L).[19] Currently, several producers of baby formula include prebiotic oligosaccharides to their products. Beverages and nutritional supplements marketed for older infants, children, and adults contain oligosacchrides and nucleotide additives in varying amounts.

#### **Use Of Probiotics and Prebiotics In Prevention And Treatment of Clinical Diseases:**

The references contain reviews of probiotic and prebiotic therapeutic uses.[4,8-14] Below are some findings from evidence-based evaluations of the clinical efficacy of probiotics and prebiotics. It is important to note that the absence of efficacy evidence at the moment does not rule out the possibility of significant health advantages for probiotics and prebiotics being discovered in the course of future clinical research.

#### **Acute Infectious Diarrhoea:**

According to published randomized controlled trials' (RCTs) findings, administering probiotics to healthy adults and children can help reduce acute gastrointestinal tract infections.[20-23] The majority of the investigations were carried out in daycare facilities. Probiotics such as LGG, *S thermophilus*, *Lactobacillus casei*, *B lactis*, or *Lactobacillus Reuteri* were either administered orally or blended with milk or newborn formula. In the RCTs, rotavirus was the most typical culprit behind acute diarrhoea.

Good results on the therapeutic efficacy of probiotics in children with acute infectious diarrhoea have been provided by well-conducted RCTs in healthy children in developed nations. Szymanski *et al*. [24] randomized, double-blind, placebo-controlled experiment found that the administration of LGG considerably reduced the average length of acute rotavirus diarrhoea by 40 hours, but had no effect on the duration of diarrhoea from other causes.

Additionally, intravenous rehydration required less time after probiotic administration—on average, 18 hours less time. Results of several meta-analyses[25-27] as well as a Cochrane review[28] on the effectiveness of probiotics for treating acute infectious diarrhoea in children have been published. These reports show that probiotics shorten diarrhoea by around a day and lower the number of diarrhoeal stools. Benefits depend on the level of strain. The LGG probiotic is the most effective one that has been documented to date and is dose-dependent at dosages more than 1010 CFU.

Probiotics also seem to be more effective when given early in the course of diarrhoea and are most helpful for otherwise healthy infants and young children with watery diarrhoea secondary to viral gastroenteritis but not invasive bacterial infections. Thus, there is evidence to support the use of probiotics, specifically LGG, early in the course of acute infectious diarrhoea to reduce the duration by 1 day.

#### **Allergy:**

People who are allergic have a distinct microbiome than those who are not. The "microbiota hypothesis" attributes changes in the gut microbiota to the rise in allergy rates that have been seen in highly developed nations over the past few decades.[29] While on an exclusion diet, Diaz et al. demonstrated that newborns with non-IgE mediated allergy have a distinct microbiota from healthy infants.[30] Additionally, the microbiota has a variable composition depending on the protein source (casein or whey hydrolysate, or a formula of vegetable origin).[30] It is necessary to look at the therapeutic applicability of these findings in more detail. Children who have persistent immunological problems like asthma may benefit from receiving *Lactobacillus* (L.).[31]

Lower asthma severity and improved scores on the Childhood Asthma Control Test were found in a prospective, double-blind, randomized Chinese trial with four groups (L. paracasei, L. fermentum, their combination, and placebo).[31] The group given both probiotics showed the greatest improvement, as evidenced by elevated peak expiratory flow rates and

lowered IgE concentrations. Thus, *Lactobacillus* treatment, at least for the strains that have been investigated, may help asthmatic children improve clinically.[31] According to a meta-analysis, L. rhamnosus GG had no effect on the severity of atopic dermatitis.[32]

#### **Infantile colic:**

Infantile colic is a frequent illness that affects 20% of all infants and has an unknown pathophysiology. It frustrates and worries parents, who subsequently look for appropriate treatment.[33] Infantile colic's pathophysiologic causes are thought to include dysbiosis and chronic inflammation.[34] According to a study from Ukraine, the combination of L. rhamnosus 19070-2 and L. reuteri plus a tiny amount of fructo-oligosaccharide (FOS), a prebiotic, significantly reduced the amount of time babies spent crying in comparison to the placebo group's natural development.[34] These findings support earlier research[35] that found *Lactobacilli* reduce infantile colic in exclusively breastfed infants, mostly utilizing L. reuteri alone.

A probiotic mixture was also shown to reduce crying time in exclusively breastfed infants compared to placebo, although no differences between the groups were found regarding anthropometric data, bowel movements, stool consistency or microbiota composition.[36] Unfortunately, data on the outcome of probiotic administration in formula fed infants presenting with infantile colic are still missing. L. Reuteri DSM 17938 may be considered for the management of breastfed colic infants, while data on other probiotic strains, probiotic mixtures or synbiotics are limited in infantile colic.[37]

#### **Preterm infants:**

Since probiotics are thought to improve feeding tolerance and lower the prevalence of serious illnesses such as necrotizing enterocolitis (NEC) and late-onset sepsis, they are increasingly used for extremely low birth weight infants.[38] Only preterm infants that were exclusively breastfed with human milk were confirmed to benefit from probiotics in terms of feeding type.[39]

The ESPGHAN working committee on pre- and probiotics reviewed 51 randomized controlled studies including 11,231 preterm infants.[40] Only 3 of 25 studied probiotic treatment combinations showed a significant reduction in mortality rates [40]. Seven treatments reduced NEC incidence, two reduced late-onset sepsis, and three reduced time until full enteral feeding.[40] Among human milk fed infants, only probiotic mixtures, and not single-strain products, were effective in reducing late onset sepsis.[39] Humanmilk oligosaccharides (HMO) have a strong prebiotic effect, and stimulate the development of a bifidogenic microbiome in breastfed infants.

Through the interaction of gut epithelial cells or indirectly through the modification of the gut microbiota, including the stimulation of the bifidobacteria, HMOs may enhance the development of immune function and offer protection against infectious illnesses.[41,42] According to the scant clinical evidence, adding HMOs to newborn formula appears to be safe and well accepted, causing normal growth and pointing toward potential health advantages.[41] Preterm infants' immature guts make them more sensitive to NEC, have trouble tolerating enteral nutrition, and have bacterial colonization.[43] This is especially true when breast milk is insufficient.

#### Conclusion:

This special issue presents and discusses various pro- and prebiotics in paediatric issues. The overall finding implies that while there is physiologic and patho-physiological support for the influence of a balanced microbiota on various aspects of baby and child health, clinical outcomes are frequently incongruent. Future studies and trials must produce pertinent results that are widely agreed upon. Reporting the precise probiotic strains should be required. Utilizing commercial items is recommended for studies. Therefore, more investigation is still required into the effects of probiotic and prebiotic modulation of the gut microbiota in children.

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