

OBJECTIVES

It is generally accepted that the fetal human gastrointestinal tract is sterile and that the establishment of the gut microbiota is immediately initiated at birth and characterized by a dynamic succession of bacterial populations. The composition and activity of the gut microbiota co-develop with the host, and are subjected to a complex interplay that depends on the hosts' genetics, nutrition, and life-style (1). Gut microbiota provides protection against infection, ensures tolerance to foods, and contributes to nutrient digestion and energy harvest.

Bacterial gastroenteritis and the use of antibiotic therapy may be characterized by an altered composition of gut microbiota, suggesting that microbial dysbiosis associated with early antibiotic exposure in neonates may be a predisposing factor to inflammatory bowel disease, including other disease conditions, such as wheezing and asthma. Acute gastroenteritis is considered one of the leading causes of illness and death in children under the age of 5 years, and is characterized by acute onset of diarrhea, which may or may not be accompanied by nausea, emesis, fever, abdominal pain and dehydration. Acute gastroenteritis is prevalent worldwide and associated with high rates of morbidity and mortality in developing countries (2).

Despite the well-accepted role of oral rehydration solution as the first-line therapy in children with mild to moderate dehydration secondary to gastroenteritis, there remains a desire to identify interventions that further reduce the burden of disease. Probiotics, which are viable nonpathogenic microorganisms that modify the metabolic activities of the intestinal microflora to confer a health benefit to the host, represent a potential treatment option.

Their administration to children with acute gastroenteritis along with rehydration therapy can reduce the duration and severity of diarrhea (3).

Probiotics have been extensively studied over the past several years in the prevention and, to a larger extent, in the treatment of diarrheal diseases, especially in pediatric populations; therefore probiotic administration during the

neonatal period can improve gut function by enhancing the intestinal immune status and maintaining microbial balance during gastrointestinal disturbances (3).

The aim of the study was to assess the composition of the microbiota of infants with gastroenteritis, after treatment with antibiotics and probiotics.

METHODS

Selection of Subjects and Sample Collection. From January 2013 to March 2014, 1241 infants were assessed for eligibility. 1192 infants were excluded because they did not fit the inclusion criteria (n=1170), parents refused to participate (n=12) or the amount of fecal sample was not sufficient (n=10) (Fig. 1). Forty-nine children, aged 0-12 months, were enrolled at Regina Margherita Children Hospital, Turin and divided into 3 groups: 15 healthy children (1st group), 17 with bacterial gastroenteritis and antibiotic therapy (2nd group), and 17 with bacterial gastroenteritis and antibiotic therapy plus probiotics (3rd group). Children's parents gave their written informed consent. Fecal samples were collected and transported to the Microbiological Laboratory of the Public Health and Pediatrics Dept. for analysis.

Microbiological Analysis. Fecal samples were immediately diluted and cultured on selective media to detect total bacteria, *Enterobacteriaceae*, enterococci, lactobacilli and bifidobacteria.

Total aerobic counts on Brain Heart Infusion Agar (Biolife) were performed; Azide Maltose Agar and MacConkey Agar to detect enterococci and *Enterobacteriaceae* were used. All plates were incubated at 37 ° C for 24 h. Schaedler CNA Agar +5% Sheep Blood (Becton Dickinson) and Schaedler Kanamycin-Vancomycin Agar +5% Sheep Blood were used for total anaerobic counts. Lactobacilli and bifidobacteria were obtained on Rogosa Bios Agar under microaerophilic and anaerobic conditions, respectively. All plates were incubated at 37° C for 3-7 days. All counts were recorded as CFU/g. The qualitative analysis was performed by API System.

Statistical Analysis. Differences between groups were evaluated by Student's t test and Yates' chi-squared test and considered to be significant when p ≤ 0.05.

RESULTS

We find that the three groups showed differences in gut microbial strains and richness. The microbiota in children treated with antibiotics was characterized by a decrease in lactobacilli and bifidobacteria compared to healthy subjects. Conversely, children with bacterial gastroenteritis showed higher levels of bifidobacteria, and lactobacilli but lower of enterococci after treatment with probiotics, similar to healthy children. The fecal counts of *Enterobacteriaceae* were found to be significantly lower in the treated groups compared with the control group (Fig 2).

The investigation revealed that enterococci did not significantly increase in children with bacterial gastroenteritis treated with antibiotics with or without probiotics, compared to healthy subjects.

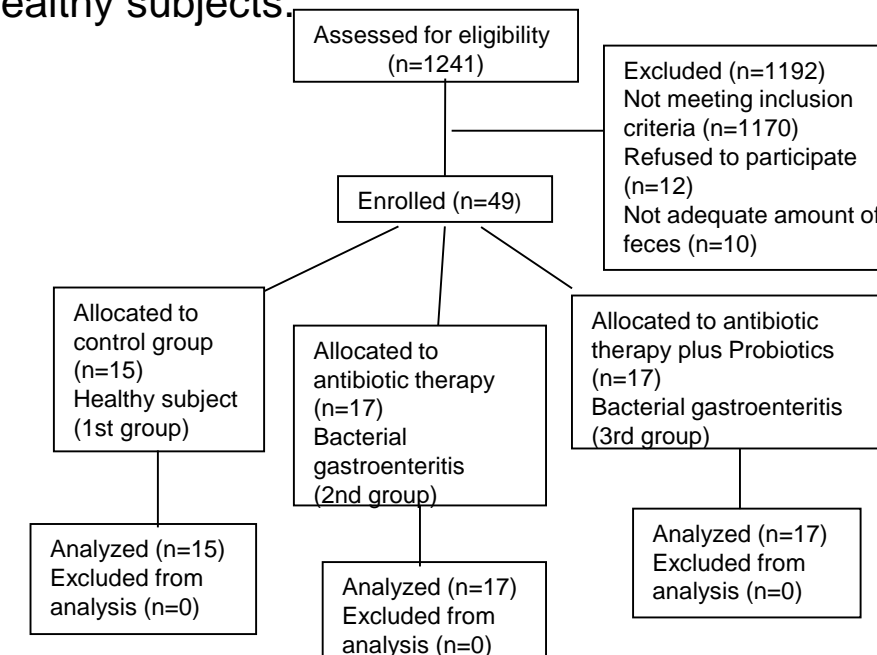


Fig 1. Diagram showing the flow of participants through each stage of the study.

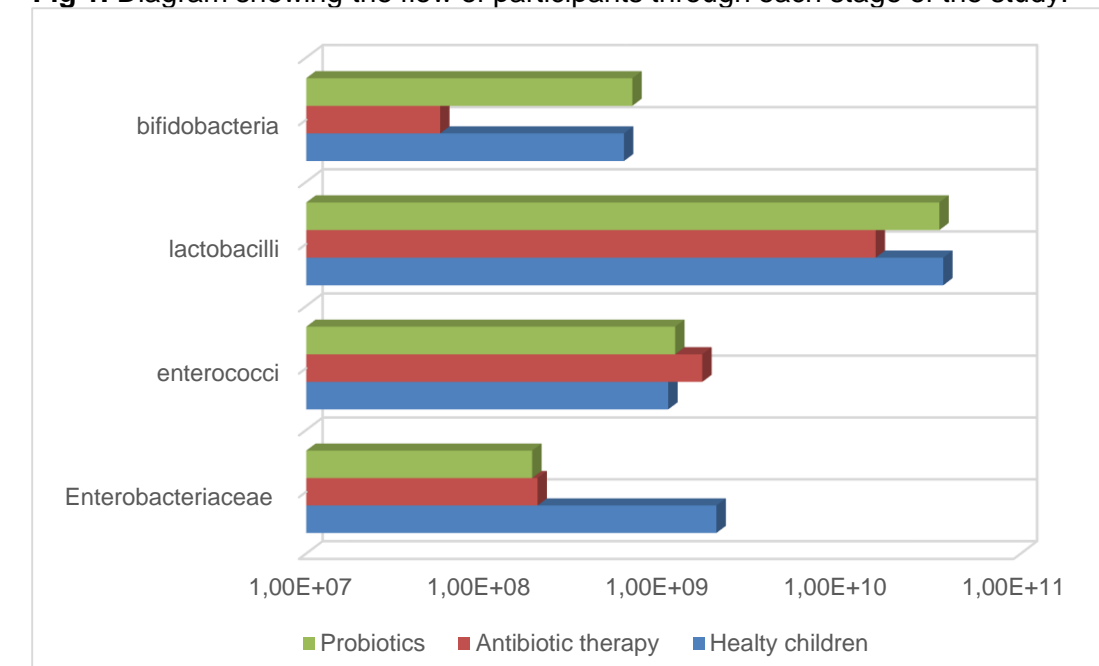


Fig 2. Bacterial load (CFU/g) in children (0-12 months) with gastroenteritis, after treatment with antibiotics and antibiotic therapy plus probiotics compared to healthy children.

CONCLUSIONS

These no significant differences in microbiota composition between healthy children and those treated with probiotics suggest that probiotic administration in early infancy appear to be a useful adjunct to antibiotic therapy in treating gastrointestinal disease in children. Our findings enhanced our understanding of the effects of probiotics on gut health in pediatric subjects.

REFERENCES

- Chassard C, de Wouters T, Lacroix C. Probiotics tailored to the infant: a window of opportunity. *Curr Opin Biotechnol.* 2014;26:141-7.
- Laham NA, Elyazji M, Al-Haddad R, Ridwan F. Prevalence of enteric pathogen-associated community gastroenteritis among kindergarten children in Gaza. *J Biomed Res.* 2015;29:61-8.
- Freedman SB, Sherman PM, Willan A, Johnson D, Gouin S, Schuh S, on behalf of Pediatric Emergency Research Canada (PERC). Emergency Department Treatment of Children With Diarrhea Who Attend Day Care: A Randomized Multidose Trial of a *Lactobacillus helveticus* and *Lactobacillus rhamnosus* Combination Probiotic. *Clin Pediatr (Phila).* 2015 Feb 10. pii: 0009922815569200