

BIFIDOGENIC EFFECT OF A FOLLOW-ON FORMULA SUPPLEMENTED WITH PREBIOTICS

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Background:

Human breast milk is considered the gold standard nutrition for babies. Mother's milk provides all the nutritive elements for normal growth and for baby's digestive conditions. Although human milk is the first choice for the newborn, milk substitutes play an indispensable role in baby's nutrition when breastfeeding is not possible, desirable or sufficient. Infant and follow-on milk formulas have been designed to provide babies with the required nutrients for optimal growth and development. At birth, many bacterial species gain access into the intestinal tract, but bifidobacteria gradually become established as the main bacteria, and predominate in the intestinal microflora of breast-fed babies. The bifidogenic effect is a stimulation of the growth and metabolism of bifidogenic bacteria in the gut.

Aim:

The aim of this study was to determine the bifidogenic effect of a follow-on formula supplemented with inulin and fructooligosaccharides (FOS), and compare it to that of human breast milk.

Material and methods:

Healthy, vaginally, term born babies 6-12 months old, were enrolled in 28-day study. Babies were divided in two groups according to the type of feeding: those receiving supplemented follow-on formula with inulin and FOS (FF group) and those receiving breast milk (BMF, control group). The follow-on formula group received an experimental full-term formula designed for babies 6 to 12 months old, and supplemented with inulin and FOS (4.0 g/L). Fecal samples were obtained before (D0) and during study at days 14 and 28 (D14, D28), and used to determine the counts of *Bifidobacterium sp.* and *Lactobacillus sp.*, and biochemical parameters (pH and total organic acids). Every day during the study, the weight and length of the babies, number of feeds, tolerance to offered meal (follow-on formula or breast milk), and stool frequency and consistency were recorded.

Results:

Before (day 0) and after 14 days of formula administration, the number of bifidobacteria and lactobacilli did not differ among the groups. At the end of the 28-day period, an intake of 4.0 g/L of inulin and FOS caused a significant increase ($p < 0.05$) of *Bifidobacteria sp.* and *Lactobacillus sp.* in formula fed versus breast milk fed group. The bacterial counts are expressed as means $\pm 10^8$ CFU/g feces (Table 1). There was a statistically significant difference between the groups in total bacterially generated organic acids ($p < 0.05$) and no difference in stool pH during the study (Table 2). All babies exhibited normal growth during the study, within the normal framework for that period of life (age between 6-12 months). The intake of bottle formula with added inulin and FOS at 4.0 g/L was well tolerated by the infants. Stool frequency and consistency, and side effects did not differ among the two feeding groups during the study.

Conclusion:

This study showed that compared to breast milk, inulin and FOS supplemented follow-on formula stimulates bifidogenic effect in the baby's intestine during weaning period. It is concluded that inulin and FOS consumption in follow-on formula-fed infants after weaning positively affected the microbial composition of feces. We can conclude that tested follow-on formula with prebiotics has similar effect on the baby's intestine as human breast milk.

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Table 1.
LEVELS OF BABY'S GUT COLONIZATION WITH *BIFIDOBACTERIUM SP.*
AND *LACTOBACILLUS SP.* IN THE FF AND BMF GROUPS DURING THE STUDY

Type of feeding	CFUx 10 ⁸ /g of feces in the following group		p [*]	F1 ^{**}	F1group ^{**}
	Follow-on formula with added inulin and FOS (FF)	Breastfeeding (BMF)			
<i>Bifidobacterium</i>				0.012	0.022
D0	9.86 \pm 10.23	9.04 \pm 11.97	0.871		
D14	18.68 \pm 19.43	20.81 \pm 46.75	0.896		
D28	33.57 \pm 20.64	9.91 \pm 10.48	0.005		
<i>Lactobacillus</i>				0.003	0.022
D0	12.21 \pm 12.40	14.95 \pm 21.05	0.727		
D14	18.03 \pm 21.35	16.60 \pm 18.14	0.874		
D28	60.24 \pm 30.23	16.79 \pm 12.70	0.001		

*The p value represents the significance level of the difference in the change between the groups during the study, determined by the independent-sample t-test. ** F1 and F1 group - given as the internal group factor (within subject factors - F1) and as the factor of differences between the groups (between subject factors - F1 group).



Table 2.
BIOCHEMICAL DATA IN STOOLS FROM THE GROUPS
OF THE BABIES ENROLLED IN THE STUDY (GIVEN AS MEAN \pm SD)

Type of feeding	Follow-on formula with added inulin and FOS (FF)	Breastfeeding (BMF)	p [*]	F1 ^{**}	F1group ^{**}
pH				0.218	0.171
D0	7.63 \pm 0.38	6.98 \pm 1.08	0.090		
D14	7.32 \pm 0.45	6.93 \pm 0.84	0.217		
D28	6.99 \pm 0.78	6.98 \pm 0.94	0.961		
TOA				0.045	0.021
D0	0.0032 \pm 0.0022	0.0134 \pm 0.0022	0.066		
D14	0.0103 \pm 0.0121	0.0159 \pm 0.0152	0.314		
D28	0.0227 \pm 0.0184	0.0147 \pm 0.0137	0.281		

*The p value represents the significance level of the difference in the change between the groups during the study, determined by the independent-sample t-test. ** F1 and F1 group - given as the internal group factor (within subject factors - F1) and as the factor of differences between the groups (between subject factors - F1 group).
TOA- Total organic acids, calculated as lactic acid (g/100ml)