

Acidified infant formula explained

Labuschagne IL, BSc Dietetics, Principal Dietitian
van Niekerk E, M Dietetics, Lecturer; Lombard MJ, PhD, NICUS Manager, Registered Dietitian
Nutrition Information Centre, Stellenbosch University

Correspondence to: Martani Lombard, e-mail: nicus@sun.ac.za

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Abstract

The development of effective methods to prevent acute gastroenteritis is an important goal for infant health. Exclusive breastfeeding and postponement of complementary foods until the age of six months is recommended for healthy infants. However, at times, infant formula is required. Various types are commercially available. Acidified cow's milk formula has been found to prevent the growth of pathogenic bacteria and concurring diarrhoeal disease.

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Introduction

Diarrhoea remains one of the leading causes of mortality in infants in developing countries. Two major contributing factors of infant diarrhoea are poor hygienic conditions and contamination of infant food with bacterial pathogens (*Escherichia coli* and *Salmonella*) viruses (rotaviruses) and parasites (*Cryptosporidium*).¹ Breast milk remains the best source of nourishment for infants, and all mothers should be encouraged to breastfeed.^{2,3} Breastfeeding reduces exposure to these pathogens and also supplies the infant with protective antibodies against food-borne pathogens, resulting in a decreased incidence of diarrhoea in breastfed children.¹ The development of effective methods to prevent acute gastroenteritis in infants remains a central objective for infant health. Breastfeeding is associated with a decreased incidence of gastrointestinal infection, possibly because it promotes the growth of bifidobacteria in the intestinal tract, whereby the creation of an acidic environment is inhospitable to infectious organisms.⁴ Despite the numerous benefits of breastfeeding, it is not always an option or possible, as many women are unable to, or choose not to, breastfeed.^{5,6} A wide range of infant formula is commercially available, including acidified infant formula. Research indicates that intestinal infection is reduced in infants who receive biologically acidified infant formula.^{7,8}

Acidification of infant formula

Acidification of infant formula is acquired by one of two methods. The formula can either be chemically acidified through the addition of L-(+)lactic acid, or biologically acidified through fermentation, which transforms lactose into lactic acid. Chemically acidified formula appears

to provide the same protection as that that is acidified through fermentation. In addition, attempts to modulate the microbiota toward increasing bifidobacteria counts have been achieved by the addition of living bifidobacteria (probiotics) or bifidogenic factors (prebiotics) to infant formula. Probiotics have been shown to be effective in the prevention and treatment of diarrhoea in infants.⁹ Figure 1 distinguishes between the different methods of acidification of infant formula.

Fermented milk products may induce a variety of gastrointestinal, immunological and other effects in the recipient organism. The European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) Committee on Nutrition defines fermented formula as infant and follow-on formula that has been fermented with lactic acid-producing bacteria during the production process, but does not contain significant amounts of viable bacteria in the final product because of inactivation of the fermenting bacteria by heat or other means. This may include homogenisation, pasteurisation, sterilisation and/or spray-drying. The Commission of the European Communities directive on infant formula and follow-on formula permits the addition of live bacteria to infant and/or follow-on formula for the purpose of acidifying the formula. Fermented infant formula without live bacteria is usually not considered to be a probiotic product, based on the widely accepted definition of probiotics as "live microbial food ingredients that are beneficial to health".¹⁰

However, the scientific basis of this definition has been questioned because some probiotic effects were reported to be achievable by nonviable bacteria, and even by isolated bacterial DNA. Therefore, fermented formula without live

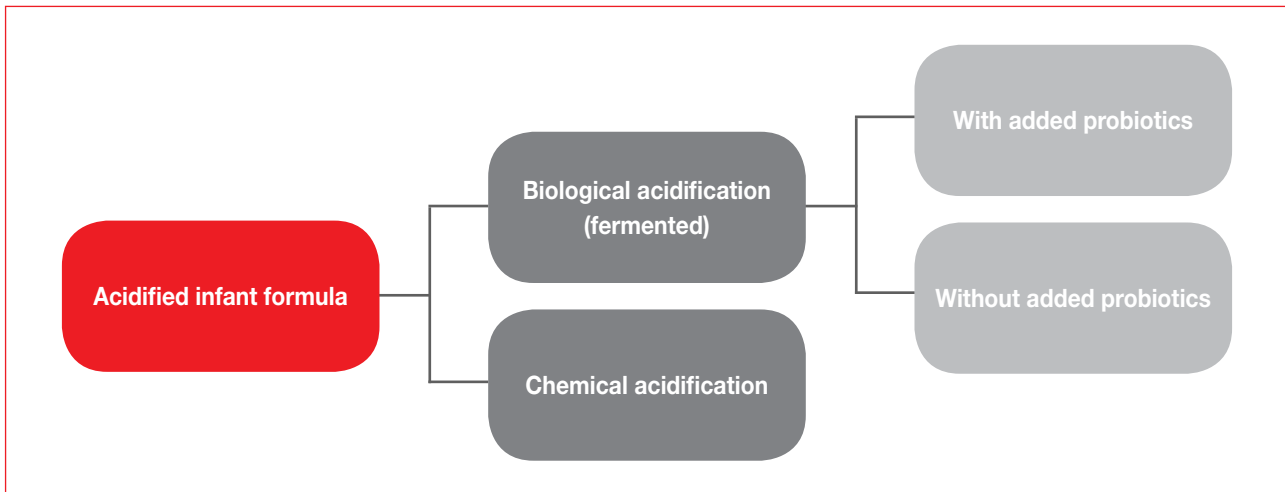


Figure 1: Acidification of infant formula

bacteria may be considered to have probiotic effects if the bacterial components or bacterial metabolites in these products have been revealed to have beneficial effects on infant health.¹⁰

Acidified cow's milk formula is acidified infant formula that inhibits the growth of harmful bacteria in the prepared feed. Therefore, acidified milk provides some advantage over non-acidified formula in children with mild digestive problems (or in situation in which there are less than ideal hygienic circumstances) through the prevention of rapid microbial proliferation achieved by acidification.^{11,12}

Furthermore, attempts to modulate the microbiota in formula-fed infants towards increased bifidobacteria counts have been achieved by adding living bifidobacteria.⁹

The ESPGHAN Committee on Nutrition systematically reviews published data on the effects of fermented infant formula without live bacteria. The conclusion was that the available data are limited and do not allow firm conclusions to be drawn on the efficacy of fermented infant formula in combatting the severity of infectious diarrhoea in infants. The committee recommends that the effects of fermented infant formula on infectious diarrhoea and other relevant outcomes should be assessed in further randomised controlled trials in accordance with current scientific standards.¹⁰

Acidified formula with added probiotic agents

Exclusively breastfed infants have higher numbers of bifidobacteria and lower numbers of *E. coli* bacteria, while formula-fed infants harbour equal amounts of these different types of intestinal flora.¹³⁻¹⁶ The results of published randomised controlled trials have indicated that there is modest benefit to be gained from giving probiotics to prevent acute gastrointestinal tract infections in healthy infants and children. Rotavirus was the most common cause

of acute diarrhoea in randomised controlled trials.¹⁷ The strains of probiotics used included *Lactobacillus rhamnosus* GG, *Streptococcus thermophilus*, *L. casei*, *Bifidobacterium lactis* or *L. reuteri*. These may be mixed with milk or infant formula, or given as an oral supplement.

Chouraqui et al conducted a multicentre, double-blind, controlled study to evaluate the efficacy of a milk formula supplemented with viable *B. lactis* strain BB-12 in the prevention of acute diarrhoea in infants younger than eight months living in residential nurseries or foster care centres. They found that the prophylactic use of an acidified formula with low casein and phosphate, a high lactose content and living *B. lactis* BB-12 had a protective impact on acute gastroenteritis and nosocomial infections in these infants. The supplemented formula was biologically acidified by fermentation using a mixture of L-(+) lactic-acid-producing bacteria, i.e. *S. thermophilus* and *L. helveticus*.⁶ Velaphi et al further reported that infants receiving acidified formula had similar growth patterns to those in infants fed a standard whey formula, irrespective of the method of acidification. However, the addition of *B. lactis* to acidified formula resulted in greater weight gain, compared to that with standard formula.⁹

Available formula in South Africa

Nestlé Nan Pelargon and Aspen Melegi is chemically acidified formula which is commercially available in South Africa. Nan Pelargon has a whey to casein ratio of 50:50 and is intended from birth onwards. Aspen Melegi 1 is a starter formula with a whey to casein protein ratio of 60:40, indicated for newborn babies who are not being breastfed. Melegi 2 is indicated for babies from 6-12 months as a follow-up formula and is formulated to complement the infant's weaning diet from six months, while Melegi 3 is a milk-based, growing-up nutritional supplement for 1- to 3-year-old active toddlers and children who need extra energy.¹²

Conclusion

Acidified infant formula shows the potential to inhibit the growth of harmful bacteria in the prepared feed. Breastfeeding should be encouraged in communities with poor sanitation, an inadequate safe water supply and high rates of infantile diarrhoea. If breastfeeding, heat-treated breast milk or donor breast milk is not possible, so acidified formula should be recommended, based on the available limited data. The published data on the effects of acidified and fermented infant formula without live bacteria are limited and do not allow firm conclusions to be made, yet they are promising, with no reported safety effects.

Conflict of interest

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this paper.

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