Special article

Arch Argent Pediatr. 2026;e202510840

Yogurt in infant nutrition: Answers to frequent questions

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ABSTRACT

Unlike pasteurized or sterile foods, fermented foods provide live microorganisms that are beneficial to health. Various dietary guidelines recommend certain fermented foods to promote a varied diet. Not all fermented foods are suitable for children, due to their palatability or alcohol content.

Yogurt is made from pasteurized milk under controlled hygienic conditions and is available in versions without excess critical nutrients, so it is recommended from the start of complementary feeding. Along with fresh cheeses, it provides microorganisms that are useful for the intestinal microbiota and the immune system, as well as calcium and vitamin D, nutrients that are currently deficient in the child population.

Despite its benefits, there are frequent doubts about its recommendation. This study answers frequent questions about yogurt from a multidisciplinary perspective, bringing together professionals from pediatrics, nutrition, gastroenterology, psychiatry, and microbiology.

Keywords: *yogurt; child nutrition; safety; nutritional sciences; pediatrics.*

doi: http://dx.doi.org/10.5546/aap.2025-10840.eng

To cite: Arribas A, Blasi S, Boggio Marzet C, Britos S, Cabreriso MS, Carosella M, et al. Yogurt in infant nutrition: Answers to frequent questions. *Arch Argent Pediatr.* 2026;e202510840. Online ahead of print 2-APR-2026.

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Funding and conflict of interest: *This manuscript was funded by Danone Argentina S.A. and prepared independently, with the participation of all authors, without the company exercising editorial control over the content or the result. The authors declare that their only relationship with the company was their participation as speakers at conferences or symposia organized by the company. GV is a member of the board of directors of the International Scientific Association for Probiotics and Prebiotics (ISAPP).*

Received*: 7-29-2025*
Accepted*: 12-23-2025*

INTRODUCTION

Fermented foods can be a source of life, beneficial microorganisms, a quality that other foods lack. The inclusion of some fermented foods is recommended in all dietary guidelines for children and, like all food groups, they should be included to ensure a diverse diet.[1] However, not all fermented foods are suitable for children, either because of their unpalatable organoleptic characteristics at this stage of life (kimchi, kombucha, miso, natto) or because of their alcohol content (kefir, kombucha).[2]

Yogurt is a fermented food produced industrially from pasteurized milk under strict hygiene conditions, with a known microbiological composition, available in versions without excess critical nutrients, and recommended for inclusion from the start of complementary feeding.[1] Along with fresh cheeses, it is suitable for children because it does not contain alcohol and also provides live microorganisms that are beneficial for the intestinal microbiota and the immune system associated with the intestine. It also provides significant amounts of calcium and vitamin D.[3]

However, in practice, there are doubts and questions about its recommendation and implementation. This paper aimed to answer a series of frequently asked questions agreed upon by the authors of the manuscript, a group of professionals with multiple perspectives.

METHODS

The authors of this study (4 pediatricians, 8 nutritionists, 3 pediatric gastroenterologists, 1 psychiatrist, 1 nutritionist, and 1 microbiologist) presented, in virtual meetings, the questions they most frequently encounter in their professional practice. The questions were submitted to all authors for consideration, and those deemed most frequent and relevant were selected, in a quantity that could be answered consistently in 100 to 120 words. The questions were chosen by unanimous consensus; all authors agreed. Due to space limitations and the number of references allowed, the authors selected the scientific papers (from PubMed, Scopus, and ScienceDirect) they considered most relevant to justify the answer, based on their clinical relevance, methodological quality, and applicability in healthcare contexts. All authors approved the final version of each of the questions presented.

Is it a food of modernity?

It is estimated that it has been consumed for over 4000 years, and that its origin was the spontaneous fermentation of milk in animal skin bags, mainly the gastrointestinal tract, colonized by lactic acid bacteria that transformed lactose into lactic acid. In 1873, Joseph Lister isolated *Bacterium lactis* (now *Lactococcus lactis*), while in 1905, Stamen Grigorov identified *Lactobacillus bulgaricus*. Its international recognition came from the studies of Elie Méchnikov, who observed remarkable health and longevity in elderly consumers of fermented milk in the Balkans. Since the 1960s, it has been produced with *L. bulgaricus* and *Streptococcus thermophilus*.[4]

Is it an important food?

It is a nutrient-dense food that provides protein, calcium, phosphorus, magnesium, zinc, potassium, vitamins A, D, and B complex (B2, B3, and B12).[5] Its consumption is associated with a higher-quality nutritional diet.[6] Furthermore, as a fermented dairy product, it can be a vehicle for probiotic bacteria.[7] Along with fresh cheeses, it is a source of live microorganisms, which is relevant in the context of the emerging concept in nutrition of the daily dose of live microorganisms[8] and, unlike other fermented foods that could also be a source, such as kefir, it does not contain alcohol.[9]

Can it be part of complementary feeding?

According to the Ministry of Health's *Clinical Practice Guideline for Complementary Feeding of Children Under Two Years of Age*,[1] natural, whole yogurt with no added sugar or sweeteners can be offered from the start of complementary feeding.

At what age can it be offered?

It can be introduced from 6 months of age. The Argentine Ministry of Health[1] and the Latin American Consensus on Complementary Feeding of the Latin American Society of Gastroenterology, Hepatology, and Pediatric Nutrition[10] agree that it is suitable for this stage, provided it does not replace breast milk and is offered as part of a varied infant diet.

Is it a substitute for milk?

Breast milk and/or infant formula remain the main sources of nutrition when breastfeeding is not possible, and continue to be the main sources until the child starts eating family meals. The introduction of cow's milk and its derivatives should be gradual and in small quantities,

preferably as an ingredient in foods such as baby food or desserts. Natural yogurt can therefore be incorporated into complementary feeding, provided its characteristics are considered, but it cannot replace the main dairy component.[1,11] Both yogurt and cow's milk have similar caloric, protein, vitamin, and mineral values, so that they can be interchanged as part of a varied infant diet. However, the live microorganisms in yogurt are an additional benefit for gastrointestinal health, immunity, and development.[12]

Does fermentation improve nutrient absorption?

Fermentation improves nutrient absorption by generating predigestion products, increasing the bioavailability of proteins and carbohydrates. For example, fermentation accelerates post-prandial amino acid absorption by increasing protein digestibility.[13] In addition, changes in the composition of the product and intestinal function promote the absorption of micronutrients.[14] Milk fermentation also increases the content of some B vitamins, such as folic acid. In terms of minerals, it increases the bioavailability of calcium and magnesium. Regarding phosphorus, a portion present as phosphate becomes more readily absorbed.[15]

Can it cause hemolytic uremic syndrome?

Before fermentation, the milk undergoes heat treatment at 76 degrees for 20 seconds (pasteurization) and, after formulation, treatment at 95 degrees for 270 seconds, which aims to denature the whey proteins to obtain a more viscous product. Both heat treatments ensure the inactivation of potential pathogenic microorganisms.[16]

It is also verified that each batch produced complies with the safety requirements of the Argentine Food Code,[17] as evidenced by the presence of data from the National Registry of Establishments (R.N.E., by its Spanish acronym) and the National Food Product Registry (R.N.P.A., by its Spanish acronym) on the packaging. However, *Escherichia coli* O157:H7 has been reported in yogurts made with raw milk.[18,19]

Should it be discarded if it has been outside the refrigerator for 2 hours?

Food spoilage is the process that renders food unsafe for consumption due to safety concerns or undesirable for consumption due to sensory reasons. It may be caused by the proliferation of pathogenic microorganisms (which generally do not alter the sensory characteristics of food), by the loss of expected sensory qualities (without posing a microbiological risk), or by a combination of both phenomena.[20] In the case of yogurt made from pasteurized milk, if it remains outside the refrigerator for two hours, as long as the integrity of the container is maintained, no proliferation of pathogenic microorganisms should be expected, as they have been inactivated during pasteurization and due to the acidity of the product. Regarding sensory properties, exposure to room temperature resumes fermentation, leading to post-acidification and syneresis.[21] Yeast proliferation in yogurt was reported after 5 days at 20 °C[22] and a 1-log reduction in probiotic count after 24 hours at 20 °C.[23]

Does it cause inflammation?

Intestinal inflammation is an immune process. To define the impact of dairy products on inflammatory processes, an inflammation index was constructed, as it is a complex phenomenon that cannot be described with a single biomarker. Across categories, the fermented dairy index showed an anti-inflammatory effect, possibly due to lactic acid and bioactive peptides.[24] When comparing the separate impacts of average milk, yogurt, and cheese intake on chronic inflammation, only yogurt consumption was associated with lower levels. A report from a meeting of the American Society for Nutrition suggests that there is no evidence of an anti-inflammatory effect of dairy products as a category, nor do they increase biomarkers of chronic systemic inflammation.

Does it cause acne?

Milk has been associated with an increased risk of acne in a systematic review of 78 529 participants. Still, fermented dairy products such as natural yogurt may have a protective effect due to their lactic acid content, a metabolite with anti-inflammatory activity.[27] In a study of Polish adolescents, its consumption was linked to a lower impact of acne on quality of life.[28] The benefits depend on the type of yogurt; products without added sugars are preferred. Observational data suggest that yogurt consumption is not associated with an increase in acne, unlike other dairy products.[29]

Does it cause mucus?

The association between dairy consumption

and increased respiratory secretions lacks scientific support. Several controlled studies have shown no increase in objective nasal mucus production or respiratory symptoms after consuming milk or yogurt, even during viral illnesses.[30] The subjective perception of mucus is attributed to physicochemical interactions between milk emulsions and salivary mucins, which generate a temporary sensation of coating in the mouth and throat. Nor has a direct physiological effect on mucus production been demonstrated in patients with asthma or respiratory diseases.[31]

Does it cause tooth decay?

The oral microbiota is closely linked to conditions such as tooth decay and periodontal disease. The development of tooth decay depends on the presence of acidogenic bacteria and the availability of fermentable carbohydrates, where diet plays a fundamental role.[32] Fermented dairy products with probiotics and no added sugars have been shown to have beneficial effects on oral health, preventing caries development by reducing *Streptococcus mutans*, decreasing its adhesion through competition, and interfering with biofilm formation. Added to this is the contribution of the structural components of the teeth, such as calcium, phosphorus, and proteins, which facilitate remineralization.[33]

Should it be restricted if there is lactose intolerance?

Yogurt is a food that can be consumed by individuals who are lactose intolerant because the cultures used to ferment the milk contain the endogenous lactase enzyme, which can reduce lactose content by up to 50% through fermentation. In addition, because of its higher viscosity, yogurt delays gastric emptying and slows intestinal transit compared to the same amount of milk, allowing a gradual release of the remaining lactose and allowing the residual β-galactosidase present in the small intestine to act.[35] Microbial lactase is still active in the distal small intestine. In cases of total intolerance, there are varieties made with lactose-free milk.

Is it an ultra-processed food?

According to the NOVA classification,[36] natural yogurts with no added sugars, colorants, or sweeteners do not qualify as an ultra-processed food. It is important to distinguish between the formulation (chemical composition) and the processes applied to food production, which, in the case of yogurt, include milk homogenization, pasteurization, formulation, fermentation, cooling, and packaging.[16] The sum of technological processes does not necessarily detract from the nutritional quality of a food. It is the formulation of the food, and depending on the ingredients added, that will define its nutritional quality. This conceptual error can lead to foods that are not recommended for a healthy diet.[37]

Can industrial products be considered sweets?

According to Article 1201 of the Argentine Food Code,[17] the primary ingredient in sweets is sugar, while the primary ingredient in yogurt is milk. The processing and formulation of foods, *per se*, if they do not alter their nutritional quality, do not necessarily pose a health risk. Yogurts with added sugars are often disparaged by comparing them to candy. Even with the addition of sugars, they have better nutritional density than the average candy, since candy has negative nutritional density because it contains more critical nutrients per unit of energy than proteins or micronutrients.[31] That said, natural, whole versions without added sugars should be preferred. Yogurts with added sugars should not be offered to children under 2 years old.

Are they all probiotics?

The term *probiotics* refers to beneficial microorganisms that have been adequately identified at the strain level,[38] and which, in practical terms, can be delivered in dietary supplements (capsules, tablets, sachets, drops) or in foods (yogurts, cheeses, fruit smoothies). Yogurts are made with generic strains of *S. thermophilus* and *L. bulgaricus*. Some yogurts also contain added probiotic strains, such as *L. rhamnosus* CRL1505, *L. casei* DN-114 001, *Bifidobacterium lactis* DN-173 010, *L. rhamnosus* GG, *L. casei* Shirota, among others,[39] making it possible to distinguish between yogurt and yogurt with probiotics. The presence of probiotics adds the beneficial effects of the added probiotic strain to the proven effects of yogurt.

Does adding sugars cancel out the probiotic effect?

The matrix effect refers to the phenomenon in which a complex food matrix can behave physiologically and functionally differently from its individual components.[40] The Japanese strain

L. casei Shirota included in Yakult fermented milk has been the subject of numerous clinical studies where its probiotic capacity has been observed,[41] even though an 80 ml bottle of the product contains 10 grams of sugar.[42] The presence of sugars did not affect the probiotic effect demonstrated in the corresponding clinical study. However, it is important to keep sugar consumption below the maximum recommended by the World Health Organization.[43]

CONCLUSION

Understanding the chemical, nutritional, and microbiological characteristics of yogurt, addressed in this study through a series of questions among health professionals, will allow it to be used as an important food as part of a diverse and healthy diet for children from the start of complementary feeding, without replacing or displacing breastfeeding or infant formula when breastfeeding is not possible. ■

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