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6-1-2021

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Author manuscript

*JAMA Pediatr.* Author manuscript; available in PMC 2022 June 01.

Published in final edited form as:

*JAMA Pediatr.* 2021 June 01; 175(6): 555–556. doi:10.1001/jamapediatrics.2020.5840.

## Plant-Based Beverages in the Diets of Infants and Young Children

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Plant-based beverage intake in the US increased 61% from 2012 to 2017<sup>1</sup> owing to interest in vegetarian and vegan diets and plant-based options, environmental and ethical concerns, perceived health benefits, cow's milk allergy and intolerance, and taste preferences.<sup>2</sup> In 2016, 5% of children aged 2 to 4 years enrolled in the Feeding Infants and Toddlers Study, one of the largest dietary intake studies in the US, consumed plant-based milk on the day of the survey, an increase from past years.<sup>1</sup> However, little is known about patterns of plant-based beverage intake among children aged 12 to 24 months, for which a nutrient-dense diet is particularly important for optimal growth and development.

A recent National Academies of Sciences, Engineering, and Medicine committee report summarized the recommendations from authoritative bodies in high-income countries on plant-based beverage intake for young children.<sup>3</sup> Overall, most of the authoritative bodies recommended against the provision of plant-based beverages to young children, with some nuances in the guidance provided. Across the guideline documents reviewed, however, the National Academies committee identified a range of methodological approaches, which has implications for both the consistency and quality of guideline documents. In the future, it is important for organizations to collaborate on the planning and development of guidelines, including the process of conducting systematic evidence reviews, the report concluded.

A 2019 Robert Wood Johnson Foundation-Healthy Eating Research (RWJF-HER) report summarized the known benefits and risks of plant-based milk consumption for young children.<sup>1</sup> In this collaboration among the American Academy of Pediatrics, Academy of Nutrition and Dietetics, American Heart Association, and American Academy of Pediatric Dentistry, the consensus group identified little evidence of health benefits of plant-based

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beverages compared with cow's milk in young children, while noting potential risks related to frequent consumption of plant-based beverage if the overall nutrient content of the child's diet is not carefully managed.

Plant-based drinks are manufactured from a diverse range of nuts, seeds, legumes, grains, fruits, and vegetables. As a result, the nutrient and ingredient profile of plant-based drinks varies substantially, but most drinks are relatively low in energy, protein, fat, and other nutrients compared with cow's milk.<sup>1,4</sup> The RWJF-HER consensus group found 3 studies that evaluated the nutrient content of plant-based beverages, and each study concluded that these beverages are inadequate substitutes for cow's milk.<sup>1</sup> Although some plant-based beverages are nutrient fortified (eg, calcium, vitamin D, vitamin B<sub>12</sub>) at levels similar to cow's milk, phytates (the storage form of phosphorus in plants) can bind to protein and minerals (eg, zinc, calcium) to reduce their bioavailability. This means the nutrient content reflected on the label is higher than what the child absorbs.<sup>4</sup> For instance, soy has the highest protein content of plant-based beverages, but its reduced protein bioavailability is a serious concern.<sup>4</sup>

Substantial substitution of plant-based beverages for cow's milk, breast milk, or formula intake in infants and young children carries a high risk of a nutritional deficiency disease if the diet is not properly managed to account for overall nutrient needs. The RWJF-HER report cited a review of 30 cases of severe nutritional deficiencies, including kwashiorkor, rickets, metabolic alkalosis, and scurvy, among children aged 4 months to 22 months who consumed plant-based beverages either alone or with complementary foods (predominantly fruits and vegetables).<sup>1</sup> A Canadian study found that non-cow's milk beverage intake was associated with vitamin D insufficiency in children 1 to 6 years of age, but plant-based milk was not separated from goat's milk in the analysis.<sup>1</sup>

A collaborative group of organizations in Canada (Breastfeeding Committee for Canada, Canadian Paediatric Society, Dietitians of Canada, Health Canada) recommends against using plant-based beverages (even fortified beverages) as an alternative to cow's milk in children younger than 2 years.<sup>5</sup> The RWJF-HER report agrees with the Canadian recommendations but adds exceptions for intake of soy beverages when medically indicated or to meet dietary preferences.<sup>1</sup> The Australian government states that intake of full-fat, calcium-fortified rice or oat drinks consumed with diets rich in alternative sources of protein and vitamin B<sub>12</sub> are acceptable under the supervision of a physician.<sup>6</sup> They recommend against all other plant-based beverages, including soy drinks, as alternatives to cow's milk. In contrast, the New Zealand Ministry of Health specifies that intake of calcium-fortified plant-based beverages for toddlers can be a suitable substitute for cow's milk, with a vitamin B<sub>12</sub>-fortified drink required for vegan toddlers.<sup>7</sup>

It is evident that plant-based beverages cannot fully substitute for the nutrient quality of cow's milk in children 12 to 24 months of age. Therefore, it is essential for health care clinicians to ask parents whether young children consume plant-based beverages, and if so, how much the child consumes in a day—whether the beverage completely, frequently, or occasionally replaces cow's milk. In cases when plant-based beverages frequently or completely replace cow's milk in the diet, the child's overall nutrient intake should be

assessed either by a pediatrician or a pediatric registered dietitian. This expert should also provide education and counseling relevant to specific plant-based beverages and dietary adjustments that can compensate for missing nutrients.

In addition, to improve the evidence base that informs plant-based beverage recommendations for toddlers, it is important to address key research gaps. Research is needed to improve understanding of the following:

- Current patterns of plant-based beverage intake in children 12 to 24 months of age.
- The health risks and benefits of substituting varying amounts of plant-based beverages for cow's milk in children's diets.
- The quality and bioavailability of nutrients from plant-based milks.
- The most effective approaches to communicate with caregivers regarding the risks, benefits, and other considerations related to plant-based beverages in the diets of young children.

This information is critical to help clinicians give science-based guidance in a culture of rising consumer choices driven heavily by marketing and social media.

## Acknowledgments

**Conflict of Interest Disclosures:** Dr Jimenez reported receiving grant support from the Academy of Nutrition and Dietetics outside the submitted work. No other disclosures were reported.

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