

Invited Commentary

Invited commentary in response to the paper entitled 'Iodine concentration of milk-alternative drinks available in the UK in comparison with cows' milk' by Sarah Bath and colleagues

It is well recognised that iodine deficiency may increase the risks for goiter, hypothyroidism, decreased fertility, obesity, psychiatric disorders, fibromyalgia and a variety of cancers due to impaired functions of triiodothyronine and thyroxine^(1–4). Adequate iodine intake is particularly important for pregnant and nursing women, as iodine is essential for neural development in the growing fetus and newborn^(2,3). Globally, it is estimated that approximately 2 billion people have inadequate iodine intake⁽⁵⁾. Despite noticeable progress in controlling iodine deficiency worldwide since 2003⁽⁵⁾, decline in milk consumption, a major iodine source in the UK, combined with changes in dietary choices and consumer behaviour may negatively affect the iodine status of the British population. For instance, the rapid growth of milk-alternative drinks consumption in the UK⁽⁶⁾ is raising concerns about whether these products are suitable substitutes for dairy cows' milk regarding iodine provision. Emerging British research have begun to unravel this question and how milk-alternative drinks may impact consumers' health⁽⁷⁾.

Recently in the *British Journal of Nutrition*, a group of researchers from the University of Surrey led by Dr Margaret Rayman reported a comparison between the iodine concentration of retail milk-alternative drinks and that of dairy cows' milk, the first study of its kind in the UK⁽⁷⁾. Specifically, the iodine concentration of seven types of milk-alternative drinks (soya, almond, coconut, oat, rice, hazelnut and hemp) or forty-seven products was determined via inductively coupled plasma-MS. Their results revealed that the median iodine concentration of forty-four non-iodine-fortified milk-alternative drinks was quite low (7.3 µg/kg) or only 2.1 and 3.1% of that detected in all-season conventional (median 344 µg/kg) and organic (median 234 µg/kg) milk, respectively. However, the concentration of iodine in three iodine-fortified soya, oat and rice products, all from the same brand, averaged 278 µg/kg and was equivalent to 81 and 119% of the median iodine content reported for all-season conventional and organic milk, respectively. Authors pointed out that the amount of iodine (range from 0.9 to 4.3 µg) provided by a glass (200 ml) of unfortified milk-alternative drinks is negligible relative to the adult iodine recommendation of 150 µg/d^(8,9), thereby indicating that these products are not suitable substitutes for cows' milk. Thus, consumers of unfortified milk-alternative beverages should be aware of the potential health implications of insufficient iodine

intake, especially those with greater risks for iodine deficiency such as pregnant and lactating women, school-age children and vegans^(4,10,11). On the other hand, a glass of iodine-fortified soya, oat and rice drinks would provide, on average, 55 µg of iodine or approximately 37% of adults' iodine recommended intake of 150 µg/d^(8,9). Authors concluded that fortified milk-alternative drinks could be considered reasonable replacements for cows' milk in terms of iodine provision.

Rayman and co-authors also presented results about the differences in iodine concentration between organic and conventional milk. They stated that the lower iodine concentration in organic *v.* conventional milk is likely caused by restrictions on mineral-fortified concentrates in organic farming and reliance on white clover (*Trifolium repens* L.) to 'fix' N in place of prohibited chemical and synthetic fertilisers. Cyanogenic glucosides present in white clover can be converted to thiocyanate, which compete for transportation sites on the sodium-iodide symporter^(12–14), ultimately reducing the transfer of iodine into milk. In addition to differences in iodine concentration between milk sources, authors discussed the potential health implications, including iodine-induced thyroid dysfunction⁽¹⁵⁾, in response to supplementation of milk-alternative drinks with extract from the brown seaweed kombu (*Saccharina japonica*). In fact, Food Standards Australia New Zealand⁽¹⁶⁾ recalled batches of a kombu-fortified soya drink containing extremely high iodine concentration (25 000 µg/l)⁽¹⁵⁾. Feeding the brown seaweed *Ascophyllum nodosum* meal to cows, a supplement very popular in the organic dairy sector in the USA^(17–19), also raises health concerns. For instance, a glass of milk from organic-certified Jersey cows fed 57, 113 or 170 g/d of *A. nodosum* meal⁽¹⁷⁾ would result in 121, 203 and 274 µg/d of iodine intake, respectively, or 81, 135 and 183% of the adult iodine recommendation of 150 µg/d^(8,9).

Rayman and colleagues' study is the largest systematic evaluation of milk-alternative drinks in the UK and the first to report the iodine concentration of oat and hazelnut beverages. Their research is timely needed as the consumption of milk-alternative drinks is growing in a fast pace not only in the UK⁽⁶⁾ but also in the USA⁽²⁰⁾, and similar growth patterns may be underway in other industrialised or developing societies worldwide. Authors demonstrated using state-of-art analytical approach (inductively coupled plasma-MS) that the iodine concentration of non-iodine-fortified milk-alternative drinks is



extremely low, indicating that companies commercialising these beverages should consider fortification measures to mitigate potential iodine deficiency in certain groups of people. At the time of Rayman-led study, only one manufacturer (not the market leader) was fortifying some of their products. Overall, iodine nutrition is very complex as iodine deficiency or excess can lead to serious implications to human health. Therefore, emerging food sources and industries should be scrutinised through scientific and legislative approaches so consumers' health are not put at risk.

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