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Comparison of mineral profiles between cows' milk and plant-based beverages in the UK

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Cows' milk (CM) and plant-based beverages (PBB), used as milk alternatives, are not nutritionally equivalent[(1)] and PBB composition is highly varied[(2)]. However, assessing the potential nutritional risk for UK populations after dietary replacement of milk with PBB is challenging, because analytical determination of PBBs' nutrient profiles is lacking[(3)]. This study determined and compared the mineral concentrations of milk and PBB in the UK market.

Ultra-heat treated and pasteurised samples (n = 178), including 20 brands of semi-skimmed milks and 69 brands of fortified PBBs (based on almond (17; ALMO), coconut (14; COCO), oat (19; OAT) and soya (20; SOYA)) were collected in summer 2023 and winter 2024. All PBB samples had added Ca and Na, but only 62 were fortified with I. Minerals concentration was determined using microwave assisted digestion, inductively coupled plasma-optical emission spectrometry (for microminerals) and inductively coupled plasma and mass spectrometry (for trace elements and heavy metals). Data were analysed using Minitab®22.1, with linear mixed effects models using ingredient, thermal treatment and season, and their interactions, as fixed factors, and brand ID as a random factor.

The main ingredient affected all mineral concentrations ($p<0.001$), except Ca and Co. SOYA had more Mg than milk (+27.5mg/kg), and milk had more Mg than ALMO, COCO, and OAT (+41.783.3mg/kg). Milk and SOYA had more P and K than other PBB (P, +411 mg/kg and +381mg/kg; K, +920 mg/kg, and +631 mg/kg, respectively). Milk had less Na than PBB (-126-64 mg/kg) with the exception of COCO. Milk contained more I (+157-200.4 µg/kg) and Zn (+1.41-3.71 mg/kg) than PBB. SOYA contained more Cu, Mg, and Mo than other PBB (for Cu 65-70 mg/kg; for Mn +1.00-1.06 mg/kg; for Mo +46-93.5 µg/kg, respectively) and milk (Cu +0.77 mg/kg; Mn +1.44 mg/kg; Mo +84.1 µg/kg). Overall, SOYA contained the most Cd, Cr, and Ni (although difference to OAT was not significant for Cr and Ni), while milk had the lowest concentration of Cd. Concentrations of Mg, P, Cu, I, Mn, Mo, and Co varied according to season ($P<0.05$). When compared with summer, winter PBB and milk had more Mg (+4.4 mg/kg), Cu (+0.04 mg/kg), I (+41 µg/kg), and Mo (+9.8 µg/kg), but less P (-76 mg/kg), Mn (−0.08 mg/kg), Zn (−0.21 mg/kg), and Co (-5.21 µg/kg). There were no differences in mineral concentrations due to thermal processing (UHT, pasteurisation; $P>0.05$).

The minerals composition of fortified PBB varied between main ingredient, and compared to milk, and seasonal variation was high. To prevent micronutrient inadequacies from the substitution of milk for PBB (in particular for I and Zn), consumers should be aware of differences in the intrinsic nutrient composition between PBB derived from different ingredients and milk, as this study showed and adopt suitable dietary and supplementation adjustments.

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References

1. Clegg ME, Tarrado Ribes A, Reynolds R *et al.* (2021) *Food Res Int* **148**, 110586.
2. Moore SS, Costa A, Pozza M *et al.* (2023) *npj Science of Food* **7**(1), 50.
3. Finglas PM, Pinchen HM, Berry R *et al.* (2015) *McCance and Widdowson's The Composition of Foods Seventh Summary edition*. Cambridge: Royal Society of Chemistry.