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Development of novel Vitamin B12 fortified yogurts using isolated and microencapsulated Vitamin B12

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Abstract

Adults aged > 50 years, which make up to 40% of the European population, are vulnerable to low vitamin B12 (B12) status due to age-related factors that impair digestion and absorption of protein-bound B12 from natural food sources. Older adults are recommended to meeting their dietary B12 intake through the consumption of B12-fortified foods or supplements because these products contain free B12. B12 seems most bioavailable from milk products compared to other food sources, showcasing dairy as a potential vehicle for B12 food fortification. Yogurt is a versatile, popular dairy product, making it a promising food vehicle for B12 fortification to enhance the availability of B12-fortified foods for population groups at risk of B12 deficiency. With the overall goal to develop a novel, B12-fortified dairy product, the objective of this project was to compare the shelf-life stability of different chemical forms of B12 added to yogurt either in isolated or in encapsulated form. For both fortification strategies, we compared methylcobalamin (MeCB), a naturally-occurring B12 form, and cyanocobalamin (CnCB), the synthetic form of B12. Encapsulated microparticles were created by spray-drying a maize starch-derived polymeric material (EUDRAGUARD Natural®) with 1% (w/V) MeCB or CnCB. The release of B12 from encapsulated microparticles was confirmed by *in vitro* simulated gastrointestinal digestion; maximum B12 release (103% recovery) was achieved under conditions simulating the small intestine, where B12 is absorbed in the human body. Yogurts were produced by incubating whole milk (3.25% milk fat) with yogurt starter bacteria at 43°C overnight; after fermentation and cooling down, isolated (I-MeCB or I-CnCB) or encapsulated B12 powders (E-MeCB or E-CnCB) in the concentration of 50 µg of B12/175 g of yogurt were added, creating stirred yogurt. Yogurts were stored at 4°C for eight weeks, with intermittent sampling for B12 stability testing using RIDASCREEN immunoassay. For CnCB-fortified yogurts, I-CnCB and E-CnCB had similar B12 concentrations at baseline (48.3 µg and 48.2 µg, respectively) and week 8 (53.9 µg and 51.4 µg, respectively). Difference in B12 content between I-CnCB and E-CnCB was < 5% for both time-points. For MeCB, similar concentrations were found for I-MeCB (64.1 µg) and E-MeCB (65.0 µg) at baseline; however, at week 8, E-MeCB remained stable (69.8 µg) while a pronounced decrease in B12 was observed with I-MeCB (33.3 µg). At week 8, I-MeCB B12 concentrations were 52% lower than E-MeCB. In conclusion, CnCB was shown to be the more stable fortificant throughout shelf-life. Encapsulation techniques are a viable option to increase MeCB stability in fortified yogurts.

Conflict of Interest

There is no conflict of interest.