

Cobalamin Levels in Fish and Fortified Milk Substitutes

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Objectives: Natural forms of vitamin B12, methylcobalamin (MeCbl), and hydroxocobalamin (OHCbl) are bioidentical to the forms occurring in human physiology and animal foods. However, in fortified foods, different vitamers can be present including cyanocobalamin (CNCbl), a synthetic form that can be problematic due to cyanide content. The main goal of this work is to identify the different vitamin B12 vitamers (CNCbl, MeCbl, and OHCbl) in fish and in fortified soy milk to characterize the different types of cobalamins present in natural and fortified foods.

Methods: Samples of a fish from the Portuguese water coastline (mackerel) and samples of commercial fortified soy milk beverages available on the Portuguese market were collected. Mackerel samples were analyzed raw, after boiling on steam and canned in water. The clean-up was performed by immunoaffinity columns. The different vitamers were analyzed in a UHPLC coupled to a triple quadrupole mass spectrometer with electrospray ionization.

Results: In mackerel, the identified vitamers were MeCbl (prevalent form) and OHCbl. The sum of vitamers in raw fish was $9.2 \pm 1.2 \mu\text{g}/100 \text{ g}$, in steamed fish, $8.3 \pm 0.6 \mu\text{g}/100 \text{ g}$ and in canned fish $6.1 \pm 0.8 \mu\text{g}/100 \text{ g}$. In soy milk, the identified vitamer was CNCbl, with values between $0.23 \pm 0.2 \mu\text{g}/100 \text{ mL}$ and $0.75 \pm .3 \mu\text{g}/100 \text{ mL}$. Taking into account the adequate intake for adults ($4\mu\text{g}/\text{day}$), the consumption of 100 g of mackerel represents from 61% (in canned fish) to 97% (in raw fish) of the recommendations. Regarding the soy milk, we observe that values found analytically, are different from the ones reported in the label ($0.38 \mu\text{g}/100 \text{ mL}$). Fortified soy milky presents in Portugal a medium consumption of 224 mL/day, in consumers (IAN-AF, 2016). For this population, the consumption of soy milk represents a maximum of 44% of the recommended adequate intake.

Conclusions: Mackerel represents an important source of natural cobalamins, with recognized bioavailabilities and physiological effects. Individuals or ethnic groups whose diets exclude or restrict animal-based diets (such as vegans) may be at risk for inadequate nutrient intake. Furthermore, the risk benefits after long-term supplementation or intake of CNCbl fortified foods, due to cyanide accumulation could be a matter to evaluate on the vulnerable populations.

Funding Sources: Founded by NewFood4Thought Project PTDC/NUT30455.