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Cyanocobalamin Stability in Heated Milk

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Abstract

Losses of vitamin B12 during the processing and/or storage of foods and supplements have been associated with both reducing and oxidising agents. We evaluated the effects of redox active agents on cyanocobalamin stability in heat-treated non-fat milk. For metal ions studied, the metal ion could either decrease or increase cyanocobalamin loss, depending on metal ion concentration and redox potential, as well as on matrix properties and on protein properties. The largest losses of cyanocobalamin appeared to be caused by redox cycling mechanisms (for Cu^{2+} and Fe^{2+}). However, such losses could be mitigated by metal ion modification of the matrix. Of the sixteen redox active agents (RAA) evaluated in three heat-treated media, all four thiols (glutathione, cysteine, dithiothreitol and the thiamine decomposition product 2-methyl-3-furanthiol) and dithionite caused the greatest average CN-B12 losses, whereas cyanocobalamin recoveries generally increased in the presence of an added oxidizing agent. The CN-B12 decomposition pathway appears to consist of a sequence of Co(III) reduction followed by transition metal-generated ROS (e.g., H_2O_2) oxidation to irreversible oxidation products.