Investigation of biomarker responses to depletion/repletion with vitamin B\textsubscript{12}

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Despite dietary intakes well above current recommendations, low biomarker status of vitamin B\textsubscript{12} is a common problem in older adults, largely as a result of malabsorption of food-bound vitamin B\textsubscript{12}. This arises mainly from atrophic gastritis which leads to reduced gastric acid production (hypochlorhydria). Hydrochloric acid is essential for the absorption of food-bound vitamin B\textsubscript{12}, and thus vitamin B\textsubscript{12} absorption is reduced in states of hypochlorhydria, although in theory free vitamin B\textsubscript{12} (from supplements or fortified) should still be absorbed. Gastric acid suppressant medications, such as proton pump inhibitors (PPI) drugs induce hypochlorhydria and therefore a state similar to atrophic gastritis. The aim of the present study is to investigate the effect of hypochlorhydria on absorption of food-bound vitamin B\textsubscript{12} and to determine whether low-dose supplemental vitamin B\textsubscript{12} would overcome any vitamin B\textsubscript{12} malabsorption. Forty-one healthy males, aged 18–45, participated in a vitamin B\textsubscript{12} depletion/repletion trial. During the depletion phase (week 0–6) all subjects were administered with a PPI (omeprazole, 20 mg/d); after which they were randomised (by vitamin B\textsubscript{12} status as measured by serum holo-transcobalamin; holoTC; the metabolically active fraction of total circulating vitamin B\textsubscript{12}) into one of the two treatment groups to receive; omeprazole (20 mg/d) plus supplemental vitamin B\textsubscript{12} (10 mg/d) or omeprazole (20 mg/d) plus placebo for the repletion phase of the study (week 7–12).

Contrary to expectations, no significant change in vitamin B\textsubscript{12} status (as assessed by either total vitamin B\textsubscript{12} or holoTC) was observed during the depletion phase of the study. During the repletion phase of the study, an increase in vitamin B\textsubscript{12} status was observed in the treatment group, but this was significant \((P = 0.006)\) only using the biomarker holoTC, with the response for total vitamin B\textsubscript{12} failing to reach significance. In conclusion, these results supports the emerging view that holoTC (compared with the traditional biomarker of status, serum total vitamin B\textsubscript{12}) is a more sensitive biomarker in detecting small changes in vitamin B\textsubscript{12} intake. Although the acute administration of PPI drugs did not significantly suppress vitamin B\textsubscript{12}, repletion with 10 \textmu{g}/d of supplemental vitamin B\textsubscript{12} was sufficient to significantly increase biomarker status within just 4 weeks. The consequence of long-term PPI therapy on vitamin B\textsubscript{12} status is still to be determined.