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Abstract

Impact of 6-Month Nutritional Supplementation and Resistance Training on Chromosome and DNA Damage in Older Adults: Exploring the Role of One Carbon Metabolites †

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The global population is rapidly ageing, bringing heightened economic and social burden due to the increased risk of common age-associated diseases, including cognitive decline. B vitamin supplementation appears to be a promising strategy to prevent the onset and progression of cognitive decline owing to their pivotal role in one carbon (1C) metabolism. Perturbed 1C metabolism is hypothesised to contribute to accelerated DNA damage, in turn driving cognitive decline. However, this has not been comprehensively studied in older adults.

This study therefore aims to explore the impact of nutritional supplementation on 1C metabolites in older adults, and to evaluate whether 1C metabolites mediate changes in DNA and chromosomal damage.

Institutionalised elderly men and women (n = 117, 65–98 years) living in Vienna, Austria were randomized to receive resistance training (RT), RT with nutritional supplementation (RTS, includes vitamins B_2, B_6, B_{12}, and folic acid), or cognitive training (CT) for 6 months. At baseline, 3- and 6-months, DNA damage was measured by comet assay, chromosomal damage by cytokinesis block micronucleus cytome assay, and plasma B_{12} and erythrocyte folate concentrations with radioimmunoassay techniques. Triple quadrupole high performance liquid chromatography coupled with mass spectrometry will be used to analyse a comprehensive panel of 12 1C metabolites.

The RTS intervention increased circulating B_{12} and folate from baseline, as has been reported elsewhere, while RT and CT groups showed no change in B vitamin concentrations. Significant correlations between 6-month change in plasma B_{12} and micronucleus frequency were found only in the RTS group.

Metabolomic analysis will determine whether the correlation observed between increased B vitamin status and reduced chromosomal damage in the RTS group may partly be explained by dynamic changes in 1C metabolites. Understanding such mechanistic actions of B vitamins will allow better guidance of their use in the prevention and treatment of cognitive disorders in elderly populations.