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The influence of physiological and lifestyle factors on essential mineral element isotopic compositions in the human body: implications for the design of isotope metallomics research

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In the last 20 years, the application of high-precision isotopic analysis of essential mineral elements (Mg, S, K, Ca, Fe, Cu and Zn) to biomedicine (sometimes referred to as *isotope metallomics*), has revealed that their isotopic compositions are altered by the metal dysregulation that is fundamental to the pathogenesis of many cancers and other diseases [1,2]. Despite many published works showing the diagnostic and prognostic potential of this approach, a number of factors that may influence the stable isotopic composition of these essential mineral elements in healthy individuals remain unstudied. In this presentation, the available evidence will be summarized from trophic level studies, animal models, and ancient and modern humans, relating to physiological and lifestyle factors that appear likely (there is evidence indicating their influence) or unlikely (there is evidence indicating their lack of influence) to require controlling for when investigating variations in essential mineral element isotopic compositions in human subjects. We also discuss factors that require additional data to properly assess. There is evidence that sex, menopausal status, age, diet, vitamin and metal supplementation, genetic variation, and obesity influence the isotopic composition of at least one essential mineral element in the human body [3]. The task of investigating potential influences on essential mineral element isotopic compositions in the human body is sizeable, but presents an exciting research opportunity. To that end, new Cu isotope ratio data determined from significant sources of Cu in the human diet will also be presented and implications for study design discussed.

[1] Vanhaecke & Costas‐Rodríguez (2021), *View* 2, 20200094.

[2] Mahan, Chung, Pountney, Moynier & Turner (2020), *Cellular and Molecular Life Sciences* 77, 3293–309.

[3] Sullivan, Moore & Vanhaecke (2023), *Metallomics* (in press).