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Abstract

From the Literature to Our Cells: A Critical Appraisal of the Bioactivity and Role of Vitamin C, Folate, and Riboflavin in Nutrition and Health Claims †

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† Presented at the 14th European Nutrition Conference FENS 2023, Belgrade, Serbia, 14–17 November 2023.

Abstract: Background and objectives: Fruits and vegetables are rich in components with health-promoting effects, such as vitamins. However, lack of compliance with the recommended '5-a-day' is an issue most nations face. While these plant-based foods contain high levels of vitamins and other bio-compounds, their bioavailability is questionable. Considerable research and legislation have been devoted to vitamins and claims that they promote health. However, little has been investigated about the overlap between what is active in our bodies and what is authorised. In this study, we adopt a dual approach: first by presenting the theory and body of evidence on bioavailability and legislation and second by extending this knowledge to a practical case in light of nutrition and health claims. Methods: We selected three vitamins regularly subjected to claims: vitamin C, riboflavin, and folate. By conducting thorough literature research, we evaluated the logical order from how these compounds are used in our bodies ('In our cells') through to how they are characterised ('In regulation') and how they are measured ('In the lab'). To illustrate this critical appraisal, we present an analysis of these vitamins from a sample of cucumbers of different varieties. Results: We observed that bioavailability is a rather complex concept for the three vitamins analysed. In particular, in fruits and vegetables, these water-soluble vitamins are registered as unstable and labile during processing and storage. Furthermore, the characterisation of such vitamins in regulations and general knowledge of the targeted compounds seems oversimplified. Likewise, measuring protocols should be detailed and focus on the bioactive forms of vitamins in humans. Discussion: The conclusions from these analyses set out the state-of-the-art on vitamins that can be characterised and measured and the implications of these findings for the use of nutrition and health claims. A better understanding of what each vitamin entails for the decision-makers of claims and users of composition data is needed. These insights will help to harmonise what is measured in the lab, regulated by EU law, and taken up in our cells.

Keywords: bioaccessibility; bioactivity; European food law; fresh produce; nutrient composition

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Citation: Beltramo, B.; Urlings, M.; Padilla-Díaz, C.M.; Bast, A.; Diliën, H.; de Boer, A. From the Literature to Our Cells: A Critical Appraisal of the Bioactivity and Role of Vitamin C, Folate, and Riboflavin in Nutrition and Health Claims. *Proceedings* **2023**, *91*, 208. https://doi.org/10.3390/proceedings2023091208

Academic Editors: Sladjana Sobajic and Philip Calder

Published: 4 February 2024

Author Contributions: Conceptualization, B.B., M.U. and A.B.; methodology, B.B.; software and formal analysis, B.B. and C.M.P.-D.; writing—original draft preparation, B.B.; writing—review and

editing, B.B., M.U., C.M.P.-D., A.B., H.D. and A.d.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the European Regional Development Fund of the European Union that runs under Food Screening Euregio EMR project.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: No new data were created or analyzed in this study. Data sharing is not applicable.

Conflicts of Interest: The authors declare no conflicts of interest.