

Book Review

Bioavailability and analysis of vitamins in foods

by GFM Ball

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The main purpose of this book is to discuss the important factors that influence the bioavailability of vitamins in foods including physiological, dietary composition, alcohol and drugs, age and nutritional status. In addition, various methods of analysis for vitamins in foods are presented with an emphasis on the extraction procedures used.

The main drawback of the book is that it is a single author compilation and, as such, it is almost impossible to present a comprehensive review of the current state-of-the-art in vitamin bioavailability and future trends and developments, for each of the vitamins discussed. No mention is made of an earlier review on 'Human bioavailability of vitamins' which was published in 1994 by members of the EC FLAIR Concerted Action No 10 project on 'The measurement of micronutrient absorption and status' (Bates and Hesecker, 1994), and is recognised as one of the leading nutritional reviews on this topic. It would have been more desirable for active researchers with recognised authorities in their fields to have contributed to each chapter. Despite vitamin bioavailability being the main focus of the book, only about 25% of the entire contents is devoted to this, the rest being made up of various general topics and a discussion of the analytical techniques used with various examples.

Throughout the book there are some dubious nutritional statements that are erroneous. For example, in the preface, the author argues that physiochemical and microbiological methods used to determine the total vitamin content of a food grossly overestimate the nutritional value of the food because bound vitamin forms are not released for subsequent absorption. This statement is supported by reports of vitamin deficiencies in situations where dietary intake is adequate on the basis of conventional analysis. These statements are not strictly true. Most nutritionists would agree that overt signs of vitamin deficiencies in the general population of most industrialised societies are indeed rare. However, for certain more vulnerable sections of the population, such as the elderly, adolescents and pregnant women, biochemical indices of vitamin status at the lower end of the normal ranges are sometimes found. The functional consequences for this is still unclear and this is an area of much current research.

Chapter 1 provides a useful description of the various physiological aspects of vitamin bioavailability which is not normally found in textbooks of this type. General physiology of digestion and absorption, and introductory concepts and methods used for vitamin bioavailability are presented. Some of the definitions and ideas presented here are somewhat outdated and no mention is made of the international series of Bioavailability Conferences (the last

being held in Wageningen in May 1997), where these concepts are being developed among nutritional scientists. Methods for determining vitamin bioavailability are given a totally inadequate three pages of discussion and this section warrants considerable expansion. Some indication of future techniques, such as stable isotopes, have not been given sufficient importance here that they potentially deserve.

The second chapter discusses the analytical techniques used for vitamin determinations in food and included a considerable amount of general information on each of the techniques which is superfluous and can be found in numerous other publications. Again, the author has failed to indicate the most commonly used procedures (such as HPLC and microbiological assays), and some of the emerging techniques (such as capillary electrophoresis, biospecific methods). Combined LC- and/or GC-MS procedures (for example, folates, vitamin B6 and carotenoids) are not mentioned here but some do appear in later chapters).

A major limitation of this chapter is that no information is given on analytical quality assurance of these techniques including the availability and use of certified reference materials for vitamins (a recent important development), and general method validation. There has been a considerable amount of research carried out in the last few years under various European projects on the optimisation of extraction conditions for B-vitamins, carotenoids and the fat-soluble vitamins (A, E & D), and agreement between different procedures (for example, HPLC versus microbiological assay for the water-soluble B-group vitamins). The author fails to mention any of these findings and recommendations. In addition, various standardised horizontal methods of analysis for selected vitamins have recently been published by European Committee for Standardisation for adoption by member countries for nutritional labelling of foods. None of this information can be found in this chapter.

Another major criticism is that for bioavailability work, the analysis of vitamins in biological samples such as blood plasma, erythrocytes and various tissues is essential. Although the methods used are similar compared to foods, different problems are often encountered especially for extraction and clean-up. The author has failed to include any information on the analysis of vitamins in these samples.

Chapter 3–15 covers the thirteen individual fat- and water-soluble vitamins. A common format is used including: introduction, chemical structure and nomenclature, biopotency, deficiency syndromes, biochemical and physiological functions, physiochemical properties, analysis, bioavailability, dietary intake, synopsis and references. Each

vitamin is dealt with fairly extensively, although some of the analysis section is repeated in Chapter 2. The references cited are fairly comprehensive although some of the more recent references are rather scarce. Applications of individual methods for each of the vitamins are presented in tabular form.

The main problem of these chapters is that the bioavailability section is very much overshadowed by the more general information, some of the information and ideas presented are a little outdated. The author has failed to indicate for which vitamins, the question of vitamin bioavailability is currently the most important from a nutritional viewpoint. Certainly the current debate as to the bioavailability of carotenoids from leafy-green vegetables, and whether folic acid in fortified foods is more bioavailable than naturally-occurring folates, are two which come to mind, and deserve much greater attention.

Overall, this book provides a useful review of the general aspects of vitamin chemistry, biochemistry and

analysis, and should be of interest to those concerned with vitamins. However, it has not provided a sufficiently critical and authoritative discussion of the factors that influence vitamin bioavailability from foods, and the methods used to determine bioavailability, that this topic deserves from a nutritional public health viewpoint. The title of the book is misleading!

Reference

Bates CJ & Heseker H (1994): Human bioavailability of vitamins. *Nutr. Res. Rev.* 7, 93–127.

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