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Bioavailability of nutrients

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Abstract

The aim of the study is to evaluate the in vivo antimicrobial effect of some natural products, Bioavailability is the amount of nutrient in a foodstuff that the body can utilize, to perform various physiologic functions. It varies according to age and physiologic conditions of individuals. The bioavailability of a nutrient depends on several factors such as factors contained in the food itself, factors of human physiology, factors specific to individual's health status, and factors related to the food processing. Bioavailability is influenced by both dietary and host-related factors. Several dietary factors affect the nutrient bioavailability of plant foods when they are consumed, such as the chemical form of the nutrient in the food and the nature of the food matrix, interactions occurring between nutrients and other organic components within the plant food and pre-treatment of the food during processing and/or preparation. Bioavailability of nutrients are very important for fixing nutrient requirements and using it in food labelling purposes. Bioavailability influences a nutrient's beneficial effects at physiologic levels of intake and affects the nature and severity of toxicity due to excessive intakes. Bioavailability is an important issue for many nutritional concerns especially to determine the nutritional status of an individual. As the dietary supplements industry is registering steady and rapid growth, consumers are demanding quality supplements. Consumer perception of the quality of oral solid dosage forms is changing. Good quality is associated with the ability to disintegrate and dissolve. Performance characteristics of oral solid dosage forms in public standards will address the in vitro dissolution requirements, which will be presented as they relate to multivitamin-mineral combination products. The commonly accepted definition of bioavailability is the proportion of the nutrient that is digested, absorbed and metabolized through normal pathways. Consequently, it is not enough to know how much of a nutrient is present in a dietary supplement; the more important issue is how much of that present is bioavailable. A common belief regarding bioavailability of dietary supplements is that they have to be in solution to be absorbed in the body. However, the veracity of this axiom with regard to commercially available supplements was recently called into question. studies on the use of calcium salts as fillers for tablets and capsules and observed that in addition to not dissolving in many cases the calcium salt tablets took as long as 4–6 h even to disintegrate. Moreover, was able to extend these observations beyond calcium supplements to include several single vitamin as well as multivitamin and mineral preparations. An immediate consequence of these findings, aside from their impact on consumer confidence, was initiation by the U.S. Pharmacopeia (USP)[3] Committee of Revision of a process to develop public standards for the multivitamin-mineral combination products marketed as dietary supplements. This article will be an overview of the steps taken by USP to develop these standards. Although the formulation, development and manufacturing technology involved in the preparation of dietary supplements are similar to those in the manufacture of drug products, significant differences can be found between these products that impact on the evaluation of their bioavailability as defined above. The absence of dose response and the attendant no criticality of the dosing intervals for dietary supplements is a key distinction that should be reflected in the evaluative standards. Thus, although content uniformity requirement for drug products is an acknowledgment of the existence of a well-defined dose-response curve and, thus, dosing intervals, such a requirement is not possible for multivitamin-mineral combination products used as nutritional supplements. Alternatively, weight variation requirement could be used to ensure that the article was indeed manufactured under good manufacturing practices. In spite of the lack of clearly defined dose-response curve, a dietary supplement formulated into tablet or capsule is expected to disintegrate inside the stomach within a reasonable time to release the active ingredient or nutrient. This disintegration then will facilitate further dissolution in the biological fluids before gastrointestinal absorption. Because nutritional supplements are formulated and manufactured using the same technology as drugs, in vitro dissolution requirement, as a surrogate for in vivo absorption, is considered appropriate for oral solid dosage forms of multivitamin-mineral products. In a typical multivitamin-mineral combination product, it is neither practical nor necessary to require in vitro demonstration of each and every vitamin and mineral. Consequently, a specific dissolution requirement has been adopted for multivitamin-mineral combination products, in which an index vitamin and an index mineral are identified as markers for dissolution. In an attempt to account for the many different permutations of vitamins and mineral combinations, a hierarchy of index vitamins and index minerals has been developed and specified. Opposed to the dissolution criteria used for water-soluble vitamins, the hierarchy for index minerals is based on their importance in public health. For example, iron was chosen as the number one index mineral because iron deficiency is the most commonly prevalent condition in the United States and because iron is invariably present in nearly all the marketed multivitamin-mineral combination products. Similarly, calcium was chosen as the next index mineral in view of its importance in the prevention of osteoporosis. As with the vitamins, a similar hierarchical approach based on presence in a given preparation is used to determine the index mineral in a given supplement, i.e., iron, then calcium, then zinc, then magnesium. The UPS is in the process of developing in vitro dissolution requirements for botanical dosage forms along the lines of multivitamin-mineral combination products. The

challenge is enormous but the USP considers an in vitro dissolution test to be an essential testing requirement to ensure that the dosage form will meet the standard of bioavailability, i.e., the preparation will dissolve in biological fluids in a reasonable time frame, thereby allowing delivery of the bioactive components for absorption and ultimate utilization.

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