

Bioaccessibility: An Evaluation to Predict the Nutritional Effectiveness of Food Products

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Bioaccessibility is defined as the concentration of a particular nutrient or compound that is released from the food matrix during the digestive process and becomes available for absorption [1,2]. When it comes to the fraction of the compound that is released from the food matrix, absorbed and with potential to meet physiological demands, the term used is bioavailability [1,3]. Often bioaccessibility is confused with bioavailability, and it is important to point out that they are distinct but related terms, since for the nutrient or compound to become bioavailable, it must first be bioaccessible.

Bioaccessibility of a particular compound or nutrient may be assessed by *in vivo* and *in vitro* assays. Both have advantages and disadvantages, and the choice of the method depends mainly on the purposes of the analysis and the availability of materials. The *in vivo* assays requires more time and specific resources for experimental control, as well as some analytical and ethical limitations. These assays include mass balance and tissue concentration studies, which are performed with animals or humans. Mass balance assays determine the amount of nutrient absorbed from the difference between ingested and excreted concentrations. Tissue concentration assays monitor the increase in the concentration of the compound of interest in blood plasma [2,4].

On the other hand, *in vitro* assays are presented as an alternative to *in vivo* methods, as they are simpler, faster, cheaper, and without ethical restrictions. The choice of controlled conditions and easy sampling makes *in vitro* models suitable for mechanistic studies and hypothesis construction [5]. *In vitro* assays consist of subjecting food samples to conditions that simulate the sequence of processes that occur during digestion in the human gastrointestinal tract [6,7]. Thus, the chemical composition of digestive fluids, pH, temperature and time in each compartment should be similar to those of the digestive system. Most studies employ digestive enzymes, bile salts, temperature of 37°C, time of two hours, pH 2 - 3 in the gastric stage and pH 6 - 7 in the intestinal stage. In some cases the oral phase is still performed before the gastric and intestinal stages procedures [3,5-7].

However, due to the complexity of the reactions and mechanisms involved in the individual physiological conditions (age, genotype, nutritional status, amount of gastric and intestinal secretion, type of intestinal microbiota), the *in vitro* approach has limitations, which makes it impossible to fully simulate the gastrointestinal system. In this context, the *in vitro* assays are considered as a prior analysis of changes occurring *in vivo* and are useful for acquiring information on influences of both the food matrix and the gastrointestinal system on the potential of nutrients and compounds to be absorbed by the human gastrointestinal tract [3,6].

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