

Editorial

The Antioxidant Potential of Fermented Foods: Challenges and Future Trends

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The major roles of antioxidant compounds in preserving food shelf-life, as well as in providing health-promoting benefits, combined with the increasing concern regarding synthetic antioxidants, is progressively leading the scientific community to focus on natural antioxidants. Polyphenols, bioactive peptides, amino acids, and vitamins are among the most common antioxidant compounds naturally present in foods. Nevertheless, enabling further improvements to food antioxidant activity in vitro, which could potentially reflect on that in vivo, is a topic of the utmost significance. The bioconversion elicited by the use of microbial enzymes, and/or fermentation with selected starters, can be considered a tool for enhancing the activity of bioactive compounds by facilitating their release or changing their structural conformation. Indeed, fermentation is known to affect food features and, although it began as a means to extend food shelf-life, over the last few decades, research shifted to the investigation of its health benefits, among which are those provided by antioxidant compounds [1]. In this framework, this Special Issue aimed to cover the most recent advances in the use of fermentation as a means to enhance food antioxidants' potential.

Many of the papers published relied on the use of in vitro assays to determine how fermentation, either spontaneous [2–4] or with selected starters [5–11], can improve the antioxidant potential of cereals [9], legumes [6,9], milling by-products [8], and other vegetable matrices [2–5,7,10]. In most of the cases, the activity of lactic acid bacteria (LAB) and/or yeasts led to a higher bio-accessibility of phenolic compounds which, in turn, determined a higher antioxidant activity [2,6–11], often measured as DPPH (2,2-difenil-1-picrylidrazyl) radical scavenging activity, as well as a higher anti-inflammatory and antiplatelet potential [5].

Even though, due to their limitations, the use of in vitro tests has generated controversies over the years, they are still of great importance in the selection of potential antioxidant compounds or studying conspicuous sets of microorganisms/matrices [1], hence they are often coupled to other methods including those comprising cellular models. This is the case of the research of Polo et al. [12], who studied the effect of fermentation with several LAB starters on ice cream. The authors found that ice cream fermented with *Lactocaseibacillus casei* F14 counteracted the accumulation of proinflammatory interleukin mediators IL-8 and IL-6 and reactive oxygen species in Caco-2 cell culture, thus showing antiradical and anti-inflammatory features [12].

Nevertheless, in vitro and ex vivo assays can only be predictive tools of the antioxidant activity in vivo, and human trials are time-consuming and heavily regulated by ethical committees. Some papers collected in this Special Issue [13–16] relied on animal studies to further explain the in vivo roles of fermented foods. Indeed, the consumption of yogurt or LAB used as probiotic by rats experiencing oxidative stress resulted in a significant decrease in triglycerides, total cholesterol, low-density lipoprotein, and a remarkable increase in high-density lipoprotein [13–15], thus demonstrating the feasibility of fermentation for enhancing the functionality of foods. However, the elucidation of new bioconversion



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pathways, the study of antioxidant bioavailability and bio-accessibility, as well as their functions in in vivo digestion, are areas that still needs exploring.

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