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EDITORIAL

Beyond Antioxidant Functions

Much has been written on the protective effects of dietary bioactive compounds against several diseases of public health importance, including type 2 diabetes, cardiovascular disease, and cancers. The pathogenesis of these chronic diseases may feature elements of oxidative damage and inflammation. In this respect, bioactive compounds in foods that have antioxidant actions have been extensively investigated. Antioxidants act either directly in neutralising free radicals or indirectly as co-factors of antioxidant enzymes. Through these actions, antioxidants reduce, if not eliminate, free radical damage to cellular DNA, lipids and proteins.

In recent years, new hypotheses have emerged that provide a broader perspective in explaining the protective actions of dietary antioxidants that extend beyond their established function as scavengers of free radicals. Take the case of whole-grain cereals. In a recently published review, Fardet (2010) put forward new mechanisms of action for antioxidants. For example, polyphenols have been found to act on cell signaling pathways thereby modifying gene regulation and cell redox status. "There is a strong link between the intra- and/or extra-cellular actions of polyphenols, redox cell status and gene regulation, hence broadening the notion of antioxidant polyphenols to activities other than just free radical scavenging." The health benefits derived from consuming whole-grain cereals are believed to be multi-factorial, brought about by the synergistic action of numerous bioactive compounds, which are mainly contained in the bran and germ fractions of cereals. Examples include sulfur compounds that are precursors of GSH, as well as methyl donors and lipotropes (betaine, choline) that may be involved in cardiovascular and/or hepatic protection, improving lipid status and DNA methylation.

Hollman (2010) has also drawn attention to the multi-faceted actions of bioactive compounds in foods. Based on a meta-analysis of human intervention studies, he found little evidence of flavonoid-rich foods affecting biomarkers of lipid peroxidation, thereby raising doubts on *in vivo* antioxidant effect of flavonoids. "Flavonoids have a limited bioavailability and only low concentrations are present in the systemic circulation and tissues. The extensive metabolism of flavonoids during absorption and distribution in the body greatly diminishes their antioxidant activity."

Nature has endowed our plant foods with an amazing array of bioactive phytochemicals. While epidemiological and experimental studies have unraveled the actions of many of them in relation to human health, many more remain elusive, awaiting investigation into their pharmacodynamics. Is it through their actions on endothelial function, platelet activity, glucose tolerance, cholesterol or other pathways that cancer and cardiovascular morbidity and mortality are modulated? Evidence is mounting for the multi-factorial synergistic action of these bioactives in bringing about their health benefits, beyond one-dimensional action only.

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