



ANTHONY FARDET

INRA, UMR 1019, UNH, CRNH Auvergne,
F-63000 CLERMONT-FERRAND & Clermont Université,
Université d'Auvergne, Unité de Nutrition Humaine,
BP 10448, F-63000 CLERMONT-FERRAND, France



Anthony Fardet

Complex foods versus functional foods, nutraceuticals and dietary supplements: differential health impact (Part 2)

KEYWORDS: complex foods, functional foods, nutraceuticals, food structure, synergy, human studies, health potential.

Abstract What differentiates natural complex foods from nutraceuticals and dietary supplements is food structure, this latter involving nutrient interaction and synergism, and a complex mixture at nutritional doses. Scientific evidence showed that functional foods, nutraceuticals and dietary supplements (FND) have failed stopping chronic diseases epidemics: most conclusions of recent meta-analyses and systematic reviews are lack of significant health effect and needs for further studies. Why such disappointing results? Probably because FND results from a curative and reductionist nutritional approach while complex foods participates in a preventive and holistic approach. Indeed, reductionism has led to fractionate foods, isolating compounds from them for use at supra-nutritional doses in FND. Holism considers foods as complex systems in which the whole is more than sum of the parts leading to more sustainable health effects, and technological treatments more respectful of food structure.

An emphasis on synergism

Synergy means that $1 + 1$ is not equal to 2 but is higher than 2, e.g., as eloquently shown in vitro with a mix of rutin, p-coumaric acid, abscisic acid (1). In other words, the whole is more than the sum of the parts. For example, the strength of a cable is higher than the sum of the strengths of each steel rope constitutive of the cable and taken separately. Examples could be multiplied indefinitely. In addition, there are more and more papers showing convincing results about this issue.

Thus, Rayalam et al. have studied synergism between resveratrol and other phytochemicals and the implications for obesity and osteoporosis. They concluded that "combining resveratrol with other phytochemicals may provide an extraordinary potential for preventing obesity and osteoporosis by not only decreasing the dose of each compound, thereby avoiding potential toxic side effects, but also by targeting multiple signaling pathways affecting adipogenesis, apoptosis, lipolysis and osteogenesis simultaneously" and added that "these phytochemical synergies may make possible novel safe, potent and efficacious therapies" (2). Further, Wang et al. concluded that "combining foods across food categories was more likely to create an antioxidant synergism" (3).

In another study, authors have investigated the effect of botanical diversity on antioxidant status in healthy women. The reduction in urinary isoprostanes is higher following consumption of eighteen fruits and vegetable species than with only five botanical species. Authors concluded that "botanical diversity plays a role in determining the bioactivity of high-vegetable and fruit diets and that smaller amounts of many phytochemicals may have greater beneficial effects than larger amounts of fewer phytochemicals" (4). The second study is an observational study in which authors have tested the effect of fruit and vegetable variety versus quantity consumed: the consumption of a high variety of fruits and vegetables, but not quantity, was associated with significant better cognitive test scores (5).

These examples well illustrate that increasing botanical varieties within diets increases the number and diversity of bioactive compounds rather than their amount, leading to beneficial synergetic effects which are less predominant when increasing the quantity of only a few food compounds. This may have important implications for nutritional policies. For example, it is not sufficient recommending increasing fruit and vegetable consumption - such as in the French Programme National Nutrition Santé guidelines marks -, one must also recommend to increase botanical diversity.