

## Functional Foods Need More Mechanistic Studies

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A huge number of various research and clinical studies have now associated plant-based diet intake (especially rich in Polyphenols) with various beneficial health and biological activities. Functional foods and supplements have been found to reduce risk of chronic diseases, such as coronary heart disease, stroke, type 2 diabetes, obesity, neurodegenerative disorders and some cancers. For this reason, they are now regarded as important components of a healthy diet and are thought to be partly responsible for the health benefits of an increased fruit and vegetable consumption. For example, the rise of polyphenols and in particular, flavonoids potential to protect against oxidative stress linked to a host of diseases has seen a huge increase in the market of functional antioxidants [1]. In addition, functional nutrients have become essential not only for energy production and body matter of classic metabolism, but also a conditioning environment that modulates the epigenome activity and influences stress adaptive responses, energy metabolism, immune homeostasis, and the physiology of the body [2,3]. It can be postulated that the pleiotropic effects of plant phytochemicals on body systems can be translated into stable epigenetic patterns of gene expression, and thus diet interventions designed for healthy aging might become a hot topic in nutritional epigenomic research [4].

Functional Food Centres were established in USA, UK and other countries to integrate and combine the cutting-edge research expertise in the bio-medical sciences and nutrition with practical business experience in order to develop and commercialize functional foods for alternative prevention and treatment of chronic diseases and other human needs. The mechanisms for the biological actions of natural polyphenols have been mainly attributed to their antioxidant properties; however, during the last decade, extensive research has led to a new consensus and realization that these nutritional foods and products may exert their function through multiple mode of actions (pleiotropic effects) affecting various cellular pathways. Maraldi, et al. [5] have published an interesting article reviewing a multitude of dietary polyphenols and their effects on cell biochemistry and patho physiology. The pleiotropic effects of these polyphenols were evident as to their role in redox modulation and inflammatory processes, molecular signaling, stem cell proliferation and differentiation, metabolism regulation, potential effect in cancer and neurodegenerative diseases in addition to their known protective effects in lowering cardiovascular disease risk factors and blood pressure through their antioxidant properties and affecting endothelial nitric oxide synthase and thereby modulating nitric oxide bioavailability [6,7]. The mechanism of action of some natural compounds and nutraceuticals such as resveratrol and EGCG have been elucidated and found to be mediated by specific mechanisms other than its well-known anti-oxidant properties. We have discovered that polyphenols in pomegranate and green coffee can inhibit 11B-HSD1 activity, thereby improving mood and reducing stress by causing a slight reduction in blood pressure and the levels of the stress hormone, cortisol [8,9].

Another important findings presented during the 5th ICMAN5 in Brisbane, Australia [10] regarding the mechanisms by which natural products could exert their antihypertensive effect showed the multiplicity of actions (e.g. increased NO production, inhibition of renin and ACE activity, angiotensin receptor and calcium channel blockade, antioxidant and anti-inflammatory activities and opioid agonistic effect). This shows that natural products and plant extracts actions are mediated possibly through a naturally formulated, multi-mechanistic mode and in a synergistic way. Therefore, the task of elucidating the mechanism of action of these products will be far harder and require much more efforts. More mechanistic studies are urgently required to investigate the role of steroid hormones, interaction between Steroid, Peptide and Gut hormones, inflammatory markers, transcription factors and others. We all know, for example that steroid hormones regulate and maintain a number of biological functions in the body and interact with insulin, Leptin, PYY and others to achieve the desired

effect. Following that, we can progress the research in functional foods and understand how these products and their active constituents exert their action by influencing hormone levels (production, modulation or metabolism), translational factors (transcription factors and inflammatory markers) and other modulators. Only then Clinicians and the public will be fully convinced of the great benefits of natural foods and their derived nutraceuticals in the prevention and possibly the cure of some diseases.

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