

EDITORIAL

NutRedOx COST Action: Insight into Redox Compounds

For two years till now, the NutRedOx COST Action has developed a wide network not only within the European Union but also in non-EU Mediterranean countries. The prime focus of the network was on the impact of redox-active compounds in food on healthy ageing, chemoprevention, and redox control in the context of major age-related diseases [1]. A number of significant collaborations have been established, notably between researchers from different disciplines belonging to different participant countries. Short Term Scientific Missions (STSM) have been a crucial instrument to offer such opportunities. Resulting STSMs paved the way to establish solid collaborations between chemists, biochemists and nutritionists and between molecular biologists, nutritionists and microbiologists among others. A total of 34 STSMs were funded by the Action during the past two grant periods. These STSMs represent 946 investigation days for 11 Ph.D. students and 7 early career investigators coming from 13 Inclusiveness Target Countries and 2 near neighbor countries. In addition, two training programs were held during these last 2 years. The first one was held in Gdansk, Poland on the COMET assay, including 20 trainees from 12 participant countries. The second one was conducted in Lisbon, Portugal with two workshops: one on food metabolites and the impact of microbiota; and the second on cell migration (concept, mechanism and technics), including 24 trainees and 8 trainers from 13 participant countries.

Five scientific workshops with specific scientific sessions for each Action working group were organized: in Strasbourg (FR), Mallorca (SP), Gdansk (PL), Luxemburg (LU) and Lisbon (PT), accumulating 342 participants, with an average of 68 participants per meeting. The working groups have made significant progress during these meetings by focusing on the impact of redox-active compounds in food on healthy ageing, at different levels from nutrition to microbiota and their impact on different cell and animal models related to major age-related diseases.

The progress of action activities was disseminated in 5 special issues with more than 55 articles and abstracts published in *Nutrients* (MDPI publisher), *Current Pharmaceutical Design* (Bentham publisher), *Free Radical Research* (Taylor and Francis publisher), *Proceedings* (MDPI publisher) and *Biochemical Pharmacology* (Elsevier publisher). The launch of “*Current Nutraceuticals*” (Bentham Publishers) represents an additional engagement of NutRedOx members in the dissemination of a new scientific journal covering all aspects of nutraceuticals, including redox-active secondary metabolites, their synthesis and comprehensive analysis of their biological activities.

NutRedOx Networking permitted the publication of several articles providing an overview of natural products, particularly those issued from the Mediterranean Diet and their impact on health. Deligiannidou *et al.*, [2] reviewed the modulator compounds of Type 2 diabetes mellitus with hypoglycemic or nutriepigenetic effects. Composition of fatty acids, tocopherols, phytosterols and polyphenols has been reported by Zarouk *et al.* [3] for two mediterranean oils (Argan and Olive Oils) and their antioxidant and cytoprotective activities were evaluated. Among signaling pathways targeted by several natural compounds, Nrf2 signaling and its implication in the antioxidant activities were mostly highlighted. Accordingly, Paunkov *et al.*, [4] reviewed the role of the Keap1/Nrf2 signaling pathway and also the effect of antioxidant natural compounds on the thyroid gland. In addition, the involvement of the ERK/Nrf2 pathway was remarkably demonstrated based on a triterpenoid 18 α -Glycyrrhetic acid (derived from *Glycyrrhiza radix*) against DNA damage induced by mitomycin C treatment [5]. An excellent research work was reported for another antioxidant polyphenol, anthocyanin. Indeed, the antioxidative activity and health benefits of anthocyanin-rich fruit juice were evaluated in healthy volunteers, showing that anthocyanin-rich fruit juice improves DNA integrity and might influence lipid metabolism in humans [6]. Besides their antioxidant activities, several natural compounds possess additional anti-inflammatory properties as exemplified by the well-studied polyphenol, resveratrol. An interesting review has been published in 2019 [7] on the preventive effect of resveratrol towards alterations during the aging process based on clinical trials, preclinical studies, and cell culture approach. A special focus in this review was on the protective effects of resveratrol on brain aging of the elderly and its role in the microglial cells-associated neuroinflammation [7]. The bioavailability of natural compounds is crucial for their action but is dependent on their metabolism by the gut microbiome and on the intestinal permeability. Two interesting reviews were recently issued in this sense [8, 9]. Moreover, Del Bo' *et al.*, [10] reported a systematic review of polyphenol intake and its health outcomes. Natural compounds could also act as immunoadjuvants and their therapeutic effects can be triggered by increasing the stress and the immunogenicity of cancer cells culminating by immunogenic cell death [11]. Additionally, recent reviews on redox-active nutraceuticals highlighted their roles in nutrition and health in our modern society [12-14]. Healthy aging is not the sole question rather, lifestyles and habits also play key roles. As reported by Pastor and Tur [15], a combination of omega-3 fatty acid with exercise augmented lean mass in women, but not in men; and on the other hand, antioxidant supplementation protected muscle from exercise-induced damage.

NutRedOx network members disseminated to the large public through several “café Scientifiques” with public lectures. The network also disseminated its activities through the university Newsletters and social media profiles (LinkedIn, ResearchGate, Facebook and Twitter).

Collectively, this review of NutRedOx activities can be extended by following NutRedOx network activities through the social media: [researchgate.net/project/Personalized-Nutrition-in-aging-society-redox-control-of-major-age-related-diseases](https://www.researchgate.net/project/Personalized-Nutrition-in-aging-society-redox-control-of-major-age-related-diseases); [linkedin.com/company/cost-nutredox/](https://www.linkedin.com/company/cost-nutredox/); [facebook.com/NutRedOx/](https://www.facebook.com/NutRedOx/); and twitter.com/COSTNutRedOx.

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