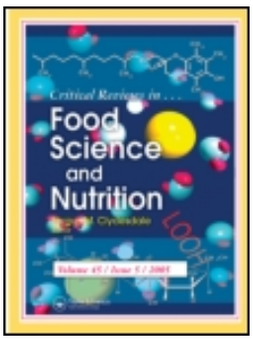

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Phytochemicals in Food and Nutrition

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The International Symposium on Phytochemicals in Medicine and Food (ISPMF2015) was held from June 26 to 29, 2015, in Shanghai, China. It is for the first time that a Phytochemical Society of Europe conference took place in China, which provided an opportunity for 270 scientists from 48 countries to communicate their up-to-date knowledge on phytochemicals. ISPMF2015 comprised exciting and various programs with 16 sessions, including 12 plenary lectures, 20 invited talks, 55 short oral presentations, and more than 130 posters. With the help of Prof. Fergus M. Clydesdale, a special issue of Critical Reviews in Food Science and Nutrition *containing 11 reviews from scientists was presented in this conference. In this special issue, bioactive flavonoids and polysaccharides for human health received significant attention.*

Keywords Phytochemicals, symposium, food, nutrition

The International Symposium on Phytochemicals in Medicine and Food (ISPMF2015), organized by the Phytochemical Society of Europe (PSE) and the Phytochemical Society of Asia (PSA), was held from June 26–29, 2015 in Shanghai, China. This was for the first time that a PSE meeting was held in Asia, and a PSE–PSA joint symposium provided an opportunity for communication between scientists from European and Asian countries. ISPMF2015 was jointly organized by Shanghai Normal University and Macau University of Science and Technology, and was jointly sponsored by Fujian Agriculture and Forestry University, Guizhou Medical University, Yancheng Institute of Technology, Beijing Normal University, and Fudan University. More than 270 scientists from 48 countries attended this meeting. The international organizing committee and scientific advisory board of ISPMF2015 comprised world's outstanding scientists. Dr. Jianbo Xiao from Macau University and Fujian Agriculture and Forestry University was the chairperson of the International Organizing Committee of ISPMF2015 and moderated the open address on June 26, 2015.

ISPMF2015 was supported by several journals, including *Critical Reviews in Food Science and Nutrition* (Taylor & Francis), *Comprehensive Reviews in Food Science and Food Safety* (Wiley), *Food Chemistry* (Elsevier), *Journal of Agricultural and Food Chemistry* (ACS), *Phytochemistry Reviews* (Springer), and *Nutrients* (MDPI). The special issue of *Food Chemistry* (Xiao and Georgiev, 2015) comprised six sections, namely dietary polyphenols, carbohydrate polymers, isolation and identification of phytochemicals, bioactivity of phytochemicals, phytochemical analysis, and chemistry of food process. Drs. Jianbo Xiao and Milen I. Georgiev were the managing guest editors of this special issue. More than 130 submissions were received, and 48 papers were selected for publication after peer review. The special issue of *Phytochemistry Reviews* (Xiao, 2015) published 15 selected invited reviews on "photochemistry aspect" from the keynote and invited oral presentations in this symposium.

The organizing committee of ISPMF2015 assembled an exciting and diverse programs, featuring 16 sessions, including isolation/structure elucidation of natural products, anti-cancer/cancer prevention, bioactivity of natural product, cardioprotection with phytochemicals, bioseparations and downstream processing of natural products, functional phytochemicals in food, carbohydrate polymers, pharmacokinetics of phytochemicals, biotechnology and bioprocess engineering for phytochemicals production, natural antioxidants, ethnomedicine and traditional food, leads finding from nature, antimicrobial and antifungal activities of phytochemicals, analytical techniques for phytochemicals, and polyphenols and human health. The program comprised 12 plenary lectures, 20 invited talks, 55 short oral presentations, and more than 130 posters, which were dedicated to create a podium for exchanging the results of latest research in phytochemicals for food and human health. ISPMF2015 was dedicated toward creating a stage for

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exchanging the latest research results in phytochemicals for food and human health.

Flavonoids, especially their glycosides, are the most important polyphenols in our diets with an extensive spectrum of benefits for human health, including antioxidant, anticancer, anti-inflammatory, anti-diabetes, and antiviral activities (Shao and Bao, 2015; Wang and Wang, 2015; Xiao and Högger, 2015; Xiao, 2016). Almost all natural flavonoids exist in their O-glycoside or C-glycoside forms in plants (Xiao, 2016). The dietary flavonoids, C-glycosides, have received less attention than their corresponding O-glycosides. Xiao et al. (2016) summarized current knowledge on flavonoid C-glycosides and their health benefits. Among the flavonoid C-glycosides, flavone C-glycosides were more frequently mentioned than others. Flavonoid C-monoglycosides are poorly absorbed with very few metabolites in urine and blood, and are deglycosylated and degraded in the colon by human intestinal bacteria. However, flavonoid C-multiglycosides are absorbed unchangeably in the intestine and distributed to other tissues. Flavonoid C-glycosides significantly exhibit antioxidant, anticancer and antitumor, hepato-protective, anti-inflammatory, anti-diabetic, antiviral, antibacterial, and antifungal activities. It seems that C-glycosylflavonoids in most cases show higher antioxidant and anti-diabetic potential than their corresponding O-glycosylflavonoids and aglycones. However, there is a lack of in vivo data on the biological benefits of C-glycosides.

Menezes et al. (2016) highlighted the therapeutic potential of natural and synthetic flavonoids as anticancer agents in leukemia treatment, emphasizing the structure–activity relationship (SAR) and molecular mechanisms. The SAR analysis suggests that flavonoids with 2,3-double bond and 5,7-hydroxyl group have apoptosis and differentiation effects. Moreover, the hydroxyl group at C-4′ position in B-ring is a key for granulocytic differentiation. The methylation and alkylation of flavonoids enhances their oral bioavailability and induces essentially monocytic differentiation effects. Methoxylation of flavones/flavonols at C-8 position in A-ring may improve the activity. The flavanones show low activity in inducing apoptosis, except for hydroxylation at the C-4′ and C-6 positions; however, an additional prenyl group improves cytotoxicity.

The evidence suggested that the consumption of strawberries is linked with the prevention of chronic degenerative diseases. Forbes-Hernandez et al. (2016) updated and discussed the molecular and cellular mechanisms of the healthy effects of strawberry polyphenols against common chronic diseases. The antioxidant capacity of polyphenols found in strawberry was previously proposed to be its first mechanism. However, recent findings have demonstrated that besides being antioxidant, polyphenols can interact with cellular signaling cascades, which regulated the activity of transcription factors, and consequently affected the expression of genes involved in cellular metabolism and survival.

Isoflavones are the most widely consumed phytoestrogens in diets. Wahajuddin (2016) summarized the up-to-date literature on isoflavone–drug interactions to explore the possible mechanisms and their implications on clinical outcomes. Isoflavones exert potent modulatory effects on the activity of drug metabolizing enzymes (DMEs) and drug transporters. The exact clinical outcome of isoflavones–drug interactions cannot be predicted from experimental data alone. Isoflavone glycosides have less affinity and show inconspicuous effects on transporter activity than aglycones. Most isoflavones show competitive inhibition mechanism for DMEs/transporters; however, the involvement of transcription factors has also been shown for some. More studies that are mechanistic are nonetheless required to enhance our predictive tools to get an accurate in vivo projection.

In recent decades, polysaccharides from medicinal plants have attracted significant attention due to their benefits for human health. Xie and coworkers (2016) comprehensively reviewed the most recent developments in physiochemical and structural features and bioactivities of polysaccharides from a number of important medicinal plants such as *Astragalus membranaceus*, Dendrobium plants, Bupleurum, Cactus fruits, *Acanthopanax senticosus, Angelica sinensis* (Oliv) Diels, *Aloe barbadensis* Miller, and *Dimocarpus longan* Lour. The authors also summarized the applications of these bioactive polysaccharides. Many bioactive polysaccharides can be used as antitumor, immuno-stimulating, or anticancer agents. The tumor microenvironment comprises tumor cells and their surrounding environment. The tumor microenvironment is considered a new target for antitumor therapy. Liu et al. (2016) summarized the regulation effects of polysaccharides on tumor microenvironment. Natural polysaccharides have some advantages such as plentiful source and less adverse reactions. Other phytochemicals are difficult to compare with them. With further research, polysaccharides, which take tumor microenvironment as a target, may become a new field of antitumor therapy.

Phytochemicals derived from edible medicinal plants have been investigated intensively for their healthy benefits. However, their detailed mechanism and corresponding molecular targets frequently remain elusive. Wong et al. (2016) summarized the phytochemical-mediated molecular targets identified via proteomic approach. The authors highlighted that a comparative proteomic is considered as a powerful tool in the identification of phytochemical-mediated protein target.

Table vinegar, rich in acetic acid, is a traditional healthy food used in China and Japan. Yamashita (2016) highlighted the biological benefits of acetic acid in obesity and diabetes. It was revealed that acetic acid was formed as a final product of enhanced β-oxidation of fatty acids, and utilized as a fuel in extra hepatic tissues under starving conditions. Under the fed condition, β-oxidation is suppressed and acetic acid production is decreased. Furthermore, acetic acid contributed to protect from the accumulation of lipid in the liver as well as abdominal fat. It is indicated that exogenously administered acetic acid would have effects on lipid metabolism in both liver and skeletal muscles, and has a function that works against obesity and obesity-linked type 2 diabetes.

Fruits and vegetables rich in antioxidants are perishable and difficult to preserve as fresh products, which can be resolved by drying. Kamiloglu et al. (2016) reviewed the effects of different drying techniques on antioxidants in fruits and vegetables such as ascorbic acid, carotenoids, flavonoids, and phenolic acids. In most cases decrease in antioxidant content is observed, which can generally be attributed to oxidation processes or thermal degradation. However, in some cases, it significantly improves the content of some antioxidants. In general, the freeze-drying is a better drying method to preserve antioxidants, and leads to higher extraction efficiency of antioxidants.

The consumption of edible flowers with numerous phytochemicals has significantly increased in recent years. Lu et al. (2016) reviewed the species, traditional application, phytochemicals, health benefits, and the toxicology of common edible flowers from 2000 to 2015. In 15 species of common edible flowers, flavonols, flavones, flavanols, anthocyanins, and phenolic acids were the main bioactive components. The edible flowers are reported to have antioxidant, anti-inflammatory, anticancer, anti-obesity, and neuroprotective effects.

Temperate forage legumes belong to Fabaceae species and include worldwide important crops. Cornara et al. (2016) reviewed the phytochemical and pharmacological potential of forage legumes. The major compounds were identified as alkaloids and amines, cyanogenic glycosides, flavonoids, coumarins, condensed tannins, and saponins, which have antihypercholesterolemia, antidiabetic, anti-menopause, anti-inflammatory, anti-edema, anthelmintic, and kidney protective effects. Two widely prescribed drugs have been developed from temperate forage legumes, namely the antithrombotic warfarin, inspired from sweet clover's coumarin, and the antidiabetic metformin, a derivative of sainfoin's guanidine.

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