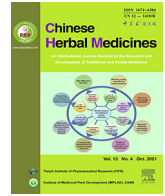




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Editorial

'Food and medicine continuum' – Why we should promote cross-cultural communication between the global East and West

It is estimated that by 2030 one sixth of the global population will be aged over 60 (WHO, 2021). Aging leads to functional decline, which triggers many chronic diseases and geriatrics. It is reported that the elderly often suffer from geriatric syndromes such as frailty, sarcopenia, weight loss and dementia (Sanford et al., 2020); for those aged over 85, conditions of hearing and vision loss, decline in immune function, cardiovascular diseases, osteoporosis and dementia are in high prevalence (Jaul & Barron, 2017). Therefore, aging has been an important risk for chronic diseases and geriatrics globally.

However, there is no “pills” to cure such chronic diseases and geriatrics, instead, maintaining healthy behaviors throughout life may reduce the risk (WHO, 2021). It has been shown that diets prevent or ameliorate illnesses and disorders commonly associated with the personal aging process and thus help with a society's aging population (Heinrich & Prieto, 2008). There is a tradition to use herbal medicines in diets for sustaining health both in the global West and East. Based on classical Greek tradition, 'Let thy food be thy medicine and thy medicine be thy food' was an important philosophical and medical basis for treatments and prevention, a statement linked to the School of Hippocrates (ca. 460 B.C.E.–ca. 370 B.C.E.) (Witkamp & van Norren, 2018). In Asian regions, the written evidence for the concept of a food and medicine continuum has been traced back to an herbal of the 1st century C.E. – *Shennong's Classic of Materia Medica* (*Shěnnóng Běncāo Jīng* in Chinese). It recorded 120 herbal medicines of the 'top grade' with nourishing properties and they can be consumed for extended periods of time, indicating their functional food and medicinal benefits (Liu et al., 2015). In the last few decades, the bioactivities of many edible Chinese herbal medicines and their metabolites have been investigated in great detail. For example, many edible plants, such as ginseng, angelica, liquorice, goji, etc., showing effects linked to enhanced immunity (Song et al., 2021). The benefits of dietary interventions and specifically plant (and fungal) metabolites on cognitive functions which often is negatively affected in aging is now supported by a growing body of evidence (Howes et al., 2020). Therefore, food and medicine dual-use products are important in the prevention and intervention of chronic diseases and geriatrics.

Take goji – the fruit of *Lycium barbarum* L. as an example, in some regions it also refers to *L. chinense* Mill. For two millennia in Asian countries, it has been used traditionally as a food and medicine (Yao et al., 2021). In recent years, it has been increasingly accepted as a 'superfood' on the 'global' market (Yao et al., 2018).

Hundreds of metabolites have been isolated from goji, many with some evidence for positive health properties (Qian et al., 2017). For example, polysaccharides have been shown to act as anti-oxidants, as anti-diabetic, immunomodulatory, neuroprotective, anti-fatigue and anti-aging agents, on spermatogenesis, they are hepatoprotective, etc. Carotenoids, especially zeaxanthin, demonstrated protective effects related to retinal protection and act hepatoprotectives (So & Mi, 2015; Yao et al., 2018). Spermidines are a class of polyamides from goji, which may have activities relevant in the management of Alzheimer's Disease (AD) (Zhou et al., 2016; Chen et al., 2021). Using network pharmacology, the potential functions against diabetes, retinitis pigmentosa, cancer, hypertension and AD were postulated theoretically (Lu et al., 2020; Tan et al., 2020; Yalamanchili et al., 2020; Ou et al., 2021); claims which still require a pharmacological assessment. As a result, goji is an edible herbal medicine with a vast range of activities relevant in the management of aging-related diseases and specifically their prevention.

Numerous food plants derived from European and North American traditions have shown health beneficial effects, like sea buckthorn - *Hippophae rhamnoides* L. (Ciesarova et al., 2020). Lipophilic carotenoids and tocopherols and hydrophilic flavonoids, tannins, phenolic acids, ascorbic acid act as antioxidants and diverse other health promoting effects have been established.

Other than goji and sea buckthorn, there are many edible herbal medicines with diverse functions (Heinrich, 2016). Such extracts and metabolites isolated from them have some well-understood physiological effects and long-term are likely to be safe. Therefore, they could be developed into new products to be used in the prevention chronic diseases specifically in geriatrics (Liu et al., 2015; Liu, 2018).

Different biocultural environments and the historical developments have resulted in different knowledge system related to food and medicine. The continuum between these two categories differs between cultures and societies including between the global East and West. Firstly, many of the species used in the East are seldomly used in the outside its region of origin. Since 1987, the Chinese government has published a list of “substances which are used traditionally as both food and Chinese Materia Medica”, a list which is constantly being updated. Until 2021, 115 materia medica are included in the list. However, according to our evaluation, only 53 of these are used in the Europe as health food, spices or herbal medicine. Even many of the very commonly used ones in China may not be used in the West, such as honeysuckle (*Lonicera*

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spp.), the flower bud of which is used for herbal teas, and lily (*Lilium* spp.), the bulb of which is used for medicated meals. There are numerous barriers to this, for example, a lack of safety data, which follows the standards of the relevant regulatory authorities or simply that in this region the plant would be a novel food. At the same time, many of the species used in North America or Europe are seldomly used in the China. We examined the 'Top-Selling Herbal Supplements in 2020 in US Mainstream Multi-Outlet Channel' (Smith et al., 2021). Only 14 species (or products containing purified extracts) of the top 40 were also commonly used in China as spices or herbal medicines. For example, Ashwagandha (*Withania somnifera* (L.) Dunal), ranking 12th with a total sale of over 31 million USD in the US, is little-known on the Chinese market. Interestingly, this species is originally from India and adjoining countries, but is not (yet) relevant in China. In case of some species are used in both sides, the plant parts and usages may differ. For example, Crataegus (fruits of *Crataegus* spp.) is commonly used as herbal teas or spices for digestive problems, while in the Europe, a combination of flowers and leaves has a long tradition of use for cardiovascular health. The use of ginkgo (*Ginkgo biloba* L.) presents as an invention by the West: in the East the seed is often used for medicated meals, while in the West a special leaf extract is commonly used as an herbal medicine (in some countries licensed in the treatment of cognitive decline) or a food supplement (Heinrich, 2013).

These differences and the varied expectation highlight the need for cross-cultural communication between the different cultures globally and here specifically between Europe / North America and China. This communication needs to be based on a detailed understanding of the scientific basis (which is universal), but also different interpretations of these data, as well as different approaches, expectations and the wider cultural background. The economic developments can only work if communication is at the centre of the process.

Since the interpretation of the food and medicine continuum differs greatly in the various regulatory systems, cross-cultural communication between the global East and West will lead to the exchange of knowledge on foods and medicines and their acceptance within such cultural and regulatory systems. Understanding the various continua between food and medicines will further facilitate the common health policy globally, contributing to better health for all and more generally to achieving the Global Sustainable Development Goals (<https://sdgs.un.org/goals>). Ultimately, the challenges posed by an aging population are common to countries on all continents as soon as they have entered a phase of fast socio-economic development and require an international, transdisciplinary, and sustainable approach by all stakeholders.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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