

## From plants to pharmacy shelf: natural products revival

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Throughout most of history medicinal plants (and their bioactive principles) have long had a central role in the treatment of a wide spectrum of diseases, hence continuously supporting the health of human populations (Cragg et al. 2014; George et al. 2016). Traced back to Paleolithic Age, hunter-gatherer ancestors possessed extensive empirical knowledge (sense experience) on the nutritional and medicinal properties of surrounding vegetation (George et al. 2016).

Nowadays, in excess of quarter of modern medicines are derived either directly or indirectly from plants; moreover in case of cancer therapy and infectious diseases these numbers exceed 60–75 % (Georgiev 2014). According to the Directive 2004/24/EC of the European Parliament and of the Council herbal medicinal product is “any medicinal product, exclusively containing as active ingredients one or more herbal substances or one or more herbal preparations, or one or more such herbal substances in combination with one or more such herbal preparations”. De Luca

et al. (2012) estimated that the most important commercially relevant pharmaceuticals to be derived from plants are valued at over 22 billion euros on an annual basis. Taxol (antineoplastic), galanthamine (reversible cholinesterase inhibitor), codeine and morphine (analgesic) and artemisinin (antimalarial) are amongst the best-selling drugs worldwide. It is worth of mentioning that the discovery of artemisinin (a sesquiterpene lactone, isolated for the first time by prof. Youyou Tu from *Artemisia annua* L.) was recently awarded with Nobel Prize in Physiology and Medicine 2015 (Efferth et al. 2015). Natural products revival, isn't it?

Recently in the USA, for instance, two new drug applications have been approved for marketing botanical products as prescription drugs, namely Veregen (sinecatechins), a topical drug for the treatment of genital and perianal warts and Fulyzaq (crofelemer), an oral drug for the treatment of HIV/AIDS related diarrhea. These two new drug applications approvals are testimonial examples that new therapies derived from complex botanical mixtures can be developed to meet modern FDA standards of quality, safety, and efficacy as new drugs (Lal 2015).

In October 2015, the Novotel Hotel in Plovdiv (Bulgaria) hosted the 2nd International Conference on Natural Products Utilization: from Plants to Pharmacy Shelf (ICNPU-2015; [www.icnpu2015.cim.bg](http://www.icnpu2015.cim.bg)), jointly organized by the Phytochemical Society of Europe (PSE) and its sister society in Bulgaria, the recently

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established Bulgarian Phytochemical Society (BPS). In excess of 330 scientists and exhibitors coming from ca. 50 different countries attended the meeting. The international committee of ICNPU-2015 assembled an exciting program, featuring diverse keynote lectures of Bharat B. Aggarwal (USA), Alisdair Fernie (Germany) and Rob Verpoorte (The Netherlands), consecutively followed by 15 plenary and invited talks, 52 oral presentations and 254 posters. Several awards were kindly provided by the sponsors, i.e. four TEVA awards, Elsevier best poster award, Springer best poster award, CRC best poster award and BPS best poster award. As a tradition, ICNPU meetings focus on the emerging trends in the treatment (and prevention) of malignancies, sustainable (bio)production and use of natural products, and the emerging omics platforms toward accelerated lead finding. This editorial article aims at giving little insight into natural products-related research, presented at the ICNPU-2015 conference.

The importance of traditional medicinal plants is introduced by a set of excellent reviews on *Rhodiola rosea* (golden root), *Saussurea laniceps* (snow lotus) and *Astragalus* species (Fabaceae), their bioactive molecules as well as records of accomplishment in traditional use (Chen et al. 2016; Krasteva et al. 2016; Marchev et al. 2016). The development of modern biotechnological approaches for sustainable supply of high value molecules (Georgiev and Weber 2014) is also outlined.

Further, Luca et al. (2016) highlighted the antitoxic potential of dietary flavonoids. Some dietary flavonoids have shown an immense protective effect against DNA damage, induced by different genotoxic agents such as mycotoxins, food processing-derived contaminants, cytostatic agents, other medications (estrogenic and androgenic hormones), metal ions, radiopharmaceuticals and ionizing radiation, and etc. In another excellent review, Koziol and Skalicka-Wozniak (2016) outlined the pharmacological potential of imperatorin (a furanocoumarin derivative) in the treatment of central nervous system and cardiovascular disorders along with its antineoplastic and antiviral properties. The isolation and purification of imperatorin by means of counter-current chromatography is also nicely covered.

According to Cragg et al. (2014) there is an urgency to discover new drugs and leads for the treatment of infectious disease that are rapidly developing

resistance to previously effective drugs. Mikulasova et al. (2016) summarized the potential synergism between antibiotics and natural products (plant extracts and essential oils) with efflux pump inhibitory activity, towards coping with multidrug-resistant staphylococci. Parasitic infections, caused by *Leishmania* parasites, remain a severe public health problem, especially in developing countries where it is highly endemic. In another comprehensive review, Oliveira et al. (2016) discussed the current knowledge on the marine invertebrate extracts and pure compounds against *Leishmania* parasites along with the data on structure–activity relationships and possible mechanisms of action.

I am deeply grateful to Rob Verpoorte, Editor-in-Chief, for his continued support to ICNPU meeting series, and great efforts and tireless exertion in promoting natural products research. An enormous support of the PSE and its President—Prof. Dr. Miroslav Strnad (Institute of Experimental Botany, Olomouc, Czech Republic)—is greatly appreciated.

Looking forward to hosting you again at ICNPU-2017!

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