Natural products: call for hard evidence

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Abstract

Given the potential of natural products (NPs) for various aspects of human well-being, it is important to involve a variety of stakeholders and disciplines in the investigation of their health-related properties. For this reason, IUPHAR has initiated a project aimed at establishing a science-based registry of NPs and their pharmacological activities, with a view to providing a better understanding of their potential influences on human health. From a pharmacological perspective, it is important to evaluate the effects of selected NPs on important determinants of health such as, e.g. immune response and inflammation (among others). IUPHAR calls for a concerted effort and asks stakeholders to contribute to this project.

Introduction

Wild plants, algae, fungi, etc. are an essential part of the diet of people all over the world (Bacchetta et al., 2016). According to the Food and Agriculture Organization of the United Nations (FAO), more than 100 million people in the European Union, or about 20% of the world’s population, consume wild plants as part of their diet or for medicinal purposes (Bacchetta et al., 2016). A further > 65 million (14% of the world’s population) occasionally collect some form of wild plant (Bacchetta et al., 2016). In the context of human evolution, wild plants are of particular importance as they are at the dynamic interface between food and pharmacology. Plants are not just a simple food, but can also be a type of dietary supplement with hypothesized cardio- and chemopreventive properties (Lu, Friedrich, & Efferth, 2023; Visioli, 2022). Moreover, some plants contain potentially antibacterial products that could theoretically be used in the current search for new antibiotics (Bacchetta et al., 2016). Indeed, the bioactive components of plants (hereafter referred to as natural products, NP) are being actively researched by pharmacologists worldwide.

In addition to pharmaceutical preparations, health food stores in many countries offer products made from or enriched with NP (Visioli, 2022). Examples include coffee based on Cichorium intybus, syrup made from Taraxacum spp. and pasta to which the powder of Urtica spp. has been added to take advantage of the alleged health benefits of NPs (Bacchetta et al., 2016). However, the true nature and extent of the pharmacological activities of NPs are still largely unexplored (with some notable exceptions, e.g. morphine or capsaicin among others). Furthermore, the actual impact of regular consumption of these molecules on the prevention of chronic diseases is currently unclear. Scientists have shown that wild vegetables often contain high concentrations of minerals, phytochemicals such as (poly)phenols, terpenoids or polysaccharides and high levels of some vitamins, e.g. A and C. In fact, a plant-based diet is associated with better health (Willett et al., 2019). One of the proposed mechanisms of action is that various plants produce biologically active secondary metabolites, many of which are thought to be involved in plant defense mechanisms. From an ethnopharmacological perspective, people have used plants for pharmaceutical reasons (Bacchetta et al., 2016). Today, many active compounds are extracted from plants and formulated and marketed as “nutraceuticals” or “functional foods”, often with ambiguous legislation and a “natural” halo effect (Visioli, 2022).

Nevertheless, there is little data on the efficacy and safety of NPs in pharmaceutical food preparations as
only a very limited number of plant species have been thoroughly investigated. Large arrays of molecules are poorly characterized (Tome-Carneiro & Visioli, 2016). Similarly, there are few surveys on NPs for veterinary medicine, which is an ever-growing market (Stoev, 2024). The metabolic pathways of NPs can also produce toxic compounds that need to be detected to protect human and animal health. Complex extracts may also contain high levels of toxins that have accumulated in the environment; this is not the case with synthetic pharmacological preparations. Most importantly, the vast majority of NPs have been studied in in vitro models using human cells (often at supra-physiological concentrations) and have indeed been shown to possess potentially beneficial activities that have yet to be demonstrated in vivo, particularly in humans (Tome-Carneiro & Visioli, 2016).

Given the potential of NPs for various aspects of human well-being, it is important to involve a variety of stakeholders and disciplines in the investigation of health-related properties. For this reason, IUPHAR has initiated a project aimed at establishing a science-based registry of NPs and their pharmacological activities, with a view to providing a better understanding of their potential influences on human health.

There is a need for a joint effort. A successful research activity should take up the challenge of establishing scientific collaboration between different disciplines and between scientists and society in order to promote discussion on knowledge, practices and values and generate results that are relevant to pharmacology and society in general.

From a pharmacological perspective, it is important to evaluate the effects of selected NPs on important determinants of health such as immune response and inflammation (among others). This activity should ideally be extended to the evaluation of the pharmagenomic effects of selected NPs in humans. The broad spectrum of bioactivities that characterize NPs (those that are well-characterized molecularly, and much less characterized crude preparation, e.g. teas) should be thoroughly tested to improve human health, ideally following the protocols of allopathic medicine.

Finally, appropriate dissemination and communication activities are essential to raise consumer awareness of NPs and their use in order to optimize their consumption as healthy and – as mandatory part of future politics - environmentally friendly “medicines”. These activities should also gain the support of stakeholders and policy makers to expand efforts for the in situ and ex situ conservation of plants with high phytochemical content in a virtuous cycle.

We believe the time is right to produce and disseminate hard evidence on the pharmacological actions of NPs and we ask stakeholders to contribute to the IUPHAR’s effort.

References
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