

Herbal medicine as an element that supports new technologies in medicine

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Abstract

Prescription drugs have dominated the medical market. However, the values of herbal substances are being increasingly appreciated. The active compounds that occur in particular parts of the plants are characterized by a number of beneficial properties, such as antioxidant, antimicrobial and anticancer effects. Herbal preparations, despite their natural origin, may have undesirable side effects. Their use should be consulted in connection with the correlation of active substances in herbs with other medications. Plants owe their precious properties to biologically active compounds. It is these substances that are isolated from the individual parts of plants and used in medical devices. The development of modern medicine is closely related to the deepening knowledge about the possibilities of using herbal remedies in the treatment of modern civilization diseases. Research confirms that plants are still offering new medicines to people. They play a dynamic role in the fight against many deadly diseases, such as cancer and viral hepatitis. The beneficial effects of herbs still hide many secrets.

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Introduction

Knowledge about the health-promoting properties of herbs dates back to the beginnings of human existence. The lack of availability of pharmaceutical preparations has led to the necessity of using natural products. Their precious health-promoting effects made the herbs gain value. They are a valuable product in general with many diseases of modern age. Wide availability and various properties have made plant products a beneficial element in the support of current medicine.

History of herbal medicine

The world of plants has been known to man since the very beginning. In the old days, information about the health-promoting properties of herbal raw materials was passed down from generation to generation. The first herbs were used only as spices. It was only through trial and error that their beneficial effects on individual diseases were recognized. Guided by the principle of “similar cure like”, particular attention was paid to the shape of the raw materials that were used. Thus, heart-shaped plants helped with heart disorders, fruits similar in shape to the head were used in head ailments, while the inflorescence of the yellow color healed liver instability [1-4]. The beneficial effects on our bodies of particular plants are conditioned by the presence of many biologically active compounds in them. It is these substances that determine the profile of a given herb. They occur in each plant in different proportions and composition. These differences depend to a large extent on the environmental conditions in which a particular herb grows, as well as on the way of cultivation, harvesting, and further processing. The biologically active compounds that occur in plants can include essential oils, polyphenols, flavonoids, alkaloids, glycosides, saponins, anthocyanins, and tannins. Most of these substances cannot be synthesized by the body, so we need to ingest them in food which is of key importance in the prevention of most civilization diseases [5,6]. Nowadays the importance of herbs as a raw

material beneficial to the body is on the increase again. The knowledge gained by our great-grandfathers is used in the field of science, which is herbal medicine [7].

Phytomedicine

The term phytomedicine literally means “herbal medicine” or “plant medicine”. However, the very meaning of the word is much wider. This is a field of science dealing with the production of herbal medicine and treatment with herbal remedies. The area of work in this field also includes: the selection of active substances from herbs, the analysis of the effects of individual plants on various ailments, the combination of concentrations and several plant materials, as well as checking for possible adverse effects resulting from the consumption of a given herbal preparation [8,9].

Biologically active substances

The importance of plants as health-promoting raw materials is on the increase. The long-term analyzes of the impact of herbs on particular ailments confirmed their positive effect on the body. Plant raw materials have antibacterial, antifungal, anti-atherosclerotic, antineoplastic, antidiabetic and antioxidant properties. They owe their health properties to the presence of biologically active substances. This group includes flavonoids, tannins, alkaloids, sterols and terpanoids. Tannins have astringent effect which improves the healing of wounds and inflammation. Flavonoids and tannins are characterized by antifungal and antibacterial properties in relation to, among others, *Bacillus cereus* and *Staphylococcus aureus*. Tannins have been used in the production of soaps as substances that cleanse the surface of the skin. Saponins are dominant in relation to microorganisms, therefore they can be used as antimicrobial components. In addition, they have a beneficial effect in the treatment of cardiovascular ailments and in controlling cholesterol levels [10-14].

Application of herbal products

In many developing countries, such as the countries of Africa, Asia and some parts of Europe, due to the long history of medicinal plants, herbal medicine has the dominant role in the health care system [15]. Their popularity is due to several aspects. First and foremost, they are considered effective and safe. In addition, they are more available in comparison to prescription drugs, also in financial terms. In some parts of the world in rural areas, the health care system is very limited. There are problems with access to preventive examinations, specialist physicians and diagnostic devices. People are heavily dependent on traditional healing systems. They believe that in the disease-stricken area there are also plants that are characterized by therapeutic properties in relation to a given ailment [16]. The issue of perceiving herbal preparations as safer comparing to conventional medicines is noticeable in the literature. In medical journals, the side effects resulting from the use of prescription drugs are described more often. Herbal products are completely safe. Nothing could be more wrong. The fact that they are of natural origin is not synonymous with the statement that they cannot cause adverse effects. The main mistake resulting from the lack of knowledge about the side effects of herbal remedies is not to inform physicians during a medical appointment about taking herbal drugs. In the past, when people wanted to get a proper herb or plant mixture for a given condition, they had to visit the herbalist. Currently, shelves in stores are full of “natural products”. Starting from migraine preparations, through the products to improve our mood, to the products helping to improve our memory [17]. In the literature there are cases of interactions between herbs and medicines. Herbal preparations may reduce, increase or imitate the effects of some medicines. There are cases where the plant product itself is synergistic in relation to other medications. This may result in a “supertherapeutic” effect or lead to toxicity by disturbing the monitoring of disease states. In addition, some plant raw materials may change the level of absorption, metabolism and excretion of

other pharmaceuticals. As a result of inhibiting drug metabolism, the concentration of the drug may increase, and thus the increase of its effectiveness and the risk of toxicity. The situation is reversed in the case of plant preparations that affect the metabolism of other medicinal products. Then, the concentration of the drug substance decreases and the effectiveness of the treatment decreases [18].

The future of plant medicine

An increasing number of developing countries use herbal substances in new medical technologies. The World Health Organization has divided plant medicines according to their origin to four groups:

- local herbal medicines,
- herbal medicines in systems,
- processed plant medicines,
- imported products with a herbal base [19].

Currently, around 25% of used drugs are of plant origin. Many secondary metabolites have contributed to the increase in the number of herbal medicines. We can mention here: anticholinergic preparations (atropine), analgesics (opium alkaloids), antimicrobial (quinine) and antineoplastic agents (vinblastine/vincristine). The world of plants has also provided us with many effective substances that can be classified as anti-cancer: dactinomycin, bleomycin, doxorubicin, vinblastine, irinotecan, topotecan, etoposide and paclitaxel, antimalarial activity: mefloquine chloroquine, amodiachin artemisinin, dihydroememisinin, artemeter and arteeter, antidiabetic : metformin, harunganine, cryptolepin, maprouneacin and retroviral agents: calanolide A, kucinumminin, phenethyl isocyanate, phenoxidiol [19].

The plant world consists of several tens of thousands of different species. Most herbs have a specific effect on the disease. And the group of plants with anti-cancer activity includes: *Agapanthus africanus*, *Aglaila sylvestre*, *Apium graveolens*, *Bleckeria vitensis*, *Brucea antidysenterica*, *Bursera microphylla*, *Campotheca acuminata*, *Catharanthus roseus*, *Centaurea montata*, *Cephalotaxus harringtonia*, *Cleenthus collinus*, *Combretum caffrum*, *Croton lechleri*, *Daphne mezereum*, *Diphylleia grayi*, *Dysoxylum binectariferum*,

Erythroxylum pervillei, *Euphorbia semiperfoliata*, *Fritillaria thunbergii*, *Gunnera perpensa*, *Hypericum perforatum*, *Hypoxis colchicifolia*, *Indigofera tinctoria*, *Justicia procumbens*, *Lantana camara*, *Larrea tridentate*, *Paris polyphylla*, *Pestemon deustus*, *Phaleria macrocarpa*, *Pteris multifida*, *Vitex rotundifolia* and *Wikstroemia viridi*. About 3,500 million people around the world die every year. The high number of deaths, as well as the side effects of chemotherapy and radiotherapy, make people look for an alternative method of treatment [20,21].

Despite the development of conventional and natural medicine, diabetes is a common civilization disease in developed countries. The necessity to modify the diet in the case of this ailment has made the use of herbal preparations with anti-diabetic effect become popular. The plants exhibiting such properties are: *Alangium lamarckii*, *Albizia odoratissima*, *Axonopus compressus*, *Berberis vulgaris*, *Brassica juncea*, *Caesalpinia digyna*, *Catharanthus roseus*, *Centaurium erythraea*, *Chaenomeles sinensis*, *Cocos nucifera*, *Dillenia indica*, *Embelia ribes*, *Hybanthus enneaspermus*, *Lippa nodiflora*, *Lithocarpus polystachyus*, *Marrubium vulgare*, *Ocimum sanctum*, *Opuntia streptacantha*, *Psidium guajava*, *Semecarpus anacardium*, *Prosopis glandulosa*, *Ophiopogon japonicus*, *Setaria italica*, *Solanum torvum*, *Cassia auriculata*, *Zygophyllum album*, *Vitex negundo*, *Viscum schimperii*, *Symplocos cochinchinensis*, *Enicostemma littorale*, *Vaccinium arctostaphylos*, *Solanum xanthocarpum* [22,23].

Many herbal raw materials have analgesic and anti-inflammatory effects. Plants characterized by these properties are: *Albizia lebeck*, *Annona squamosa*, *Artemisia absinthium*, *Bauhinia racemosa*, *Carissa carandas*, *Cassia sieberiana*, *Cussonia paniculata*, *Daphne retusa*, *Desmodium triflorum*, *Diospyros variegata*, *Garcinia hanburyi*, *Gloriosa superba*, *Glycine tomentella*, *Heracleum persicum*, *Hypericum canariense*, *Hypericum glandulosum*, *Lactuca sativa*, *Lactuca scariola*, *Lantana trifolia*, *Leonurus sibiricus*, *Mahonia oiwakensis*, *Margaritaria discoidea*, *Newbouldia laevis*, *Pergularia daemia*, *Pogostemon cablin*, *Rheedia longifolia*, *Rivea hypocrateriformis*, *Smilax China*, *Trichilia connaroides*, *Trigonella*, *Xanthium strumarium*, *Xeromphis spinosa*, *Zizyphus lotus* [24,25].

In today's world, many people of childbearing age have fertility problems. Despite the great development of medicine, we firmly believe in natural medicine. Many studies have proved beneficial effects of plant preparations on fertility. The group of herbs with anti-infertility properties are: *Abrus precatorius*, *Acacia concinna*, *Acalypha indica*, *Achillea millefolium*, *Achyranthus aspera*, *Aegle marmalos*, *Ailanthus excels*, *Aspilia Africana*, *Ballota undulate*, *Cananga odorata*, *Capparis aphylla*, *Carrica papaya*, *Cassia fistula*, *Cnidioscolousa conitifolius*, *Crataeva nurvala*, *Croton roxburghii*, *Cuminum cyminum*, *Curcuma aromatica*, *Daucus carota*, *Rivea hypocrateriformis*, *Sesbania sesban*, *Trichosanthes cucumerina*, *Trigonella foenum graecum*, *Tripterygium wilfordii* [26,27].

The liver plays a key role in regulating metabolism by removing harmful substances and toxins from the body. Herbal medicines, due to their "natural" origin, are becoming more and more popular in the treatment of this disease. Among the herbs with protective properties in relation to the liver are: *Andrographis paniculata*, *Boerhavia diffusa*, *Cichorium intybus*, *Curcuma longa*, *Eclipta alba*, *Fumaria indica*, *Glycyrrhiza gabra*, *Picrorhiza kuraro*, *Polygala arvensis*, *Polygonum Bistorta*, *Solanum nigrum*, *Tamarindus indica*, *Taraxacum officinale*, *Tephrosia purpurea*, *Terminalia belerica*, *Tinospora cordifolia*, *Trichosanthes cucumerina*, *Vitis coignetiae*, *Wikstroemia indica* [28,29].

The combination of herbal raw materials for each ailment is difficult to describe. In the plant world there is a huge group of herbs showing beneficial effects on particular diseases. Plant preparations with sedatives (*Bacopa monniera*, *Panax quinquefolius*, *Piper methysticum*, *Rhodiola rosea*, *Valeriana officinalis* and *Hypericum perforatum*), digestive stimulants, alleviate mouth and gum irritations (*Acacia catechu*, *Acacia arabica*, *Althea officinalis*, *Anacyclus pyrethrum*, *Azadirachta indica*, *Barleria prionitis*, *Cinnamomum camphora*, *Cuminum cyminum*, *Eucalyptus globules*, *Gardenia gummifera*, *Holarrhena antidysenterica*, *Jasminum grandiflorum*, *Juglans regia*, *Pistacia lentiscus*, *Pterocarpus marsupium*, *Punica granatum*, *Salvadora persica*, *Salvia officinalis*, *Solanum xanthocarpum*, *Symplocos racemosa*, *Syzygium aromaticum*) and many others [30].

Herbal dietary supplements

The most popular herbal supplements consumed by society include dietary supplements. The pursuit of everyday life, the increase of demands placed before us at school or at work, stress, a sedentary lifestyle, stimulants they make people more and more often look for some ways to improve the quality of their lives. Dietary supplements are often used as a substitute for a properly balanced diet [31]. In most cases, raw materials of plant origin are used for the production of dietary supplements. However, herbal preparations cannot contain a higher dose of the active substance in the raw material than pharmaceutical products [32]. Dietary supplements are defined as non-pharmacological products used to supplement the diet with vitamins, minerals and amino acids. In addition, they can be used as regular food, a product of a given meal, or as a support for conventional medicine [33]. The use of plant-derived dietary supplements, as well as herbs themselves, may have side effects. They can contribute to reducing the absorption of many drugs, including antibiotics and cardiac drugs [34]. St. John's Wort is a herb with the most documentary drug interactions [35]. Some of the plant ingredients can have both, healing properties and adversely affect human health. An example is the Japanese ginkgo which has properties that inhibit platelet aggregation, increasing the risk of intracranial haemorrhage at the same time. Taking ginseng preparations may increase the effect of antidiabetic agents, which results in lowering the level of sugar in the blood. Taking products containing nettles for too long can lead to serious circulatory disorders, avitaminosis and disturbances in metabolism. Medicinal products, also of plant origin, should be taken under the supervision of a physician and with the awareness of benefits, but also possible side effects resulting from their use [36].

Conclusion

Herbal preparations are increasingly supporting for conventional medicine. Using modern technologies

you can control the quality and interaction of heterogeneous herbal products. As a result, they become safer and, due to the appropriate selection of proportions, may show better health-promoting properties. The basic use of plants in industry will continue in the future. They are the source of medicinal raw materials and semi-finished products in the cosmetics and food industry. Increased acceptance of plant products by recipients is reflected in the growing number of herbal preparations on the market [37].

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