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History and significance of phytotherapy in the human history

3. The development of phytotherapy from the Middle Ages to modern times

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Abstract: Thanks to the knowledge accumulated by successive generations over the centuries and advances in analytical techniques, phytotherapy has become one of the essential fields of medical sciences. Although herbal medicine was of lesser interest during some periods of development of our civilization, as in the case of rapid social changes, epidemics of the Middle Ages, or the development of antibiotic therapy in the 20th century, natural therapeutic methods based on plants are becoming increasingly popular, which is associated with, inter alia, the adverse side effects of synthetic drugs and resistance to long-term antibiotic therapy.

1. History of phytotherapy – Middle Ages (5th–15th centuries)

In medieval Europe, advances in medical sciences were effectively hampered by the church, which strongly opposed all the experiments and considered diseases as punishment for sins. At that time, various superstitions and beliefs about individual herbal plants were common. Treatment was provided either by apothecaries whose services were mainly dedicated to the rich or fork healers, shepherds and old women attempting to assist the poor [1].

In the 9th century, the world's first medical school was established in Salerno (Italy), where the knowledge of medicines, mainly plant-derived ones, described in old Greek, Roman and Arabic works, was taught in several languages. In 1224, the school was transformed into a university with medical studies. The university's major contribution was the preparation of Regimem Sanitatis Scholae Salernitanae, a poem written in Latin that provided information about the rules of hygiene and diet as well as the use of medicinal plants. This extremely popular poem, for several centuries popularizing knowledge about medicinal plants and their practical applications, has been republished multiple times and translated into almost all European languages (in 1775 also into Polish).

The knowledge about the effects of numerous herbal plants was also broadened and developed by crusades, which provided an opportunity for individuals involved in them to get acquainted with the goods imported from east Asia or other regions. It was then that Europe met spices such as pepper, cloves, cinnamon, and nutmeg. Moreover, the knowledge about raw materials and medicinal products was also spread thanks to the herb/spice trade with Arabs (8 -13th centuries) [1].

In medieval Europe, herbalism was mainly dealt with by Christian monks living in monasteries, who contributed to the development of monastic medicine [2]. Based on their knowledge, monks gardened various herbs and used them to prepare mixtures for different ailments. In the monastic cellars, however, monks also brewed beers and

prepared herbal tinctures - some of them are still famous and appreciated (e.g. Benedictine tincture). All the products were initially sold in monastic pharmacies. It was only in the 13th century that secular pharmacies began to be established, yet they enjoyed less trust as the prices of products were higher and their quality questionable. In addition to medicinal herbs, the pharmacies offered scents and spices; therefore, they were called pepper storerooms or spice shops.

The monks were not only engaged in the cultivations of herbs and preparation of herbal medicines but also spared no effort to spread their knowledge concerning herbalism. An example is the Benedictines who copied and translated into Latin some ancient works (including those dealing with medicine) [1]. In 1045, the Benedictines were brought to Tyniec near Krakow and shared their experience with those interested in. Thanks to them, such plants as mint, rosemary, sage, rue, thyme, coriander, and lovage were popularised. Some other orders, e.g. Cistercians, Camaldolese communities, Franciscans and St. John of God members, were also involved in herbalism.

In the Middle Ages, the art of designing exceptionally large and richly illustrated herbariums, which were peculiar catalogues of medicinal plants, was developed [1]. Monks and priests excelled at this art. One of the most deserving figures of medieval herbal medicine was St. Hildegard, a priory of the Benedictine monastery of Bingen (11th/12th century). In her work *Physica*, Benedictine described about 250 species of plants, considering their medicinal and nutritional properties. Saint Albert the Great was a translator and reviewer of Aristotle's works; moreover, he wrote numerous dissertations focused on nature. In Poland, the first medical treatise was probably *Mihi competit* written by Thomas of Sarepta, an English Catholic priest, bishop of the Wroclaw diocese and a physician.

The 14th century was the time of plague; numerous epidemics of bubonic plague and other infectious diseases killed about ¼ of the world population. Such dramatic events induced a regress in all areas of life. Despite their basic knowledge of herbalism, the medieval physicians could not prevent the consequences of the pandemic. Only dishonest pharmacists sold extremely expensive spices, such as nutmeg and cloves, allegedly helping to preserve health and life.

2. History of phytotherapy – Renaissance (15-16th century) and later centuries.

The great expeditions of the end of the 15th century, in particular the discovery of America (1492) and the sea route to India (1498), gave hope for those ruined by epidemics; people learnt about new plants (cocoa, vanilla, pepper, potato, sunflower, pumpkin and corn), new herbs (cinchona, eucalyptus, condurango, Peruvian Ambrette) and novel treatment options. Seeds and seedlings of new plant species were brought to Europe to observe their growth and reproduction, to determine their usability and for teaching purposes. To extend the knowledge of the newly imported plants, botanical gardens were established, which were run by scientific staff. The first European garden was founded in Padua in 1545 by Professor Francisco Buonafede, where plants brought to Europe from remote regions of the world were cultivated to study the effectiveness of new therapeutic raw materials. In Poland, the first botanical garden was established in 1775 in Grodno; the next ones were designed in Vilnius, Krakow, Kremenets and Warsaw. The gardens were important research and acclimatisation centres, contributing to the popularisation of medicinal and usable plants [3].

Gutenberg's invention of printing and the publication of the Bible (the first printed book) in 1455 enabled botanists and physicians to share

and popularize their achievements in the form of herbaria describing herbal plants, their properties and possible applications. Initially, the herbaria were written only in Latin, and over time they began to be published also in national languages [1]. The most popular herbaria of this period are: Herbarium vivat Eicones (1530) by Brunfels, De Historia Stirpium (1542) by Leonhart Fuch, Herbarium (1597) by John Gerard, The English physician (1649) by Nicholas Culpeper, and Theatrum botanicum (1669) by John Parkinson. In Poland, the first such books were "The interesting news, important to everyone, about the power of all grain, vegetables and various herbs…." by Jan Biretowski, "A physician for peasants" by Ludwik Perzyna, "Of herbs and their potency" by Stefan Falimirz (1534), "Herbal, which is the description of local and overseas herbs, their potency and application" by Marcin Siennik (1568) "The Polish herbal…." by Marcin of Urzędów (1595), "The herbal" by Simon Syrenius (Szymon Syreński) (1613), and "Dictionary of plants by Krzysztof Kluk (1787).

A real breakthrough in the history of herbal medicine was made by Paracelsus (Philippus Theophrastus Aureolus Bombastus von Hohenheim, 1493-1541), who believed that God gave people the remedies *(arcanum)* for each disease and added appropriate external signs (signatures) to facilitate the search for them. Therefore, he prescribed plants with renal leaves for kidney diseases, yellow raw materials for jaundice, and poppy seeds for headaches. He also used diets and natural medicines. Moreover, Paracelsus developed the methods of processing plant raw materials to extract "a therapeutic essence", i.e. a pharmacodynamically active substance according to modern knowledge. Therefore, Paracelsus is regarded as the father of phytochemistry and pharmacognosy. Thanks to his research into toxic substances (probably the first attempt to acquire some knowledge rather than to find better poisons to kill the enemy), Paracelsus is also considered a precursor to modern toxicology. He is credited with one of the most famous statements in the natural and medical sciences: "Poison is in everything, and no thing is without poison; the dose makes it either a poison or a remedy".

An increasing number of known plants required their scientific classification. The first classification system was developed by Carl Linnaeus, Swedish botanist and physician, who ranked plants on the basis of related characteristics, giving them two Latin names – generic and species (binomial nomenclature). In 1753, his "Species plantarum" was published, which classified about 10,000 higher plants; noteworthy, a hundred years later more than 100,000 plants were known.

3. History of phytotherapy – 19th century

The turn of the 18th and 19th centuries was the beginning of research into the chemical composition of herbs carried out in pharmacy laboratories [1]. Mathieu Orfila (1787-1853), a Spanish toxicologist and chemist, was the first to notice a correlation between the chemical and biological properties of poisons. He documented the effects of poisons on the individual organs by analyzing the tissues exposed to them. Orfila considered toxicology to be a distinct scientific discipline and wrote the first book on general toxicology.

Closely related to botany was the science regarding the knowledge of chemical compounds found in nature. Based on the popular beliefs that certain chemical compounds contained in a plant determine its medicinal properties and that a good remedy should consist of standardized, predictable doses, scientists began to isolate biologically active ingredients from plant medicines. The first attempt was made by Carl Wilhelm Scheele, a Swedish apothecary, who isolated malic, citric, oxalic, lactic

and gallic acid. A breakthrough in research into the medicinal properties of plants was the isolation of morphine present in the opium poppy carried out by Friedrich Wilhelm Sertürner (German pharmacist) in 1804. This encouraged other scientists to continue their attempts to obtain various chemicals from plants.

In the same century, Pierre Joseph Pelletier and Joseph Bienaime Caventou, French pharmacists, extracted strychnine from *Strychnos nux-vomica* L. seeds (1818) and quinine from Cinchona bark (*Cinchona succirubra* Pavon*)* (1820). Shortly after F.F. Runge isolated caffeine from coffee seeds (*Coffea arabica* L.); in 1830 salicin was extracted from willow bark (*Salix purpleea* L.) In 1859, Albert Niemann isolated cocaine from coca leaves (*Erythroxylum coca* Lam.). Still in the 19th century, crystalline digitalin was isolated from foxglove leaves (*Digitalis purpleea* L.) (1868). In 1874, a London pharmacist, looking for an addiction-free form of morphine, cooked it with acetic anhydride, used to prepare aspirin, and obtained a new substance, i.e. heroin. The first data about the properties of strophanthus (*Strophanthus gratus* Baill.), called in Africa (its place of origin) "an elephant-killing plant", were brought to Europe by the English Council Kirk, who gave the seeds to T. Fraser for further research; in 1885, strophanthin was isolated from the raw material, which is still used to treat cardiovascular diseases [5-6].

The above studies were essential for further research into plants as they marked the end of plant experimental use and opened the period of scientific research, both in terms of their chemical composition as well as their pharmacological and toxicological properties.

4. History of phytotherapy – 20th century

Both the popularization of printed herbaria, with drawings and scientific descriptions of individual plants, and advances in analytical devices and methods (e.g. improvement of the optical microscope, chromatographic techniques) have helped to promote herbs as the sources of medicines. In Poland, an outstanding popularizer of herbal medicine was Jan Muszyński (1884-1957), who established his own pharmacognosy school [7]. He wrote more than 300 papers and books designed for pharmacy students, including Handbook of Microscopic Identification of Medical Raw Materials (1926), Pharmacognosy (1957), Herbal Medicine and Plant Medicines (1958)y. Among other well-known 20th-century Polish herbalists, regarding herbal treatment as an excellent complement to conventional medicine, are father Czesław Klimuszko (1905-1980) and father Grzegorz Sroka (1930-2006) as well as Aleksander Ożarowski (1916-2011), nestor of Polish herbal medicine, scientist and pharmacist.

Natural medicines of plant origin were popular until the 1930s, when the chemical methods of obtaining synthetic drugs started to be developed. The next years of this century were the years of synthetic drugs and antibiotic therapy [8-9]. The shift towards natural therapeutic methods based on plants was observed in the second half of the 20th century, when the adverse side effects of synthetic drugs and resistance to long-term antibiotic therapy were determined.

5. History of phytotherapy – modern times

Despite several decades of predominance of synthetic drugs, associated , in particular, with beliefs in unlimited powers of antibiotics, herbal medicine is regaining its popularity. Currently, about 80% of the world's population uses some modern form of herbal medicine, i.e. phytotherapy, as part of healthcare. Scientific research regarding medicinal and cosmetic uses of herbs is increasingly comprehensive. Pharmacologists, microbiologists, botanists and chemists are still looking for new herbal medicines and biologically active substances

of plant origin [10-12]. At least 7,000 chemical compounds of modern pharmacopoeia come from plant raw materials.

Moreover, people are increasingly ecology-conscious, especially those living larger cities, and turn to natural herbal remedies. About 35% of the drugs currently used are of plant origin and are considered equal to chemical drugs. Discouraged by the ineffectiveness of chemical agents, people are increasingly believing in the power of nature and use vilcacora as a cancer drug or herbal formulations as an AIDS drug. It can therefore be assumed that the return to herbal treatments is part of the general trend of returning to nature, associated, inter alia, with increased significance of ecology, or fascination with the philosophy and culture of the Far East.

At present, herbal medicine is also practiced by individuals dealing with alternative medicine [13], who base their knowledge on many traditions, such as the systems of herbal medicine of ancient Greeks and Romans, Indian, Chinese and Tibetan medicine or even shamanic herbalism. The proponents of herbalism connected with alternative medicine claim that the conventional medicine is more effective in emergency situations, when time plays a very important role. Whereas the adequate and consistent herbal treatment can help the patient stop the development of a chronic disease and support the immune system. In their opinion, nowadays the goal of herbal therapy is primarily prevention.

6. Herbal medicine yesterday and today – summary

Medical knowledge collected and catalogued over the centuries has become a record not only of the development of herbal medicine, but also of human civilization. Regardless of their places of residence, climatic zones or degrees of civilization development, people from different parts of the world have used the same or similar plants for similar therapeutic and cosmetic purposes Biologically active substances present in various parts of plants have been used in all known old civilisations and are still being used, which evidences a strict relationship between human beings and nature.

At the threshold of our civilization, herbal medicine was regarded as magic, and herbal treatment was available only to the chosen ones. Today, herbal medicine is considered one of the fields of science, and herbal medicines are largely available to all individuals. In the 21st century, both medicine and cosmetics increasingly rely on herbs and plants, the beneficial properties of which have been confirmed by scientific research [14-16]. Nowadays, not only herbal medicines, but also cosmetics obtained from natural ingredients, are available as industrially produced products - some of them can also be prepared in a homemade way using products from allotments and gardens.

The use of herbs enables a holistic approach to healing, in which the whole individual (body and mind) is healed and not only a given disease. Herbs and other plant raw materials are applied for therapeutic, cosmetic and nutrition-related purposes (herbal drugs, herbal cosmetics, herbal spices, respectively). All aspects related to the history of herbal medicine outstandingly document the turbulent yet extremely fruitful development of human civilization.

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