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Herbalism-Science of Significance

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ABSTRACT: Herbal medicine (also called herbalism, phytomedicine or phytotherapy) is the study of pharmacognosy and the use of medicinal plants, which are a basis of traditional medicine.^[1] With worldwide research into pharmacology, some herbal medicines have been translated into modern remedies, such as the anti-malarial group of drugs called artemisinin isolated from *Artemisia annua*, a herb that was known in Chinese medicine to treat fever.^{[2][3]} There is limited scientific evidence for the safety and efficacy of many plants used in 21st-century herbalism, which generally does not provide standards for purity or dosage.^{[1][4]} The scope of herbal medicine sometimes include fungal and bee products, as well as minerals, shells and certain animal parts.

KEYWORDS-herbalism, medicinal plants, products, herbs, phytotherapy, scientific

I.INTRODUCTION

Paraherbalism describes alternative and pseudoscientific practices of using unrefined plant or animal extracts as unproven medicines or health-promoting agents.^{[1][4][6][7]} Paraherbalism relies on the belief that preserving various substances from a given source with less processing is safer or more effective than manufactured products, a concept for which there is no evidence.^[6]

History



A physician preparing an elixir, from an Arabic version of Dioscorides's pharmacopoeia, 1224

Archaeological evidence indicates that the use of medicinal plants dates back to the Paleolithic age, approximately 60,000 years ago. Written evidence of herbal remedies dates back over 5,000 years to the Sumerians, who compiled lists of plants. Some ancient cultures wrote about plants and their medical uses in books called herbals. In ancient Egypt, herbs are mentioned in Egyptian medical papyri, depicted in tomb illustrations, or on rare occasions found in medical jars containing trace amounts of herbs.^[8] In ancient Egypt, the Ebers papyrus dates from about 1550 BCE, and covers more than 700 compounds, mainly of plant origin.^[9] The earliest known Greek herbals came from Theophrastus of Eresos who, in the 4th century BCE, wrote in Greek *Historia Plantarum*, from Diocles of Carystus who wrote during the 3rd century BCE, and from Krateuas who wrote in the 1st century BCE. Only a few fragments of these works have survived intact, but from what remains, scholars noted overlap with the Egyptian herbals.^[10] Seeds likely used for herbalism were found in archaeological sites of Bronze Age China dating from the Shang dynasty^[11] (c. 1600 – c. 1046 BCE). Over a hundred of the 224 compounds mentioned in the *Huangdi Neijing*, an early Chinese medical text, are herbs.^[12] Herbs were also commonly used in the traditional medicine of ancient India, where the principal treatment for diseases was diet.^[13] *De Materia Medica*, originally written in Greek by Pedanius Dioscorides (c. 40 – c. 90 CE) of Anazarbus, Cilicia, a physician and botanist, is one example of herbal writing used over centuries until the 1600s.^[14]

Modern herbal medicine

The World Health Organization (WHO) estimates that 80 percent of the population of some Asian and African countries presently use herbal medicine for some aspect of primary health care.^[15] Some prescription drugs have a basis as herbal remedies, including artemisinin,^[16] digitalis, quinine and taxanes.

Regulatory review

In 2015, the Australian Government's Department of Health published the results of a review of alternative therapies that sought to determine if any were suitable for being covered by health insurance; herbalism was one of 17 topics evaluated for which no clear evidence of effectiveness was found.^[17] Establishing guidelines to assess safety and efficacy of herbal products, the European Medicines Agency provided criteria in 2017 for evaluating and grading the quality of clinical research in preparing monographs about herbal products.^[18] In the United States, the National Center for Complementary and Integrative Health of the National Institutes of Health funds clinical trials on herbal compounds, provides fact sheets evaluating the safety, potential effectiveness and side effects of many plant sources,^[19] and maintains a registry of clinical research conducted on herbal products.^[20]

According to Cancer Research UK as of 2015, "there is currently no strong evidence from studies in people that herbal remedies can treat, prevent or cure cancer".^[5]

Prevalence of use

The use of herbal remedies is more prevalent in people with chronic diseases, such as cancer, diabetes, asthma, and end-stage kidney disease.^{[21][22][23]} Multiple factors such as gender, age, ethnicity, education and social class are also shown to have association with prevalence of herbal remedies us[1,2,3]

Herbal preparations



Leaves of *Eucalyptus olida* being packed into a steam distillation unit to gather its essential oil

There are many forms in which herbs can be administered, the most common of which is a liquid consumed as a herbal tea or a (possibly diluted) plant extract.^[25]

Herbal teas, or tisanes, are the resultant liquid of extracting herbs into water, though they are made in a few different ways. Infusions are hot water extracts of herbs, such as chamomile or mint, through steeping. Decoctions are the long-term boiled extracts, usually of harder substances like roots or bark. Maceration is the cold infusion of plants with high mucilage-content, such as sage or thyme. To make macerates, plants are chopped and added to cold water. They are then left to stand for 7 to 12 hours (depending on herb used). For most macerates, 10 hours is used.^[26]

Tinctures are alcoholic extracts of herbs, which are generally stronger than herbal teas.^[27] Tinctures are usually obtained by combining pure ethanol (or a mixture of pure ethanol with water) with the herb. A completed tincture has an ethanol percentage of at least 25% (sometimes up to 90%).^[26] Non-alcoholic tinctures can be made with glycerin but it is believed to be less absorbed by the body than alcohol based tinctures and has a shorter shelf life.^[28] Herbal wine and elixirs are alcoholic extract of herbs, usually with an ethanol percentage of 12–38%.^[26] Extracts include liquid extracts, dry extracts, and nebulisates. Liquid extracts are liquids with a lower ethanol percentage than tinctures. They are usually made by vacuum distilling tinctures. Dry extracts are extracts of plant material that are evaporated into a dry mass. They can then be further refined to a capsule or tablet.^[26]

The exact composition of a herbal product is influenced by the method of extraction. A tea will be rich in polar components because water is a polar solvent. Oil on the other hand is a non-polar solvent and it will absorb non-polar compounds. Alcohol lies somewhere in between.^[25]



A herb shop in the souk of Marrakesh, Morocco

Many herbs are applied topically to the skin in a variety of forms. Essential oil extracts can be applied to the skin, usually diluted in a carrier oil. Many essential oils can burn the skin or are simply too high dose used straight; diluting them in olive oil or another food grade oil such as almond oil can allow these to be used safely as a topical. Salves, oils, balms, creams, and lotions are other forms of topical delivery mechanisms. Most topical applications are oil extractions of herbs. Taking a food grade oil and soaking herbs in it for anywhere from weeks to months allows certain phytochemicals to be extracted into the oil. This oil can then be made into salves, creams, lotions, or simply used as an oil for topical application. Many massage oils, antibacterial salves, and wound healing compounds are made this way.^[29]

Inhalation, as in aromatherapy, can be used as a treatment.^{[30][31][32]}

Safety^[4,5,6]



Datura stramonium has been used in Ayurveda for various treatments, but contains alkaloids, such as atropine and scopolamine, which may cause severe toxicity.^[33]

Consumption of herbs may cause adverse effects.^[34] Furthermore, "adulteration, inappropriate formulation, or lack of understanding of plant and drug interactions have led to adverse reactions that are sometimes life threatening or lethal."^[35] Proper double-blind clinical trials are needed to determine the safety and efficacy of each plant before medical use.^[36]

Although many consumers believe that herbal medicines are safe because they are natural, herbal medicines and synthetic drugs may interact, causing toxicity to the consumer. Herbal remedies can also be dangerously contaminated, and herbal medicines without established efficacy, may unknowingly be used to replace prescription medicines.^[37]

Standardization of purity and dosage is not mandated in the United States, but even products made to the same specification may differ as a result of biochemical variations within a species of plant.^[38] Plants have chemical defense mechanisms against predators that can have adverse or lethal effects on humans. Examples of highly toxic herbs include poison hemlock and nightshade.^[39] They are not marketed to the public as herbs, because the risks are well known, partly due to a long and colorful history in Europe, associated with "sorcery", "magic" and intrigue.^[40] Although not frequent, adverse reactions have been reported for herbs in widespread use.^[41] On occasion serious untoward outcomes have been linked to herb consumption. A case of major potassium depletion has been attributed to chronic licorice ingestion,^[42] and consequently professional herbalists avoid the use of licorice where they recognize that this may be a risk. Black cohosh has been implicated in a case of liver failure.^[43] Few studies are available on the safety of herbs for pregnant women,^[44] and one study found that use of complementary and alternative medicines are associated with a 30% lower ongoing pregnancy and live birth rate during fertility treatment.^[45]

Examples of herbal treatments with likely cause-effect relationships with adverse events include aconite (which is often a legally restricted herb), Ayurvedic remedies, broom, chaparral, Chinese herb mixtures, comfrey, herbs containing

certain flavonoids, germander, guar gum, liquorice root, and pennyroyal.^[46] Examples of herbs that may have long-term adverse effects include ginseng, the endangered herb goldenseal, milk thistle, senna (against which herbalists generally advise and rarely use^[citation needed]), aloe vera juice, buckthorn bark and berry, cascara sagrada bark, saw palmetto, valerian, kava (which is banned in the European Union), St. John's wort, khat, betel nut, the restricted herb ephedra, and guarana.^[35]

There is also concern with respect to the numerous well-established interactions of herbs and drugs.^{[35][47]} In consultation with a physician, usage of herbal remedies should be clarified, as some herbal remedies have the potential to cause adverse drug interactions when used in combination with various prescription and over-the-counter pharmaceuticals, just as a customer should inform a herbalist of their consumption of actual prescription and other medication.^{[48][49]}

For example, dangerously low blood pressure may result from the combination of a herbal remedy that lowers blood pressure together with prescription medicine that has the same effect. Some herbs may amplify the effects of anticoagulants.^[50] Certain herbs as well as common fruit interfere with cytochrome P450, an enzyme critical to much drug metabolism.^[51]

In a 2018 study, FDA identified active pharmaceutical additives in over 700 of analyzed dietary supplements sold as "herbal", "natural" or "traditional".^[52] The undisclosed additives included "unapproved antidepressants and designer steroids", as well as prescription drugs, such as sildenafil or sibutramine.

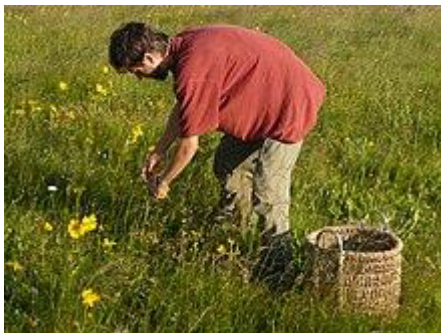
Labeling accuracy

A 2013 study found that one-third of herbal supplements sampled contained no trace of the herb listed on the label.^[38] The study found products adulterated with contaminants or fillers not listed on the label, including potential allergens such as soy, wheat, or black walnut. One bottle labeled as St. John's wort was found to actually contain Alexandrian senna, a laxative.^{[38][53]}

Researchers at the University of Adelaide found in 2014 that almost 20 percent of herbal remedies surveyed were not registered with the Therapeutic Goods Administration, despite this being a condition for their sale.^[54] They also found that nearly 60 percent of products surveyed had ingredients that did not match what was on the label. Out of 121 products, only 15 had ingredients that matched their TGA listing and packaging.^[54]

In 2015, the New York Attorney General issued cease and desist letters to four major U.S. retailers (GNC, Target, Walgreens, and Walmart) who were accused of selling herbal supplements that were mislabeled and potentially dangerous.^{[55][56]} Twenty-four products were tested by DNA barcoding as part of the investigation, with all but five containing DNA that did not match the product labels.

Practitioners of herbalism



A herbalist gathers the flower heads of *Arnica montana*.

In some countries, formalized training and minimum education standards exist for herbalists, although these are not necessarily uniform within or between countries. In Australia, for example, the self-regulated status of the profession (as of 2009) resulted in variable standards of training, and numerous loosely formed associations setting different educational standards.^[57] One 2009 review concluded that regulation of herbalists in Australia was needed to reduce the risk of interaction of herbal medicines with prescription drugs, to implement clinical guidelines and prescription of herbal products, and to assure self-regulation for protection of public health and safety.^[57] In the United Kingdom, the training of herbalists is done by state-funded universities offering Bachelor of Science degrees in herbal medicine.^[58] In the United States, according to the American Herbalist Guild, "there is currently no licensing or certification for

herbalists in any state that precludes the rights of anyone to use, dispense, or recommend herbs."^[59] However, there are U.S. federal restrictions for marketing herbs as cures for medical conditions, or essentially practicing as an unlicensed physician.^[7,8,9]

United States herbalism fraud

Over the years 2017–2020, the U.S. Food and Drug Administration (FDA) issued warning letters to numerous herbalism companies for illegally marketing products under "conditions that cause them to be drugs under section 201(g)(1) of the Act [21 U.S.C. § 321(g)(1)], because they are intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease and/or intended to affect the structure or any function of the body" when no such evidence existed.^{[60][61][62]} During the COVID-19 pandemic, the FDA and U.S. Federal Trade Commission issued warnings to several hundred American companies for promoting false claims that herbal products could prevent or treat COVID-19 disease.^{[62][63]}

Government regulations

The World Health Organization (WHO), the specialized agency of the United Nations (UN) that is concerned with international public health, published Quality control methods for medicinal plant materials in 1998 to support WHO Member States in establishing quality standards and specifications for herbal materials, within the overall context of quality assurance and control of herbal medicines.^[64]

In the European Union (EU), herbal medicines are regulated under the Committee on Herbal Medicinal Products.^[65]

In the United States, herbal remedies are regulated dietary supplements by the Food and Drug Administration (FDA) under current good manufacturing practice (cGMP) policy for dietary supplements.^[66] Manufacturers of products falling into this category are not required to prove the safety or efficacy of their product so long as they do not make 'medical' claims or imply uses other than as a 'dietary supplement', though the FDA may withdraw a product from sale should it prove harmful.^{[67][68]}

Canadian regulations are described by the Natural and Non-prescription Health Products Directorate which requires an eight-digit Natural Product Number or Homeopathic Medicine Number on the label of licensed herbal medicines or dietary supplements.^[69]

Some herbs, such as cannabis and coca, are outright banned in most countries though coca is legal in most of the South American countries where it is grown. The Cannabis plant is used as a herbal medicine, and as such is legal in some parts of the world. Since 2004, the sales of ephedra as a dietary supplement is prohibited in the United States by the FDA,^[70] and subject to Schedule III restrictions in the United Kingdom.

Scientific criticism

Herbalism has been criticized as a potential "minefield" of unreliable product quality, safety hazards, and potential for misleading health advice.^{[1][7]} Globally, there are no standards across various herbal products to authenticate their contents, safety or efficacy,^[38] and there is generally an absence of high-quality scientific research on product composition or effectiveness for anti-disease activity.^{[7][71]} Presumed claims of therapeutic benefit from herbal products, without rigorous evidence of efficacy and safety, receive skeptical views by scientists.^[1]

Unethical practices by some herbalists and manufacturers, which may include false advertising about health benefits on product labels or literature,^[7] and contamination or use of fillers during product preparation,^{[38][72]} may erode consumer confidence about services and products.^{[73][74]}

Paraherbalism



An example of a herbal medicine resource: the bark of the cinchona tree contains quinine, which today is a widely prescribed treatment for malaria. The unpurified bark is still used by some who can not afford to purchase more expensive antimalarial drugs.

Para herbalism is the pseudoscientific use of extracts of plant or animal origin as supposed medicines or health-promoting agents.^{[1][6][7]} Phytotherapy differs from plant-derived medicines in standard pharmacology because it does not isolate and standardize the compounds from a given plant believed to be biologically active. It relies on the false belief that preserving the complexity of substances from a given plant with less processing is safer and potentially more effective, for which there is no evidence either condition applies.^[6]

Phytochemical researcher Varro Eugene Tyler described para herbalism as "faulty or inferior herbalism based on pseudoscience", using scientific terminology but lacking scientific evidence for safety and efficacy. Tyler listed ten fallacies that distinguished herbalism from para herbalism, including claims that there is a conspiracy to suppress safe and effective herbs,^[10,11,12] herbs can not cause harm, that whole herbs are more effective than molecules isolated from the plants, herbs are superior to drugs, the doctrine of signatures (the belief that the shape of the plant indicates its function) is valid, dilution of substances increases their potency (a doctrine of the pseudoscience of homeopathy), astrological alignments are significant, animal testing is not appropriate to indicate human effects, anecdotal evidence is an effective means of proving a substance works and herbs were created by God to cure disease. Tyler suggests that none of these beliefs have any basis in fact.^{[6][75]}

Traditional systems



Ready to drink macerated medicinal liquor with goji berry, tokay gecko, and ginseng, for sale at a traditional medicine market in Xi'an, China

Africa

Up to 80% of the population in Africa uses traditional medicine as primary health care.^[76]

Americas

Native Americans used about 2,500 of the approximately 20,000 plant species that are native to North America.^[77]

In Andean healing practices, the use of Entheogens, in particular the San Pedro cactus (*Echinopsis pachanoi*) is still a vital component, and has been around for millennia.^[78]

China

Some researchers trained in both Western and traditional Chinese medicine have attempted to deconstruct ancient medical texts in the light of modern science. In 1972, Tu Youyou, a pharmaceutical chemist and Nobel Prize winner, extracted the anti-malarial drug artemisinin from sweet wormwood, a traditional Chinese treatment for intermittent fevers.^[79]

India



A platter of herbal medicines at Goa, India

In India, Ayurvedic medicine has quite complex formulas with 30 or more ingredients, including a sizable number of ingredients that have undergone "alchemical processing", chosen to balance dosha.^[80] In Ladakh, Lahul-Spiti, and Tibet, the Tibetan Medical System is prevalent, also called the "Amichi Medical System". Over 337 species of medicinal plants have been documented by C.P. Kala. Those are used by Amchis, the practitioners of this medical system.^{[81][82]} The Indian book, Vedas, mentions treatment of diseases with plants.^[83]

Indonesia



Different types of Indonesian jamu herbal medicines held in bottles

In Indonesia, especially among the Javanese, the jamu traditional herbal medicine may have originated in the Mataram Kingdom era, some 1300 years ago.^[84] The bas-reliefs on Borobudur depict the image of people grinding herbs with stone mortar and pestle, a drink seller, a herbalist, and masseuse treating people.^[85] The Madhawapura inscription from Majapahit period mentioned a specific profession of herbs mixer and combiner (herbalist), called Acaraki.^[85] The book from Mataram dated from circa 1700 contains 3,000 entries of jamu herbal recipes, while Javanese classical literature Serat Centhini (1814) describes some jamu herbal concoction recipes.^[85]

Though possibly influenced by Indian Ayurveda systems, the Indonesia archipelago holds numerous indigenous plants not found in India, including plants similar to those in Australia beyond the Wallace Line.^[86] Jamu practices may vary from region to region, and are often not recorded, especially in remote areas of the country.^[87] Although primarily herbal, some Jamu materials are acquired from animals, such as honey, royal jelly, milk, and [13,14,15] Ayam Kampung eggs.

Beliefs

Herbalists tend to use extracts from parts of plants, such as the roots or leaves,^[88] believing that plants are subject to environmental pressures and therefore develop resistance to threats such as radiation, reactive oxygen species and microbial attack to survive, providing defensive phytochemicals of use in herbalism.^{[88][89]}

Use of plants by animals

Indigenous healers often claim to have learned by observing that sick animals change their food preferences to nibble at bitter herbs they would normally reject.^[90] Field biologists have provided corroborating evidence based on observation of diverse species, such as chickens, sheep, butterflies, and chimpanzees. The habit of changing diet has been shown to be a physical means of purging intestinal parasites. Sick animals tend to forage plants rich in secondary metabolites, such as tannins and alkaloids

II.DISCUSSION

Traditional medicine (also known as indigenous medicine or folk medicine) comprises medical aspects of traditional knowledge that developed over generations within the folk beliefs of various societies, including indigenous peoples, before the era of modern medicine. The World Health Organization (WHO) defines traditional medicine as "the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement and treatment of physical and mental illness".^[1] Traditional medicine is often contrasted with scientific medicine.

In some Asian and African countries, up to 80% of the population relies on traditional medicine for their primary health care needs. Traditional medicine is a form of alternative medicine. Practices known as traditional medicines include traditional European medicine^[citation needed], traditional Chinese medicine, traditional Korean medicine, traditional African medicine, Ayurveda, Siddha medicine, Unani, ancient Iranian medicine, traditional Iranian medicine, medieval Islamic medicine, Muti, Ifá and Rongoã. Scientific disciplines that study traditional medicine include herbalism, ethnomedicine, ethnobotany, and medical anthropology.

The WHO notes, however, that "inappropriate use of traditional medicines or practices can have negative or dangerous effects" and that "further research is needed to ascertain the efficacy and safety" of such practices and medicinal plants used by traditional medicine systems.^[1] Its "Traditional Medicine Strategy 2014–2020" said that the WHO would "support Member States in developing proactive policies and implementing action plans that will strengthen the role traditional medicine plays in keeping populations healthy."^[2]

Usage and history

Classical history

In the written record, the study of herbs dates back 5,000 years to the ancient Sumerians, who described well-established medicinal uses for plants. In Ancient Egyptian medicine, the Ebers papyrus from c. 1552 BC records a list of folk remedies and magical medical practices.^[3] The Old Testament also mentions herb use and cultivation in regards to Kashrut.

Many herbs and minerals used in Ayurveda were described by ancient Indian herbalists such as Charaka and Sushruta during the 1st millennium BC.^[4] The first Chinese herbal book was the Shennong Bencao Jing, compiled during the Han dynasty but dating back to a much earlier date, which was later augmented as the Yaoxing Lun (Treatise on the Nature of Medicinal Herbs) during the Tang dynasty. Early recognised Greek compilers of existing and current herbal knowledge include Pythagoras and his followers, Hippocrates, Aristotle, Theophrastus, Dioscorides and Galen.

Roman sources included Pliny the Elder's Natural History and Celsus's De Medicina.^[5] Pedanius Dioscorides drew on and corrected earlier authors for his De Materia Medica, adding much new material; the work was translated into several languages, and Turkish, Arabic and Hebrew names were added to it over the centuries.^[6] Latin manuscripts of De Materia Medica were combined with a Latin herbal by Apuleius Platonicus (Herbarium Apuleii Platonici) and were incorporated into the Anglo-Saxon codex Cotton Vitellius C.III. These early Greek and Roman compilations became the backbone of European medical theory and were translated by the Persian Avicenna (Ibn Sīnā, 980–1037), the Persian Rhazes (Rāzi, 865–925) and the Jewish Maimonides.^[5]

Some fossils have been used in traditional medicine since antiquity.^[7]

Medieval and later

Arabic indigenous medicine developed from the conflict between the magic-based medicine of the Bedouins and the Arabic translations of the Hellenic and Ayurvedic medical traditions.^[8] Spanish medicine was influenced by the Arabs from 711 to 1492.^[9] Islamic physicians and Muslim botanists such as al-Dinawari^[10] and Ibn al-Baitar^[11] significantly expanded on the earlier knowledge of materia medica. The most famous Persian medical treatise was Avicenna's The Canon of Medicine, which was an early pharmacopoeia and introduced clinical trials.^{[12][13][14]} The Canon was translated into Latin in the 12th century and remained a medical authority in Europe until the 17th century. The Unani system of traditional medicine is also based on the Canon^[16,17,18]

Translations of the early Roman-Greek compilations were made into German by Hieronymus Bock whose herbal, published in 1546, was called Kreuter Buch. The book was translated into Dutch as Pemptades by Rembert Dodoens (1517–1585), and from Dutch into English by Carolus Clusius, (1526–1609), published by Henry Lyte in 1578 as A Nievve Herball. This became John Gerard's (1545–1612) Herball or General Historie of Plantes.^{[5][6]} Each new work was a compilation of existing texts with new additions.

Women's folk knowledge existed in undocumented parallel with these texts.^[5] Forty-four drugs, diluents, flavouring agents and emollients mentioned by Dioscorides are still listed in the official pharmacopoeias of Europe.^[6] The Puritans took Gerard's work to the United States where it influenced American Indigenous medicine.^[5] Francisco Hernández, physician to Philip II of Spain spent the years 1571–1577 gathering information in Mexico and then wrote *Rerum Medicarum Novae Hispaniae Thesaurus*, many versions of which have been published including one by Francisco Ximénez. Both Hernandez and Ximenez fitted Aztec ethnomedicinal information into the European concepts of disease such as "warm", "cold", and "moist", but it is not clear that the Aztecs used these categories.^[16] Juan de Esteyneffer's *Florilegio medicinal de todas las enfermedades* compiled European texts and added 35 Mexican plants. Martín de la Cruz wrote a herbal in Nahuatl which was translated into Latin by Juan Badiano as *Libellus de Medicinalibus Indorum Herbis* or *Codex Barberini*, Latin 241 and given to King Carlos V of Spain in 1552.^[17] It was apparently written in haste^[18] and influenced by the European occupation of the previous 30 years. Fray Bernardino de Sahagún's used ethnographic methods to compile his codices that then became the *Historia General de las Cosas de Nueva España*, published in 1793.^[17] Castore Durante published his *Herbario Nuovo* in 1585 describing medicinal plants from Europe and the East and West Indies. It was translated into German in 1609 and Italian editions were published for the next century.

Colonial America

In 17th and 18th-century America, traditional folk healers, frequently women, used herbal remedies, cupping and leeching.^[19] Native American traditional herbal medicine introduced cures for malaria, dysentery, scurvy, non-venereal syphilis, and goiter problems.^[20] Many of these herbal and folk remedies continued on through the 19th and into the 20th century,^[21] with some plant medicines forming the basis for modern pharmacology.^[22]

Modern usage

The prevalence of folk medicine in certain areas of the world varies according to cultural norms.^[23] Some modern medicine is based on plant phytochemicals that had been used in folk medicine.^[24] Researchers state that many of the alternative treatments are "statistically indistinguishable from placebo treatments".^[25]

Knowledge transmission and creation

Indigenous medicine is generally transmitted orally through a community, family and individuals until "collected". Within a given culture, elements of indigenous medicine knowledge may be diffusely known by many, or may be gathered and applied by those in a specific role of healer such as a shaman or midwife.^[26] Three factors legitimize the role of the healer – their own beliefs, the success of their actions and the beliefs of the community.^[27] When the claims of indigenous medicine become rejected by a culture, generally three types of adherents still use it – those born and socialized in it who become permanent believers, temporary believers who turn to it in crisis times, and those who only believe in specific aspects, not in all of it¹

Definition and terminology

Traditional medicine may sometimes be considered as distinct from folk medicine, and considered to include formalized aspects of folk medicine. Under this definition folk medicine are longstanding remedies and practises passed on and practiced by lay people. Folk medicine consists of the healing modalities, ideas of body physiology and health preservation known to some in a culture, transmitted informally as general knowledge, and practiced or applied by anyone in the culture having prior experience.^[29]

Folk medicine



Curandera performing a limpieza in Cuenca, Ecuador

Many countries have practices described as folk medicine which may coexist with formalized, science-based, and institutionalized systems of medical practice represented by conventional medicine.^[30] Examples of folk medicine traditions are traditional Chinese medicine, Iranian traditional medicine, traditional Korean medicine, Arabic indigenous medicine, Uyghur traditional medicine, Japanese Kampō medicine, traditional Aboriginal bush medicine, Native Hawaiian Lā‘au lapa‘au, and Georgian folk medicine, among others.^[31]

Australian bush medicine

Generally, bush medicine used by Aboriginal and Torres Strait Islander people in Australia is made from plant materials, such as bark, leaves and seeds, although animal products may be used as well.^[32] A major component of traditional medicine is herbal medicine, which is the use of natural plant substances to treat or prevent illness.^[33]

Native American medicine

American Native and Alaska Native medicine are traditional forms of healing that have been around for thousands of years. There are many ethnobotany plants involved in traditional medicine for Native Americans and some are still used today. When it comes to Native American traditional medicine, the ideas surrounding health and illness within the culture are virtually inseparable from the ideas of religion and spirituality.^[34] Healers within indigenous communities go by many names ranging from medicine man or woman to herbalist or even shaman and are considered spiritual or religious leaders within their respective tribes.^[34] When it comes to healing, tribal healers would look at a plant's characteristics to determine its efficacy for the treatment of an illness.^[35] Specific plant characteristics such as plant shape, smell, color, and taste could aid in determining how the plant could be used as a remedy.^[35] The Meskwaki tribe found they could use the juice from *Arum maculatum* for snakebites.^[35] This was inferred from the milky appearance of the juice from the plant which is said to resemble snake venom, and the plant's shape resembled the head of a snake.^[35] Native Americans used foxglove herb as a treatment for an illness they referred to as dropsy or edema, which is fluid buildup typically in the lower legs, and its common cause is heart failure.^[35] In modern medicine, foxglove extract is still used under the name digitalis, and its purpose is to moderate the heart rate.^[35] Native Americans were successful with some medical practices, such as treating fevers, gastrointestinal conditions, skin rashes, setting bones, as well as birthing babies, and aiding mothers in healing.^[35] A study conducted within an IHS hospital that allows Navajo healers to visit patients found that the hospital had an 80 percent success rate in getting comatose patients back to consciousness, which is higher than the rate of present-day biomedical management hospitals.^[34] The plant family Asteraceae has been commonly selected for orthopedic aids and pulmonary aids, specifically the species *Achillea* and *Artemisia*.^[36] A study conducted amongst 14 different tribes within North America found that Asteraceae was the most widely used plant family for its medicinal properties.^[36]

Nattuvaidyam

Nattuvaidyam was a set of indigenous medical practices that existed in India before the advent of allopathic or western medicine.^[37] These practices had different sets of principles and ideas of the body, health and disease. There were overlaps and borrowing of ideas, medicinal compounds used and techniques within these practices.^[38] Some of these practices had written texts in vernacular languages like Malayalam, Tamil, Telugu, etc. while others were handed down orally through various mnemonic devices. Ayurveda was one kind of nattuvaidyam practised in south India.^[39] The others were kalarichikitsa (related to bone setting and musculature),^[40] marmachikitsa (vital spot massaging), ottamoolivaidyam (single dose medicine or single time medication),^[41] chintamanivaidyam and so on. When the medical system was revamped in twentieth century India, many of the practices and techniques specific to some of these diverse nattuvaidyam were included in Ayurveda.^[42]

Home remedies

A home remedy (sometimes also referred to as a granny cure) is a treatment to cure a disease or ailment that employs certain spices, herbs, vegetables, or other common items. Home remedies may or may not have medicinal properties that treat or cure the disease or ailment in question, as they are typically passed along by laypersons (which has been facilitated in recent years by the Internet). Many are merely used as a result of tradition or habit or because they are effective in inducing the placebo effect.^[43]

One of the more popular examples of a home remedy is the use of chicken soup to treat respiratory infections such as a cold or mild flu. Other examples of home remedies include duct tape to help with setting broken bones; duct tape or superglue to treat plantar warts; and Kogel mogel to treat sore throat. In earlier times, mothers were entrusted with all but serious remedies. Historic cookbooks are frequently full of remedies for dyspepsia, fevers, and female complaints.^[44] Components of the aloe vera plant are used to treat skin disorders.^[45] Many European liqueurs or digestifs were originally sold as medicinal remedies. In Chinese folk medicine, medicinal congees (long-cooked rice soups with herbs), foods, and soups are part of treatment practices^[18,19,20]

Criticism

Safety concerns

Although 130 countries have regulations on folk medicines, there are risks associated with the use of them (i.e. zoonosis, mainly as some traditional medicines still use animal-based substances^{[47][48]}). It is often assumed that because supposed medicines are natural that they are safe, but numerous precautions are associated with using herbal remedies.^[49]

Use of endangered species



Sometimes traditional medicines include parts of endangered species, such as the slow loris in Southeast Asia.

Endangered animals, such as the slow loris, are sometimes killed to make traditional medicines.^[50]

Shark fins have also been used in traditional medicine, and although their effectiveness has not been proven, it is hurting shark populations and their ecosystem.^[51]

The illegal ivory trade can partially be traced back to buyers of traditional Chinese medicine. Demand for ivory is a huge factor in the poaching of endangered species such as rhinos and elephants.^[52]

Pangolins are threatened by poaching for their meat and scales, which are used in traditional medicine. They are the most trafficked mammals in the world.

III.RESULTS

A herbal is a book containing the names and descriptions of plants, usually with information on their medicinal, tonic, culinary, toxic, hallucinatory, aromatic, or magical powers, and the legends associated with them.^{[1][2]} A herbal may also classify the plants it describes,^[3] may give recipes for herbal extracts, tinctures, or potions, and sometimes include mineral and animal medicaments in addition to those obtained from plants. Herbals were often illustrated to assist plant identification.^[4]

Herbals were among the first literature produced in Ancient Egypt, China, India, and Europe^[5] as the medical wisdom of the day accumulated by herbalists, apothecaries and physicians.^[6] Herbals were also among the first books to be printed in both China and Europe. In Western Europe herbals flourished for two centuries following the introduction of moveable type (c. 1470–1670).^[7]

In the late 17th century, the rise of modern chemistry, toxicology and pharmacology reduced the medicinal value of the classical herbal. As reference manuals for botanical study and plant identification herbals were supplanted by Floras – systematic accounts of the plants found growing in a particular region, with scientifically accurate botanical descriptions, classification, and illustrations.^[8] Herbals have seen a modest revival in the Western world since the last decades of the 20th century, as herbalism and related disciplines (such as homeopathy and aromatherapy) became popular forms of alternative medicine.^[21,22,23]

History

The use of plants for medicinal purposes, and their descriptions, dates back two to three thousand years.^{[10][11]} The word herbal is derived from the mediaeval Latin *liber herbaris* ("book of herbs");^[2] it is sometimes used in contrast to the word *florilegium*, which is a treatise on flowers^[12] with emphasis on their beauty and enjoyment rather than the herbal emphasis on their utility.^[13] Much of the information found in printed herbals arose out of traditional medicine and herbal knowledge that predated the invention of writing.^[14]

Before the advent of printing, herbals were produced as manuscripts, which could be kept as scrolls or loose sheets, or bound into codices.^[15] Early handwritten herbals were often illustrated with paintings and drawings. Like other manuscript books, herbals were "published" through repeated copying by hand, either by professional scribes or by the readers themselves. In the process of making a copy, the copyist would often translate, expand, adapt, or reorder the content. Most of the original herbals have been lost; many have survived only as later copies (of copies...), and others are known only through references from other texts.^{[16][17]}

As printing became available, it was promptly used to publish herbals, the first printed matter being known as *incunabula*. In Europe, the first printed herbal with woodcut (xylograph) illustrations, the *Puch der Natur* of Konrad of Meigenberg, appeared in 1475.^[18] Metal-engraved plates were first used in about 1580.^[19] As woodcuts and metal engravings could be reproduced indefinitely they were traded among printers: there was therefore a large increase in the number of illustrations together with an improvement in quality and detail but a tendency for repetition.^[20]

As examples of some of the world's most important records and first printed matter, a researcher will find herbals scattered through the world's most famous libraries including the Vatican Library in Rome, the Bodleian Library in Oxford, the Royal Library in Windsor, the British Library in London and the major continental libraries.

China, India, Mexico

Shen Nung Pen Ts'ao ching of China

China is renowned for its traditional herbal medicines that date back thousands of years.^{[21][22]} Legend has it that mythical Emperor Shennong, the founder of Chinese herbal medicine, composed the Shennong Bencao Jing or Great Herbal in about 2700 BCE as the forerunner of all later Chinese herbals.^[23] It survives as a copy made c. 500 CE and describes about 365 herbs.^[24] High quality herbals and monographs on particular plants were produced in the period to 1250 CE including: the Zhenlei bencao written by Tang Shenwei in 1108, which passed through twelve editions until 1600; a monograph on the lychee by Cai Xiang in 1059 and one on the oranges of Wenzhou by Han Yanzhi in 1178.^[25] In 1406 Ming dynasty prince Zhu Xiao (朱橚) published the Jiuhuang Bencao illustrated herbal for famine foods. It contained high quality woodcuts and descriptions of 414 species of plants of which 276 were described for the first time, the book pre-dating the first European printed book by 69 years. It was reprinted many times.^[26] Other herbals include Bencao Fahui in 1450 by Xu Yong and Bencao Gangmu of Li Shizhen in 1590.^[27]

Sushruta Samhita of India [20]

Traditional herbal medicine of India, known as Ayurveda, possibly dates back to the second millennium BCE tracing its origins to the holy Hindu Vedas and, in particular, the Atharvaveda.^[28] One authentic compilation of teachings is by the surgeon Sushruta, available in a treatise called Sushruta Samhita. This contains 184 chapters and description of 1120 illnesses, 700 medicinal plants, 64 preparations from mineral sources and 57 preparations based on animal sources.^[29] Other early works of Ayurveda include the Charaka Samhita, attributed to Charaka. This tradition, however is mostly oral. The earliest surviving written material which contains the works of Sushruta is the Bower Manuscript—dated to the 4th century CE.^[30]

Hernandez – Rerum Medicarum and the Aztecs

An illustrated herbal published in Mexico in 1552, *Libellus de Medicinalibus Indorum Herbis* ("Book of Medicinal Herbs of the Indies"), is written in the Aztec Nahuatl language by a native physician, Martín Cruz. This is probably an extremely early account of the medicine of the Aztecs although the formal illustrations, resembling European ones, suggest that the artists were following the traditions of their Spanish masters rather than an indigenous style of drawing.^[31] In 1570 Francisco Hernández (c.1514–1580) was sent from Spain to study the natural resources of New Spain (now Mexico). Here he drew on indigenous sources, including the extensive botanical gardens that had been established by the Aztecs, to record c. 1200 plants in his *Rerum Medicarum* of 1615. Nicolás Monardes' *Dos Libros* (1569) contains the first published illustration of tobacco.^[32]

Egypt, Mesopotamia, Greece and Rome



Statue of Theophrastus c. 371 – c. 287 BCE, Orto botanico di Palermo

Further information: Ancient Egyptian medicine, Ancient Greek medicine, and Medicine in ancient Rome

By about 2000 BCE, medical papyri in ancient Egypt included medical prescriptions based on plant matter and made reference to the herbalist's combination of medicines and magic for healing.^[33]

Papyrus Ebers[edit]
Main article: Papyrus Ebers



A page from the Ebers Papyrus, the most complete and extensive of surviving ancient herbals. The ancient Egyptian Papyrus Ebers is one of the earliest known herbals; it dates to 1550 BCE and is based on sources, now lost, dating back a further 500 to 2000 years.^[4] The earliest Sumerian herbal dates from about 2500 BCE as a copied manuscript of the 7th century BCE. Inscribed Assyrian tablets dated 668–626 BCE list about 250 vegetable drugs: the tablets include herbal plant names that are still in use today including: saffron, cumin, turmeric and sesame.^[33]

The ancient Greeks gleaned much of their medicinal knowledge from Egypt and Mesopotamia.^[33] Hippocrates (460–377 BCE), the "father of medicine" (renowned for the eponymous Hippocratic oath), used about 400 drugs, most being of plant origin. However, the first Greek herbal of any note was written by Diocles of Carystus in the fourth century BC—although nothing remains of this except its mention in the written record. It was Aristotle's pupil Theophrastus (371–287 BCE) in his *Historia Plantarum*, (better known as the *Enquiry into Plants*) and *De Causis Plantarum* (*On the Causes of Plants*) that established the scientific method of careful and critical observation associated with modern botanical science. Based largely on Aristotle's notes, the Ninth Book of his *Enquiry* deals specifically with medicinal herbs and their uses including the recommendations of herbalists and druggists of the day, and his plant descriptions often included their natural habitat and geographic distribution.^[34] With the formation of the Alexandrian School c. 330 BCE medicine flourished and written herbals of this period included those of the physicians Herophilus, Mantias, Andreas of Karystos, Appolonius Mys, and Nicander.^[34] The work of rhizomatist (the rhizomati were the doctors of the day, berated by Theophrastus for their superstition) Krateuas (fl. 110 BCE) is of special note because he initiated the tradition of the illustrated herbal in the first century BCE.^{[35][36]}

Dioscorides – De Materia Medica[edit]



Arabic Book of Simple Drugs (c. 1334) from Dioscorides' *De Materia Medica*. British Museum
The *De Materia Medica* (c. 40–90 CE; Greek, *Περὶ ὕλης ἰατρικῆς* "*Peri hules iatrikes*", 'On medical materials') of Pedanios Dioscorides, a physician in the Roman army, was produced in about 65 CE. It was the single greatest

classical authority on the subject and the most influential herbal ever written,^[37] serving as a model for herbals and pharmacopoeias, both oriental and occidental, for the next 1000 years up to the Renaissance.^[38] It drew together much of the accumulated herbal knowledge of the time, including some 500 medicinal plants. The original has been lost but a lavishly illustrated Byzantine copy known as the Vienna Dioscurides dating from about 512 CE remains.^[39]

Pliny – Natural History

Pliny the Elder's (23–79 CE) encyclopaedic Natural History (c. 77–79 CE) is a synthesis of the information contained in about 2000 scrolls and it includes myths and folklore; there are about 200 extant copies. It comprises 37 books of which sixteen (Books 12–27) are devoted to trees, plants and medicaments and, of these, seven describe medicinal plants. In medieval herbals, along with De Materia Medica it is Pliny's work that is the most frequently mentioned of the classical texts, even though Galen's (131–201 CE) De Simplicibus is more detailed.^[40] Another Latin translation of Greek works that was widely copied in the Middle Ages, probably illustrated in the original, was that attributed to Apuleius; it also contained the alternative names for particular plants given in several languages. It dates to about 400 CE and a surviving copy dates to about 600 CE.^[41]

During the 600 years of the European Middle Ages from 600 to 1200, the tradition of herbal lore fell to the monasteries. Many of the monks were skilled at producing books and manuscripts and tending both medicinal gardens and the sick, but written works of this period simply emulated those of the classical era.^[42]

Meanwhile, in the Arab world, by 900 the great Greek herbals had been translated and copies lodged in centres of learning in the Byzantine empire of the eastern Mediterranean including Byzantium, Damascus, Cairo and Baghdad where they were combined with the botanical and pharmacological lore of the Orient.^[43] In the medieval Islamic world, Muslim botanists and Muslim physicians made a major contribution to the knowledge of herbal medicines. Those associated with this period include Mesue Maior (Masawaiyh, 777–857) who, in his Opera Medicinalia, synthesised the knowledge of Greeks, Persians, Arabs, Indians and Babylonians, this work was complemented by the medical encyclopaedia of Avicenna (Ibn Sina, 980–1037).^[44] Avicenna's Canon of Medicine was used for centuries in both East and West.^[45] During this period Islamic science protected classical botanical knowledge that had been ignored in the West and Muslim pharmacy thrived.^[46]

Albertus Magnus – De Vegetabilibus



Albertus Magnus c. 1193–1280, author of De Vegetabilibus

Main article: Albertus Magnus

In the thirteenth century, scientific inquiry was returning and this was manifest through the production of encyclopaedias; those noted for their plant content included a seven volume treatise by Albertus Magnus (c. 1193–1280) a Suabian educated at the University of Padua and tutor to St Thomas Aquinas. It was called De Vegetabilibus (c. 1256 AD) and even though based on original observations and plant descriptions it bore a close resemblance to the earlier Greek, Roman and Arabic herbals.^[47] Other accounts of the period include De Proprietatibus Rerum (c. 1230–1240) of English Franciscan friar Bartholomaeus Anglicus and a group of herbals called Tractatus de Herbis written and painted between 1280 and 1300 by Matthaeus Platearius at the East-West cultural centre of Salerno Spain, the illustrations showing the fine detail of true botanical illustration.^[48]

Western Europe



Illustration from Elizabeth Blackwell's *A Curious Herbal* (1737)[18,19,20]

Perhaps the best known herbals were produced in Europe between 1470 and 1670.^[49] The invention in Germany of printing from movable type in a printing press c. 1440 was a great stimulus to herbalism. The new herbals were more detailed with greater general appeal and often with Gothic script and the addition of woodcut illustrations that more closely resembled the plants being described.

Three important herbals, all appearing before 1500, were printed in Mainz, Germany. Two of these were by Peter Schoeffer, his *Latin Herbarius* in 1484, followed by an updated and enlarged German version in 1485, these being followed in 1491 by the *Hortus Sanitatis* printed by Jacob Meyderbach.^[50] Other early printed herbals include the *Kreuterbuch* of Hieronymus Tragus from Germany in 1539 and, in England, the *New Herball* of William Turner in 1551 were arranged, like the classical herbals, either alphabetically, according to their medicinal properties, or as "herbs, shrubs, trees".^[51] Arrangement of plants in later herbals such as *Cruydboeck* of Dodoens and John Gerard's *Herball* of 1597 became more related to their physical similarities and this heralded the beginnings of scientific classification. By 1640 a herbal had been printed that included about 3800 plants – nearly all the plants of the day that were known.^[52]

In the Modern Age and Renaissance, European herbals diversified and innovated, and came to rely more on direct observation than being mere adaptations of traditional models. Typical examples from the period are the fully illustrated *De Historia Stirpium Commentarii Insignes* by Leonhart Fuchs (1542, with over 400 plants), the astrologically themed *Complete Herbal* by Nicholas Culpeper (1653), and the *Curious Herbal* by Elizabeth Blackwell (1737).

Anglo-Saxon herbals

Anglo-Saxon plant knowledge and gardening skills (the garden was called a *wyrtzerd*, literally, herb-yard) appears to have exceeded that on the continent.^[53] Our limited knowledge of Anglo-Saxon plant vernacular comes primarily from manuscripts that include: the *Leechbook of Bald* and the *Lacnunga*.^[54] The *Leechbook of Bald* (Bald was probably a friend of King Alfred of England) was painstakingly produced by the scribe Cild in about 900–950 CE. This was written in the vernacular (native) tongue and not derived from Greek texts.^[55] The oldest illustrated herbal from Saxon times is a translation of the *Latin Herbarius Apulei Platonici*, one of the most popular medical works of medieval times, the original dating from the fifth century; this Saxon translation was produced about 1000–1050 CE and is housed in the British Library.^[56] Another vernacular herbal was the *Buch der natur* or "Book of Nature" by Konrad von Megenberg (1309–1374) which contains the first two botanical woodcuts ever made; it is also the first work of its kind in the vernacular.^{[18][43]}

Anglo-Norman herbals

In the 12th and early 13th centuries, under the influence of the Norman conquest, the herbals produced in Britain fell less under the influence of France and Germany and more that of Sicily and the Near East. This showed itself through the Byzantine-influenced Romanesque framed illustrations. Anglo-Saxon herbals in the vernacular were replaced by herbals in Latin including *Macers Herbal*, *De Viribus Herbarum* (largely derived from Pliny), with the English translation completed in about 1373.^[57]

Fifteenth-century incunabula

The earliest printed books and broadsheets are known as incunabula. The first printed herbal appeared in 1469, a version of Pliny's *Historia Naturalis*; it was published nine years before Dioscorides *De Materia Medica* was set in type.^[37] Important incunabula include the encyclopaedic *De Proprietatibus Rerum* of Franciscan friar Bartholomew Anglicus (c. 1203–1272) which, as a manuscript, had first appeared between 1248 and 1260 in at least six languages and after being first printed in 1470 ran to 25 editions.^[58] Assyrian physician Mesue (926–1016) wrote the popular *De Simplicibus*, Grabadin and *Liber Medicinarum Particularum* the first of his printings being in 1471. These were followed, in Italy, by the *Herbarium of Apuleius Platonicus* and three German works published in Mainz, the *Latin Herbarius* (1484), the first herbal published in Germany, *German Herbarius* (1485), the latter evolving into the *Ortus Sanitatis* (1491). To these can be added Macer's *De Virtutibus Herbarum*, based on Pliny's work; the 1477 edition is one of the first printed and illustrated herbals.^[59]

Fifteenth-century manuscripts

In medieval times, medicinal herbs were generally referred to by the apothecaries (physicians or doctors) as "simples" or "officinals".^[a] Before 1542, the works principally used by apothecaries were the treatises on simples by Avicenna and Serapion's *Liber De Simplici Medicina*. The *De Synonymis* and other publications of Simon Januensis, the *Liber Servitoris* of Bulchasim Ben Aberazerim, which described the preparations made from plants, animals and minerals, provided a model for the chemical treatment of modern pharmacopoeias. There was also the *Antidotarium Nicolai* of Nicolaus de Salerno, which contained Galenical compounds arranged in alphabetical order.^[62]

Spain and Portugal – de Orta, Monardes, Hernandez

The Spaniards and Portuguese were explorers, the Portuguese to India (Vasco da Gama) and Goa where physician Garcia de Orta (1490–1570) based his work *Colóquios dos Simples* (1563). The first botanical knowledge of the New World came from Spaniard Nicolas Monardes (1493–1588) who published *Dos Libros* between 1569 and 1571.^[63] The work of Hernandez on the herbal medicine of the Aztecs has already been discussed.

Germany – Bock, Brunfels and Fuchs



A Hans Weiditz hand-coloured woodcut from Otto Brunfels' *Herbarum Vivae Eicones*

Otto Brunfels (c. 1489–1534), Leonhart Fuchs (1501–1566) and Hieronymus Bock (1498–1554) were known as the "German fathers of botany"^[64] although this title belies the fact that they trod in the steps of the scientifically celebrated Hildegard of Bingen whose writings on herbalism were *Physica* and *Causae et Curae* (together known as *Liber subtilatum*) of 1150. The original manuscript is no longer in existence but a copy was printed in 1533.^[65] Another major herbalist was Valerius Cordus (1515–1544).^[66]

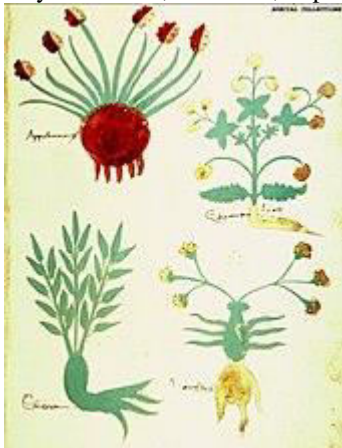
The 1530, *Herbarum Vivae Eicones* of Brunfels contained the admired botanically accurate original woodcut colour illustrations of Hans Weiditz along with descriptions of 47 species new to science. Bock, in setting out to describe the plants of his native Germany, produced the *New Kreuterbuch* of 1539 describing the plants he had found in the woods and fields but without illustration; this was supplemented by a second edition in 1546 that contained 365 woodcuts. Bock was possibly the first to adopt a botanical classification in his herbal which also covered details of ecology and

plant communities. In this, he was placing emphasis on botanical rather than medicinal characteristics, unlike the other German herbals and foreshadowing the modern Flora. De Historia Stirpium (1542 with a German version in 1843) of Fuchs was a later publication with 509 high quality woodcuts that again paid close attention to botanical detail: it included many plants introduced to Germany in the sixteenth century that were new to science.^[67] The work of Fuchs is regarded as being among the most accomplished of the Renaissance period.^[68]

Low Countries – Dodoens, Lobel, Clusius

The Flemish printer Christopher Plantin established a reputation publishing the works of Dutch herbalists Rembert Dodoens and Carolus Clusius and developing a vast library of illustrations.^[69] Translations of early Greco-Roman texts published in German by Bock in 1546 as Kreuterbuch were subsequently translated into Dutch as Pemptades by Dodoens (1517–1585) who was a Belgian botanist of world renown. This was an elaboration of his first publication Cruydeboek (1554).^[70] Matthias de Lobel (1538–1616) published his Stirpium Adversaria Nova (1570–1571) and a massive compilation of illustrations^[71] while Clusius's (1526–1609) magnum opus was Rariorum Plantarum Historia of 1601 which was a compilation of his Spanish and Hungarian floras and included over 600 plants that were new to science.^[72]

Italy – Mattioli, Calzolari, Alpino



Early Italian manuscript herbal, c. 1500. Plants illustrated are Appolinaris, Chamomeleon, Sliatriceo and Narcissus

In Italy, two herbals were beginning to include botanical descriptions. Notable herbalists included Pietro Andrea Mattioli (1501–1577), physician to the Italian aristocracy and his Commentarii (1544), which included many newly described species, and his more traditional herbal Epistolarum Medicinalium Libri Quinque (1561). Sometimes, the local flora was described as in the publication Viaggio di Monte Baldo (1566) of Francisco Calzolari. Prospero Alpini (1553–1617) published in 1592 the highly popular account of overseas plants De Plantis Aegypti and he also established a botanical garden in Padua in 1542, which together with those at Pisa and Florence, rank among the world's first.^[73]

England – Turner, Gerard, Parkinson, Culpeper

The first true herbal printed in Britain was Richard Banckes' Herball of 1525^[74] which, although popular in its day, was unillustrated and soon eclipsed by the most famous of the early printed herbals, Peter Treveris's Grete Herball of 1526 (derived in turn from the derivative French Grand Herber).^[75]



An engraving of Parkinson from his work *Theatrum Botanicum* (1640), reprinted in Agnes Arber's *Herbals*

William Turner (?1508–7 to 1568) was an English naturalist, botanist, and theologian who studied at Cambridge University and eventually became known as the “father of English botany.” His 1538 publication *Libellus de re Herbaria Novus* was the first essay on scientific botany in English. His three-part *A New Herball* of 1551–1562–1568, with woodcut illustrations taken from Fuchs, was noted for its original contributions and extensive medicinal content; it was also more accessible to readers, being written in vernacular English. Turner described over 200 species native to England.^[76] and his work had a strong influence on later eminent botanists such as John Ray and Jean Bauhin.

John Gerard (1545–1612) is the most famous of all the English herbalists.^[77] His *Herball* of 1597 is, like most herbals, largely derivative. It appears to be a reformulation of Hieronymus Bock's *Kreuterbuch* subsequently translated into Dutch as *Pemptades* by Rembert Dodoens (1517–1585), and thence into English by Carolus Clusius, (1526–1609) then re-worked by Henry Lyte in 1578 as *A Nievve Herball*. This became the basis of Gerard's *Herball* or *General Historie of Plantes*.^[78] that appeared in 1597 with its 1800 woodcuts (only 16 original). Although largely derivative, Gerard's popularity can be attributed to his evocation of plants and places in Elizabethan England and to the clear influence of gardens and gardening on this work.^[79] He had published, in 1596, *Catalogus* which was a list of 1033 plants growing in his garden^[20,21,22]

John Parkinson (1567–1650) was apothecary to James I and a founding member of the Worshipful Society of Apothecaries. He was an enthusiastic and skilful gardener, his garden in Long Acre being stocked with rarities. He maintained an active correspondence with important English and Continental botanists, herbalists and plantmen importing new and unusual plants from overseas, in particular the Levant and Virginia. Parkinson is celebrated for his two monumental works, the first *Paradisi in Sole Paradisus Terrestris* in 1629: this was essentially a gardening book, a florilegium for which Charles I awarded him the title *Botanicus Regius Primarius* – Royal Botanist. The second was his *Theatrum Botanicum* of 1640, the largest herbal ever produced in the English language. It lacked the quality illustrations of Gerard's works, but was a massive and informative compendium including about 3800 plants (twice the number of Gerard's first edition *Herball*), over 1750 pages and over 2,700 woodcuts.^[81] This was effectively the last and culminating herbal of its kind and, although it included more plants of no discernible economic or medicinal use than ever before, they were nevertheless arranged according to their properties rather than their natural affinities.^[82]



Wikiquote has quotations related to Nicholas Culpeper.

Nicholas Culpeper (1616–1654) was an English botanist, herbalist, physician, apothecary and astrologer from London's East End.^[83] His published books were *A Physicall Directory*^[84] (1649), which was a pseudoscientific pharmacopoeia. The *English Physitian*^[85] (1652) and the *Complete Herbal*^[86] (1653), contain a rich store of pharmaceutical and herbal knowledge. His works lacked scientific credibility because of their use of astrology, though he combined diseases, plants and astrological prognosis into a simple integrated system that has proved popular to the present day.^[77]

Legacy



Back cover of the Chinese pharmacopoeia (1930)

The legacy of the herbal extends beyond medicine to botany and horticulture. Herbal medicine is still practiced in many parts of the world but the traditional grand herbal, as described here, ended with the European Renaissance, the rise of modern medicine and the use of synthetic and industrialized drugs. The medicinal component of herbals has developed in several ways. Firstly, discussion of plant lore was reduced and with the increased medical content there emerged the official pharmacopoeia. The first British Pharmacopoeia was published in the English language in 1864, but gave such general dissatisfaction both to the medical profession and to chemists and druggists that the General Medical Council brought out a new and amended edition in 1867. Secondly, at a more popular level, there are the books on culinary herbs and herb gardens, medicinal and useful plants. Finally, the enduring desire for simple medicinal information on specific plants has resulted in contemporary herbals that echo the herbals of the past, an example being Maud Grieve's *A Modern Herbal*, first published in 1931 but with many subsequent editions.^[87]



Illustration of *Delphinium peregrinum* in *Flora Graeca* by John Sibthorp and Ferdinand Bauer (1806–1840)

The magical and mystical side of the herbal also lives on. Herbals often explained plant lore, displaying a superstitious or spiritual side. There was, for example, the fanciful doctrine of signatures, the belief that there were similarities in the appearance of the part of the body affected the appearance of the plant to be used as a remedy. The astrology of Culpeper can be seen in contemporary anthroposophy (biodynamic gardening) and alternative medical approaches like homeopathy, aromatherapy and other new age medicine show connections with herbals and traditional medicine.^[77]

IV.CONCLUSION

It is sometimes forgotten that the plants described in herbals were grown in special herb gardens (physic gardens). Such herb gardens were, for example, part of the medieval monastery garden that supplied the simples or officinals used to



treat the sick being cared for within the monastery. Early physic gardens were also associated with institutes of learning, whether a monastery, university or herbarium. It was this medieval garden of the fourteenth to sixteenth centuries, attended by apothecaries and physicians, that established a tradition leading to the systems gardens of the eighteenth century (gardens that demonstrated the classification system of plants) and the modern botanical garden. The advent of printing, woodcuts and metal engraving improved the means of communication. Herbals prepared the ground for modern botanical science by pioneering plant description, classification and illustration.^[88] From the time of the ancients like Dioscorides through to Parkinson in 1629, the scope of the herbal remained essentially the same.^[89] The greatest legacy of the herbal is to botany. Up to the seventeenth century, botany and medicine were one and the same but gradually greater emphasis was placed on the plants rather than their medicinal properties. During the seventeenth and eighteenth centuries, plant description and classification began to relate plants to one another and not to man. This was the first glimpse of non-anthropocentric botanical science since Theophrastus and, coupled with the new system of binomial nomenclature, resulted in "scientific herbals" called Floras that detailed and illustrated the plants growing in a particular region. These books were often backed by herbaria, collections of dried plants that verified the plant descriptions given in the Floras. In this way modern botany, especially plant taxonomy, was born out of medicine. As herbal historian Agnes Arber remarks – "Sibthorp's monumental Flora Graeca is, indeed, the direct descendant in modern science of the De Materia Medica of Dioscorides.

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5. ^ Stuart, pp. 1–26.
6. ^ Stuart, pp. 7–8, 13.
7. ^ See Arber, 1984
8. ^ Morton, pp. 115–164.
9. ^ See Andrews, 1982, pp. 277–296.
10. ^ Lais 2014, p. 8.
11. ^ USDA 2020.
12. ^ Jackson, p. 102.
13. ^ Blunt & Raphael, p. 10.
14. ^ Stuart, pp. 7–13.
15. ^ Blunt & Raphael, p. 5.
16. ^ Arber, pp. 271–285.
17. ^ Rohde, pp. 189–235.
18. ^ Jump up to:^{a b} Blunt & Raphael, p. 113.
19. ^ Blunt & Raphael, p. 172.
20. ^ Reed, p. 62.[20]



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