

The Past and Present Use of Plants for Medicines

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Evidence of the use of plants for medicinal purposes dates as far back as 60 000 years ago (1) in both western and eastern cultures; in both developed and undeveloped countries. For example, the *pharmacopoeia* of Emperor Shen Nung of China, around 2730–3000 BC, describes the medicinal use of plants such as Hemp, Aconite, Opium. The Egyptian *Pharmacopoeia* of Ebers Papyrus, written about 1500 BC, documents the medicinal use of plant extracts such as the poppy of Opium and oil of Castor beans (2, 3). Some of the plants commonly used today, such as peppermint (*Mentha piperita*), poppy (*Papaver somniferum*), mugwort (*Artemisia vulgaris*), sage (*Horminum pyrenaicum*), rosemary (*Hyssopus officinalis*), rue (*Ruta graveolens*) and verbena (*Verbena officinalis*) are well documented in the “*Materia medica*” of the great physician Hippocrates (about 460–370 BC) and in the several manuscripts written (around 160 AD) by Galen, a surgeon from Asia Minor.

In early civilizations, illness was usually believed to be due to divine punishment. The Aztecs Indian of South America, for example, believed that particular diseases were linked to specific gods; thus their god Tlaloc was associated with diseases caused by water, such as oedema (4). Similarly, Greek physicians, such as Theoprastus, were generally followers of Asclepius, the god of Medicine. Thus the use of plants for healing became strongly associated with the gods.

With the fall of the Roman Empire and the advancement of Christianity in western cultures, the use of plants for healing was discouraged. Ironically, although early Christians also saw disease and illness as divine (heaven-sent) punishment, they believed it could only be cured through repentance and prayer, not through the use of medicinal plants. Additionally, as Christianity only recognizes the power of one God, the strong association of many gods and plant medicines led to the value of plant medicines becoming clouded in myths. By the 1500s AD, the use of plants as medicine in western society became further mystified by the “*Doctrine of Signatures*”. Supporters of the doctrine believed that the physical attributes of plants were indications of their medicinal value. Thus, the holes in the leaves of St John’s wort (*Hypericum perforatum*) signified

that it was useful to help both inward and outward holes or cuts in the skin. Its walnut shape was considered to be similar to the shape of the human head and therefore useful for conditions related to the brain. The relevance of the doctrine to Christianity was then profoundly outlined by Robert Turner, who stated, “*God hath imprinted upon the plants, herbs and flowers, as it were in hieroglyphics, the very signature of their virtues*” (5).

Despite the negative influence of Christianity on plant medicines, the Arabs of eastern societies continued the compilation of data of the medicinal value of plants. They translated the original Greek manuscripts into Arabic and added their own observations producing many manuscripts. One such manuscript was the *Canon of Medicine* that recorded the findings of Avicenna (the prince of physicians, as he was called, about 1000 AD), which referred to the works of Greek philosophers, Galen and Aristotle.

The age of exploration and conquering of new lands provided western societies with a renewed interest in the usefulness of plants to treat diseases. For example, the Spaniards, who conquered Mexico and Peru between 1531 and 1536, were impressed with the medicinal uses of plants by the native Indians. *Coca* was an important painkiller used among the Indians and even up to the present time, it has held its place in western medicine due to the isolation of the medically active component, cocaine. Another Indian remedy was the resinous gum from the plant *Pinus edulis* which was used for the treatment of abscesses. It was later discovered to have pinene oils that are effective in killing *Staphylococci* bacteria (4).

With the development of Chemistry, the focus was to isolate and identify biologically active compounds from plants, as these were considered to be of greater value therapeutically and they would also provide the starting material for laboratory synthesis of new compounds of even greater value. This approach to medicinal plant research led to the elucidation of the chemistry of Opium. From this plant, morphine was isolated and many derivatives have been synthesized and are being used medicinally (6). Eventually, this would result in a preference for medicines made primarily of pure chemical compounds.

Although this approach to drug development resulted in the production of many useful synthetic drugs, there are still many health problems that have not been resolved by the use of these drugs. In the 1960s, while screening plants for

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anti-cancer activity at The University of Texas (7), Taylor made the statement that “*In our 20 years of cancer research, we have never had as much success with the chemicals invented by man as we are now having with plant extracts*”.

The World Health Organization (WHO) estimates that 4 billion people (80% of the World’s population) use herbal medicines for some aspect of primary healthcare (8). This recognition of the importance of medicinal plant-use has resulted in a WHO decision to produce 28 standard pharmacopoeia documenting information on selected plants (9). Additionally, many countries have established databases to record information (medicinal and otherwise) on their plant biodiversity and have produced plant derived medicinal products.

The renewed interest in the medicinal usefulness of plants has also resulted in the development of a new category of therapeutic agents called “Nutraceutical”, a term coined in 1989 by DeFelice. He defined nutraceuticals as foods or part of foods that provide medical or health benefits, including prevention and treatment of disease (10). Foods are eaten to provide nutrition and thus prevent illness; therefore, the original definition of nutraceuticals could include all foods. Consequently, the term was redefined by “Health Canada” (http://www.hc-sc.gc.ca/hpb-dgps/therapeut/zfiles/english/ffn/nutra_pol_e.html) as products made from foods but sold as pills, powders, potions and other medicinal forms and demonstrated to have physiological benefits or provide protection against chronic diseases.

The interest in plants as medicines is now directed towards producing therapeutically semi-purified forms, which are quantifiable, with no serious toxicities and low in cost. This would be of significant value to countries that are poor in financial resources, but are rich in biodiversity.

The development of such plant-derived products must involve standardized research protocols to ensure the safe

medicinal use of these agents. Even early civilization showed an appreciation of trials (and errors). How else could Emperor Shen Nung of China have documented that an oral dosage of 10–20 drops of Chaulmoogra oil (from *Hydrocarpus* genus) after meals and application of the oil to the wound would be enough to heal leprosy? How else would early cultures realize that the oil from Castor beans in small amounts, made a reliable purgative, while two to three beans themselves if eaten would prove fatal? How else would hunters have known they could kill animals with poisons on their arrows, yet consume the meat safely? Thus while plants have much to offer medicine, care must be taken to ensure that plant-derived products maintain the standards expected in the management of illness and not allow their significant value to become clouded in myths again.

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