ETHNOMEDICAL HERBS AND VARIOUS APPROACHES IN DEVELOPMENT OF NEW DRUGS

Dr. Ravindranath M Jaganathan*1, Dr. Little Mahendra2, Dr. Jaideep Mahendra3, Dr. Vijayarani Kumanan4 and Dr. Kumanan Kathaperumal5

1Research Scholar, Meenakshi University, Chennai, Tamilnadu, India.
2Assistant Professor, Rajah Muthiah Dental College & Hospital, Annamalai University.
3Professor, Meenakshi Ammal Dental College & Research Institute, Chennai, India.
4Professor, Dept of Animal Biotechnology, TANUVAS, Madras Veterinary College.
5Dean, Faculty of Basic Sciences, TANUVAS, Madras Veterinary College, Chennai.

ABSTRACT

Medicinal herbs and their derived phytocompounds are being increasingly recognized as useful complementary treatments for various diseases. A large volume of clinical studies have reported the beneficial effects of herbal medicines on the survival, immune modulation, and quality of life for various diseases. So far 122 compounds of defined structure, obtained from only 94 species of plants, which are used globally as drugs and demonstrate that 80% of these have had an ethnomedical use alike or associated to the existing use of the active elements of the plant. In this article we discuss advantages and disadvantages of using plants as starting points for drug development, plants as a source of therapeutic agents, specifically those used in traditional medicine and also various approaches in selecting a plant for new drug development with the greatest likelihood of success.

KEYWORDS: Medicinal plants, Ethnomedicine, Drug Discovery, Phytomedicine, Herbal drugs.

INTRODUCTION

Ethnomedicine is the study or comparison of traditional medicines practiced by various ethnic groups and especially by indigenous people. The ethnomedicine is based on ancient written sources along with knowledge and practices that have been handed down orally over
centuries. Whereas phytotherapy is the study of use of extracts of natural origin as medicines or health promoting agents, known as phytomedicines and their clinical use in phytotherapy or herbal medicine.\[1\]

In olden days natural products were the origin of all medicinal drugs. However in the last century due to the tremendous development in the field of synthetic chemistry and biotechnological techniques which had offered alternatives to natural sources.\[2\] The past few decades have witnessed a special interest in the field of drug discovery with application of new technologies to natural product research, which has led to discovery of various new active components.

The Value of Ethnomedicine
Understanding the value of Ethnomedicine, The WHO Traditional Medicine Programme (TRM) was initiated to provide evidence that ethnomedical information did indeed lead to useful drug discovery. The WHO-TRM centres throughout the world had identified the plant-derived pure compounds used as drugs in their respective countries. In addition, the scientific literatures and original papers reporting isolation of these compounds from their respective plants and also the pharmacopoeia of useful drugs were identified from developed and developing countries. This was done to determine whether the chemical efforts were stimulated by ethnomedical claims and to correlate current uses for the compounds with such ethnomedical claims.\[3\] These compounds derived from only 94 species of plants, and a conservative estimate of the number of flowering plants occurring on the planet is 250,000, there should be an abundance of drugs remaining to be discovered in these plants.

Progress in Ethnomedicine
In 1985 the WHO Special Programme of Research and Training in Human Reproduction embarked on a program called “The Task Force on Plants for Fertility Regulation.\[4\]” The mission was to select plants on the basis of ethnomedical claims related to human reproduction, safety with long-term use was presumed. The ultimate goal was to discover orally active, pure substances that were non-estrogenic, non-steroidal, non-toxic and anti-implantation agents. Work was to take place initially in designated centers in the United States, England, South Korea, Brazil, India, and Hong Kong, with additional centers later established in the People’s Republic of China and Thailand. An ingredient that all estimated projections fail to consider is that any of the 250,000 higher plant species on earth could conceivably produce a new drug, leaving all other criteria, projections, and speculations
aside. From 1960 to 1981 NCI collected and screened approximately 35,000 plant species for anticancer activity.\[5\] Eventually, all residual extracts from these 35,000 species were destroyed after they were assessed for anticancer activity.

It is improbable that one could collect all the 250,000 higher plant species to screen for one or more biologic activities, and because the number of bioassays that one could screen these species for is unlimited, one must select wisely those species most likely to produce useful activity. In addition, the biologic targets must represent the activities that correlate best with the rationale for plant selection. It would appear that selection of plants based on long-term human use (ethnomedical) in conjunction with appropriate biologic assays that correlate with the ethnomedical uses would be most appropriate.

**Advantages & Disadvantages of the plants in drug development**

There are advantages and disadvantages of using plants as the starting point in any drug development program. If one elects to use information suggesting that specific plants may yield useful drugs based on enduring use by humans (ethnomedicine) one can reduce that any isolated active compounds from the plants are likely to be safer than active compounds from plants with no history of human use. It is commonly believed that plants provide an unlimited source of novel and complex chemical structures that most likely would never be the subject of a beginning synthetic program, e.g., vinblastine, vincristine, taxol, d-tubocurarine, digoxin. If the active principles derived from plants have novel structures and useful biologic activity, patent protection can be assured.

The most useful drugs derived from plants have been discovered by follow-up of ethnomedical uses. Further, the trend today, especially in an industrial setting, is to seek bioactive compounds from plants that will serve as lead compounds for synthetic or semi synthetic development, to assure patent protection. Thus, this diminishes the need to isolate novel bioactive structures from plants, since the ultimate goal is to use the active compounds to produce synthetic derivatives with lower toxicity and higher efficacy. Several pitfalls can emerge when deciding to use plants, through either random selection or ethnomedical claims involving the targeted disease. First, plants as biologic systems have inherent potential variability in their chemistry and resulting biologic activity.
Ethnomedicine in times of yore

Ethnomedicine over the years have contributed to the breakthrough of many important plant derived drugs. Before the introduction of high throughput screening and post-genomic era, more than 80% of drug substances were either natural products or inspired by a natural compound. Studies indicate that almost half of the drugs approved since 1994 have been based on natural products.[2] This field although it still continues to produce new drugs but to a lesser extent. In many cases, modern western science has corroborated the proper use of assorted traditional ethnomedical plants including ginkgo, ginseng and centella which have become a part of modern therapies after thorough investigations establishing their quality, security and safety.

Eastern Ethnomedicine plants introduction into western medicine

Traditional medicine exists in every part of the world but is in particular popular in India, China and Europe. The philosophy of traditional medicine bears some resemblance to each other, but all differ widely from modern western medicine.[6]

Many medicinal plants and crude drugs used in traditional medicine have gradually been included in western medicine. The legislation in the developed countries of Europe and America requires that medicinal herbal drug fulfil international requisites of quality, safety and efficiency to be included in their guidebook. Although the procedure for developing herbal drugs for worldwide use is necessarily different from that of synthetic drug, the former have the incredible advantage of being readily available, usually at a reasonable cost, to patients living in the geographical areas where such drugs have been traditionally used.

Plants as sources of therapeutic agents

The knowledge of medicinal plants preserved by indigenous specialists is priceless information. As with genetic diversity, once lost, it cannot be recovered. Without it, we must use random screening, which is like searching for a needle in a haystack. Past experience is the best argument here, Overall 74% of chemical compounds used as drugs today have the same or related use in Western medicine as they do in traditional medical systems.[7] It has been estimated that ethnobotanical information might have increased the yield of active plants by 50 to 100 percent in the National Cancer Institute (NCI) research program in the search for anti-cancer and anti-AIDS drugs.
Plants have an advantage in this area based on their long-term use by humans (often hundreds or thousands of years). One might expect any bioactive compound obtained from such plants to have low human toxicity. Noticeably, some plants may be toxic within a given endemic culture that has no reporting system to document these effects. It is improbable, the acute toxic effects following the use of a plant in these cultures would not be noticed, and the plant would then be used cautiously or not at all. Chronic toxic effects would be less likely to signal that the plant should not be used. In addition, chemical diversity of secondary plant metabolites that result from plant evolution may be equal or superior to that found in synthetic combinatorial chemical libraries.

It was estimated that, for every 10,000 pure compounds that are biologically evaluated, 20 would be tested in animal models, and 10 of these would be clinically evaluated, and only one would reach U.S. Food and Drug Administration approval for marketing. The time required for this process was estimated as 10 years at a cost of $231 million.[8]

Several reviews pertaining to approaches for selecting plants as candidates for drug discovery Programs have been published.[9,10,11,12]

**Approaches for Drug Discovery**

*Follow-up of biologic activity reports*

These reports showed that the plant extracts had interesting biologic activity, but the extracts were not studied for their active principles. The literature from the 1930’s through the 1970’s contains these types of reports.

*Based on chemical Screening*

The phytochemical screening approaches have been used in the past and are currently pursued mainly in the developing countries. The tests are simple to perform, but false-positive and false-negative tests often render results difficult to assess.[13,14,15] More important, it is usually impossible to relate one class of phytochemicals to specific biologic targets; for example, the alkaloids or flavonoids produce a vast array of biologic effects that are usually not predictable in advance.

*Based on one or more biologic assays*

In the past, plant extracts were evaluated mainly in experimental animals, primarily mice and rats. The most extensive of these programs were sponsored by the National Cancer Institute.
(NCI)\textsuperscript{[16,17]} in the United States and the Central Drug Research Institute (CDRI) in India.\textsuperscript{[18,19]} More than 35,000 species were screened in vitro and later in vivo at NCI from 1960 to 1981. In 1986 the NCI program abandoned this approach and continued to collect and screen plants using tumor cell lines and also initiated a screening of plants for anti-HIV activity in-vitro. The CDRI evaluated approximately 2,000 plant species for several biologic activities, including antibacterial, antidiabetic, antifertility, antifungal, antihypercholesteremic, anti-inflammatory, antitumor, cardiovascular, central nervous-system depressant, cytotoxicity, diuretic, and others.\textsuperscript{[20]} To date no biologically active drugs for human use have arisen from that program, even though a large number of known and novel bioactive compounds were isolated from the active plants.\textsuperscript{[21]}

**Based on Chemotaxonomic approach**

Chemotaxonomic approach is guided approach in which certain families or genus of species were screened that is likely to contain certain classes of compounds such as (alkaloids, steroids, amino acids, etc.) A crude extract of a plant can be separated into its individual components, especially in the case of micromolecules, by using one or more techniques of chromatography, including paper, thin-layer, gas, or high-pressure liquid chromatography. The resulting chromatogram provides a visual display or “fingerprint” characteristic of a plant species for the particular class of compounds under study. The individual, separated spots can be further purified and then subjected to one or more types of spectroscopy, such as ultraviolet, infrared, or nuclear magnetic resonance or mass spectroscopy (or both), which may provide information about the structure of the compound. Thus, for taxonomic purposes, both visual patterns and structural knowledge of the compounds can be compared from species to species.\textsuperscript{[22]}

**CONCLUSION**

The ethnomedical knowledge has led to immense developments in health care. The field of Ethnomedicine must be explored and gathered to the fullest in order to mainstream medical field to progress further. The immense new discoveries promised by the field of modern phytomedicines are just too attractive to defy by those who respect the active scientific progress. The loss of tribal cultures and customs, some of the information will no doubt disappear. The large quantity of ethnomedical information on plant uses can be found in the scientific literature but has not yet compiled into a usable form. Regardless of the vast potential and possibilities, as of now, very few successful drugs have come into view from
Ethnomedicine. This may be because most of the work in this field has remained within the clinics of traditional practitioners or confined to academic research laboratories and not taken seriously by industries that are strong in research and development.

REFERENCES


