

IMPORTANCE OF HERBAL DRUG FOR NEW DRUG DEVELOPMENT

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ABSTRACT

Drug discovery leading to robust and viable lead candidates' remains a challenging scientific task, which is the transition from a screening hit to a drug candidate, requires expertise and experience. Natural products and their derivatives have been recognized for many years as a source of therapeutic agents and of structural diversity. However, in addition to their chemical structure diversity and their biodiversity, the development of new technologies has revolutionized the screening of natural products in discovering new drugs.

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INTRODUCTION

Nature has provided a complete storehouse of remedies to cure all ailment of mankind. The knowledge of drugs has accumulated over thousands of years as a result of man's inquisitive nature so that today we possess many effective means of ensuring health-care. The history of herbal medicines is as old as human civilization. In the past, almost all the medicines were used from the plants, the plants being man's only chemist for ages. Today, a vast store of knowledge concerning therapeutic properties of different plants has accumulated. Most of the medicinally active substances identified in the nineteenth and the twentieth century were used in the form of crude extract.^[1] A large portion of the Indian population even today depends on the Indian System of Medicine-Ayurveda, 'An ancient science of life'. The well known treaties in Ayurveda are *Charakasamhita* and *Sushruthasamhita*. The importance of medicinal plants in the traditional health care system (Ayurveda, Unani, Homeopathy and Yoga) in solving health care problem was well known since a long time. New efforts are being made to develop herbal medicines in institutes of research and technology all over the world.^[2] Herbal medicine is currently enjoying a revival in popularity in the west and in the fact it is the primary form of medicine in many part of world. With the great reliance on this type of medicine, it becomes pertinent to search for potent, effective and relatively safe plant medicines as well as scientific validation of the success claims about plants already in use by traditional medicine practitioners in order to enhance their safety and efficacy.^[3]

Ayurveda –An Indian System of Medicine

Ayurveda in Sanskrit means the "Science of life". It is the system of traditional medicines native to India and is practiced other parts

of the world as a form of alternative medicine. Ayurveda traces its origins to the Vedas, the *Atharvaveda*, and is connected to religion and mythology. Ayurveda emphasizes on prevention of disease, rejuvenation of our body systems and extension of life span. Ayurveda believes in five great elements, they are earth, water, fire, air and space comprising the universe and the human body. Ayurveda stress the balance of three Substances they are *vata* (wind/spirit/air), *pitta* (bile) and *kapha* (phlegm) constituting of Doshas. The eight elements of the Ayurveda treatment called *Ashtanga* are given the Traditional beliefs holding that our human bodies possess a unique constellation below:

- ✓ Surgery (*Shalya-chikitsa*)
- ✓ Treatment of diseases above the clavicle (*Salakyam*)
- ✓ Internal medicine (*Kaaya-chikitsa*)
- ✓ Demonic possession (*Bhutavidya*, which is also called psychiatry)
- ✓ Paediatrics (*Kaumarabhrtyam*)
- ✓ Toxicology (*Agadatantram*)
- ✓ Prevention and building immunity (*Rasayanam*)
- ✓ Aphrodisiacs (*Vajikaranam*)

Ayurveda-Ancient science of life is believed to be prevalent for last 5000 years in India. It is one of the most noted systems of medicine in world. Ayurveda is based on the hypothesis that everything in the universe is composed of five basic elements viz. space, air, energy, liquid and solid. They exist in the human body in combined forms like *vata* (space and air), *pitta* (energy and liquid) and *kapha* (liquid and solid).^[4] *Vata*, *pitta* and *kapha* together are called *Tridosha* (three pillars of life). It is believed that they are in harmony with each other, but in every human

being one of them is dominating which, in turn is called *prakruti* of person. *Tridosha* exist in human body in seven forms called *Saptadhatu*. Authentic information on Ayurveda has been compiled by ancient Indian Medicine practitioners in forms called *Samhita* and other similar books. Ayurvedic Pharmacy (*Bhaisajya-Vigyan*) proposes five basic dosage forms like *Swaras, Kalka, Kwath, Hima* and *Phant*. Large portion of the Indian population even today depends on the Indian system of medicine (Ayurveda, Unani, Homeopathy and Yoga).^[5]

Natural Products for Modern Medicine

Herbal drugs constitute a major part in all the traditional systems of medicine. Herbal medicine is a triumph of popular therapeutic diversity. Plants above all other agents have been used for medicine from time immemorial because they have fitted the immediate personal need are easily accessible and inexpensive. Indian *Materia medica* includes 2000 natural products of therapeutic importance of which 400 are of mineral and animal origin and rest are of vegetable origin. There are approximately 1250 Indian medicinal plants, which are used in formulating therapeutic preparation according to Ayurveda and other traditional system of medicine.^[6] Plants are being used in medicine from time immemorial because they have fitted the immediate personal need, they are accessible and inexpensive, the practitioners speak to those who have used them in their own language and they are not provided from a remote professional or government apparatus. For these and other reasons, the use of plants for medicines around the world still vastly exceeds the use of modern synthetic drugs. Such activity is not completely dismissed in scientific society and plants are also appreciated in pharmaceutical research as the major resource for new medicines and a growing body of medical literature supports the clinical efficacy of herbal treatments.^[7]

Herbs have provided the basis for the great medical systems in human history, of Hippocrates and Galen and great Islamic eras, of the Ayurveda of the Indian subcontinent, of waves of Chinese systemizations over two millennia and the many smaller cultural traditions that were often hybrids of the foregoing.^[8] Plant products can also be useful as starting material for the semi synthetic preparation of other drugs. The main examples are plant steroids for the manufacture of oral contraceptives and other steroidal hormones. Diosgenin from several species of yams (*Dioscorea*) and hecogenin from sisal leaves (*Agave sisalana*) is the main compound used.^[9]

Quality Control in Traditional Systems of Medicine

Owing to long standing and time proven uses of herbal drugs along with higher safety margins, World Health Organization (WHO) has taken necessary steps to ensure quality control with modern techniques and application of suitable standards for this purpose. The pharmacopoeias of different countries include monographs including quality parameters and standards for various herbal drugs, and also for some of their products. The individual parameters included in these monographs.^[10] For the purpose of quality control of herbal drugs, WHO has prepared accordingly the guidelines. The objectives put forth are provisions for recommended general test methods and also the general limits for contaminants for herbal drugs. For the standardization of herbal drugs in TSM the parameters usually studied are:

- Authentication
- Foreign matters
- Organoleptic evaluation
- Microscopy
- Volatile matters
- Extractive values
- Ash values

- Radioactive contaminants
- Microbial load
- Pesticide residues
- Refractive index
- Heavy metals load
- Chromatographic profile and
- Marker compound

In almost all the traditional systems of medicine, the Quality control aspect has been considered as important parameter from its inception itself by the *Rishis* and later by the *vaidyas* and *Hakims*.^[11]

Role of Traditional System of Medicine in Primary Health Care

India has produced a respectable healthcare system, Ayurveda which encompasses the entire spectrum of human health and contributes to the positive health of an individual. But due to certain inimical interference with the system over the ages, a need has arisen to unify the entire system and codify it. Traditional use of herbal medicine is the very basis and integral part of various cultures, which was developed within an ethnic group before the development and spread of modern science. The herbal medicines as the major remedy in traditional medical systems have been used in medical practice for thousands of years.^[12]

Importance of Herbal Therapies

Herbal medicines are prepared from a variety of plant materials-leaves, stems, roots bark and so on. They usually contain many biologically active ingredients and are used primarily for treating mild or chronic ailments. Herbs can be prepared at home in many ways using either fresh or dried ingredients.^[13] Plants are considered to be medicinal if they possess pharmacological activities of possible therapeutic use. These activities often known as a result of millennia of trial and error, but they have to be carefully investigated if we wish to develop new drugs that meet the criteria of modern treatment. The goals of research in this field are especially:

- The identification of the active principles of medicinal plants, and investigation of the extracts in order to insure that they are safe, effective, and of constant activity.
- The isolation of these active principles and the determination of their structure, in order that they may be synthesized, structurally modified, or simply extracted more efficiently.

The methodology of research into medicinal plants must be rigorous. Often simple technical errors undermine the value of research on natural products. There are many who believe that a little research is sufficient to conform the reputation of a plant, and who then attempt to proceed from there towards lucrative industrial production.^[14]

Usage of Herbal Drugs in Traditional Medicine

Work for this first stage comes within the responsibilities of the Pharmacognosist or Ethnopharmacologist, who must gather information in the field by using the lore of traditional medicine and by questioning the healers. This process is not always easy; it is difficult to obtain systematic information from healers who certainly have nothing to gain from revealing the secrets of their trade.^[15] One must also bear in mind the cultural difficulties inherent in interpreting the data of traditional medicine. They must be examined in the light of local culture and language. For example, it would be unthinkable to interpret Chinese medicine from the same vantage point as traditional African medicine; the

underlying diseases may be the same but their expression and interpretation are totally different.^[16]

Prospects of Herbal Research

There is worldwide 'green' revolution, which is the herbal remedies are safer and less damaging to the human body than synthetic drugs. Furthermore, underlying this upsurge of interest in plants is the fact that many important drugs in use today were derived from plants or from starting molecules of plant origin. Digoxin/Digitoxin, the vinca alkaloids, reserpine and tubocurarine are some important examples. Plants have also yielded molecules, which are extremely valuable tools in the characterization of enzymes and the classification of receptor systems where physostigmine, morphine, muscarine, atropine, nicotine and tubocurarine are important examples. Some scientists thus expect that the plant kingdom hold the key to the understanding of complex human biochemistry/pathology and the cure of man's perplexing diseases. The initial optimism, engendered by the idea that a sophisticated understanding of receptor systems and of the biochemistry of diseases would pave the way to predictable drug development has not been realized.^[17] Therefore laboratories around the world are engaged in the screening of plants for biological activity with therapeutic potential. Virtually every human society evolved an indigenous health care system to cope with illness. In western technologically advanced societies, traditional pre-science notions of the causes of disease and how to manage it have given way to modern ideas based on scientific biomedical theories. In the less technologically developed societies, traditional modes of thought still dominate the forms of medical practice seen in those societies. It is imperative that we do not ignore the thought processes behind these systems for two reasons;

- It is the continued use of plants for the treatment of disease in these systems that have invigorated our interest in phytotherapy.
- The experience from cultural practices of medicine can often be of value in the biomedical scientist's search for understanding of complex aspects of healing.

New Developments in Herbal Drug Research

There has been a controversial discussion about herbal medicines sold outside pharmacies. One of the problems is that some these drugs can only be sold outside pharmacies if they claim other than therapeutic indications. This legislation led to fantastic indication claims as for example "blood purifier" or "heart nutrition". Other products claim prophylactic or supporting effects. Most of these products are very complex fixed combinations composed of herbal preparations and other chemically defined substances. The dosage of the active constituents is normally quite low. It is difficult to find scientific evidence of efficacy for such products. In some cases, this is even true for a traditional use within the indications claimed for the products. Consequently, the evaluation approach by the official authorities would lead to a negative vote and to the disappearance of such products from the market, even if the weakest criteria be applied. The corresponding products have to be labelled as traditionally used based on different criteria as:

- To tonify and to fortify
- For amelioration of subjective health conditions
- To support organ function
- For prophylaxis
- As mildly active drug
- Because of these aspects, we would have to consider three groups of herbal medicines, which differ with respect to their indication claims;

- Herbal medicines with indication proved by new controlled clinical trails
- Those with indications proved at least by long-term traditional use which is supported by experimental data and
- Herbal medicines with documented traditional use but without further assessment of efficacy requiring a special labeling on the package of the finished drug.

Biological Diversity- Role in Herbal Drug Development

Natural products and especially those derived from higher plants have historically played a pivotal role in the discovery of new pharmaceuticals. However, in the recent past less emphasis been placed on higher plants as compared to other natural product sources, especially microorganism. Chemicals derived from higher plants have played a central role in the history of mankind. Efforts to develop new, clinically effective pharmaceutical agents have relied primarily on one of five approaches, most of which utilize existing in some manner as follows:

- Derivatization of existing agents
- Synthesis of additional analogs of existing agents
- Use of combination therapy of existing agents with other drugs
- Improvement of delivery of existing agents to the target site
- Discovery of new prototype pharmaceutical agents

While approaches are important and need to be continued in that they seek to utilize existing agents and information in the most effective manner, there is an urgent need for the development of totally new, prototype agents which do not share the same toxicities, across resistance or mechanism of action as existing agents.

Drug Discovery from Natural Products

All the wonderful progresses of synthetic chemistry are of science in general, unfortunately, has not served to alleviate and cure all the sickness in the world. According to surveys and other research carried out in different countries, scientific (or standard) medicine in developing countries serves only a minority (estimated at 30 to 50 per cent of the total population), while the rest of the population attends to its health needs through the process called traditional medicine, aboriginal medicine, or folk medicine, processes based essentially on the use of low-cost medicinal plants that are easily accessible to the entire population. One positive aspect of the medicinal plants is their low cost compared to the high price of new synthetic drugs, which have become totally inaccessible to the vast majority of people.

Another consideration in favour of the use of medicinal plants, when they are the only recourse available is that they have comparatively few side effects. Between 3 and 5 percent of patient hospital admissions are attributed to side effects of pharmaceuticals. On the other hand, medicinal plants, with a few exceptions, do not have great therapeutic potency, but neither do they have great therapeutic toxicity, but neither do they have intense or serious side effects. Therefore, their direct administration in folk medicine offers little risk. Thus there exists a wide field for research in the phytochemistry of those hundreds of plants that are used in folk medicine in each country, research confirming the presence of pharmacodynamic chemicals such as alkaloids, glycosides to a lesser degree, and essential oils and other substances, indispensable knowledge that justifies the practices of naturalist and folk medicine. The natural products have played the major role in drug discovery.^{[9],[11]}

CONCLUSION

The approach described in this article can be used to get more TM products registered by drug regulatory agencies (DRAs). But, there is a need, especially in emerging polities, for Research Institutes/ Universities to team up with their national DRAs, to work.

CONFLICT OF INTEREST

The author declares that he has no competing interests.

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