RATIONAL USE OF AYURVEDIC LITERATURE FOR DRUG DEVELOPMENT

Dr. DEEPA ARORA and Dr. MUKESH KUMAR
Assistant Professor, Department of Pharmacology
Universal College of Medical Sciences, Bhairahawa, Nepal

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ABSTRACT: Research in Ayurveda for lead structures has continued to be an area of major scientific interest with investigators engaged in drug development. The exhaustive information available in Ayurvedic literature provides a drug researcher the opportunity to start with a well tested and safe botanical material. However, an inappropriate interpretation of Ayurvedic texts can lead to research in a wrong direction which may present as lack of effectiveness or serious adverse effects with herb under investigation. The problems faced in the selection of medicinal plants, underlying cases and the possible solutions have been discussed in the following article.

INTRODUCTION

Botanicals have been used to ameliorate human suffering since antiquity. Even today the active principles derived from botanicals form a major component of therapeutic armamentarium, as about 130 pure chemical entities extracted from about 100 species of higher plants are being used in medicine throughout the world. Most of these have been developed on the basis of information obtained from the traditional medical systems of the west. On the other hand, Ayurveda, the Indian system of Medicine remains largely underexplored even through medicinal plants have continued to be an area of major scientific research to discover new therapeutic molecules which can further be used as templates for the development of new therapeutic molecules which can further be used as templates for the development of new improved drugs. Many renowned drug houses have launched very active programs of mechanism based natural product discovery research. In one such program, more than 61,000 primary screening assays in 21 different mechanism based assay system yielded less than 0.03% true leads

Thus, the mass screening of plants in the search for new drugs is vastly expensive as well as exhaustive with low cost effectiveness. It is well understood that specialized biological screening based on traditional use is more economic and effective. In Ayurvedic texts, there is an exhaustive description of herbs and their clinical uses which can be further explored using modern scientific methods to establish their therapeutic usefulness and detect the wonder molecules. Ayurveda, thus, has an important role in bioprospecting of further medicine.

Possible because of different therapeutic principles, many difficulties are faced during this process of drug development, which can be adequately overcome by an appropriate correlation of principles for diagnosis and treatment of both the systems of medicine. This in turn depends on an appropriate interpretation of Ayurvedic texts in contrast to mere translation in different languages.
Misinterpretation of Ayurvedic literature is one of the main reasons for erroneous selection of herbs (for the development of NCEs) leading to failures in drug development. However, the problem along with its causes has been indentified and efforts are on to rectify the same.

INAPPROPRIATE INTERPRETATION OF AYURVEDIC LITERATURE- REASONS AND SOLUTIONS

The reasons for misinterpretation of Ayurvedic texts can be

1. Non availability of systematically organized literature.
2. Communication gap
3. Difference in the lanuage and principles of documentation system

Frequent foreign invasions led to the destruction of existing literature and loss of royal patronage obstructed further developments. Continuous political turmoil and underdeveloped means of communication were the main reasons that therapeutic experiences gained in different parts of the country could not be presented in an organized manner. Till the fourth century AD, Sanskrit was common language of communication and regular seminars were held so as to streamline the thoughts, which in turn ensured the availability of systematically arranged literature. As a result of foreign invasions, Sanskrit lost its status as the main language of communication an Ayurvedic texts were being written in different scripts. Thus, different schools of treatment according to region and language developed. The loss of gurukulaparampar a further complicated the situation.

These problems are being identified by Ayurvedic experts and policy makers. The existing literature is being systematically organized in the form of Ayurvedic Pharmacopoeias, textbooks for undergraduate and postgraduate courses in Ayurveda and recently the database is being prepared by Central Council for Research in Ayurveda &Siddha. With the help of experts the available manuscripts are being edited and the classical Ayurvedic texts from different languages are being translated. It needs to be considered at this juncture that mere translation in another language can further complicate the situation, thus, it must be with correlation of basic scientific concepts which can be achieved when scholars of modern and Ayurvedic sciences sit, together understanding each others’ views. The correlation of concepts can also be facilitated by the results of research in modern laboratories on Ayurvedic medicinal plants\(^2,3\). The experimental and clinical studies in Ayurvedic medicine have been reviewed and great volumes like The Medicinal Plants vol.I & II (ICMR) and The Wealth of India (CSIR) have been prepared.

Inappropriate Application of Ayurvedic Principles

Like modern medicine in Ayurveda, substances with properties and effects opposite to that of etiologic factors are used for treatment of diseases. Thus, unlike other systems of medicine, e.g. Homoeopathy which believes in like cures like and that efficacy increases with dilution, there are no radical differences in Ayurveda and allopathy. However, even then one should not forget that Ayurveda is a different system of medicine with its own specialized principles of diagnosis and treatment, with holistic approach and individualization of therapy being some of its important attributes. The therapeutic strategy in Ayurveda is based on fundamental principles like nature of imbalance caused
by disease, the dosic constitution (prakrti) of
the person and effects of different drugs on
diseases as well as on dosas. The
formulations are designed specifically for a
person, for a specific disorder, to be used
during a specific season, under specific
environmental conditions, appropriately
know as individualization of therapy. In
order to effectively achieve all these goals,
various herbs are judiciously used in a
definite proportion, after adequate
processing. Therefore, compound
formulations are extensively used in
Ayurvedic treatment. The aim of such
modified treatment is have formulation of
Pharmaceutical product with maximum
therapeutic efficacy and high degree of
safety to the particular person under specific
conditions. Thus compound formulations
are used with a aim to achieve individualization of therapy in accordance
with Ayurvedic principles of therapy.

However, the changing life styles, tensions
and speed in modern life call for easy
accessibility, modern packaging and
delivery systems, as available with single
active chemicals, Ease of standardization,
sure reproducibility of effect and less
dependence on natural factors for production
are additional advantages offered. Further,
the medicinal plants on the verge of
extinction can be protected by the synthesis
of active chemicals. Thus, convenience of
administration along with wider
acceptability are the reasons for greater
market potentials for the SAC and
accordingly research on modern parameters
is being carried out to develop NCEs form
herbs and leads for selection of herbs are
mainly obtained form their Ayurvedic usage.

Modern sciences like Pharmacology and
medicinal chemistry provide an interface
between Ayurveda and modern medicine
and therefore can contribute a lot in this
process of drug development. More than ten
thousand plants have been scientifically
studied during 1994-98 in India\(^4\) As
compared to unguided mass screening of
plants, the process of herb selection in
accordance with their usage in traditional
medicine is cost effective and offers greater
chances for success. In many studies,
however, chemical analysis of medicinal
plants have failed to isolate active chemicals
form Ayurvedic herbs or serious adverse
effects are observed. One of the causes may
be misinterpretation and inappropriate
utilization of Ayurvedic literature leading to
nonobservance of various important aspects
of Ayurvedic therapy. Whatever may be the
reasons, such failures raise doubts about the
validity of Ayurvedic therapeutics leading to
underexploration of this sciences.

The faults can occur either during herb
selection or during processing of a
formulation and many of these can be
avoided by inclusion of an Ayurvedic expert
in the study, One has to careful about the
correct identification of the plant and its part
to be used, age of the plant, season of
collection, soil storage conditions and
dosages. However, in this process of
obtaining NCEs from Ayurvedic herbs, an
appropriate selection of the medicinal
plant is the most vital step. Though much
has been discussed and written about the
former, a lot needs to be discussed about the
right selection of lead drugs form Ayurveda.
The mass screening of plants in the search
for new drugs is vastly expensive as well as
exhaustive with lower cost effectiveness.
On the other hand a cautious choice of herbs
is crucial in order to save time, efforts and
money.

To ensure that SAC obtained form
Ayurvedic herbs possess desired efficacy
and safety, it is essential to formulate some
generalized guidelines for selection of herbs.
to be analyzed chemically in search of NCE. Therefore, here are discussed the problems faced in drug selection and reasons for the same and thereafter are summarized the general characteristics of the herbs to be preferred or rejected.

PROBLEMS FACED IN DRUG SELECTION

Two major problems faced in drug selection are botanical identification of herbs and differentiating the effective plant from adjuvants in a compound formulation. Establishing the botanical identity of Ayurvedic herbs is the foremost problem and the reasons are the lack of a detailed and systemic morphological description of herbs and the agency of synonyms which were used to describe a plant.

The morphological characteristics of drugs have been described via names and synonyms, e.g. Solanum surattense of Solanaceae is known as kantakari i.e. The one with spines. A synonym as it refers to a morphological feature (and not the herb itself) might be used to indicate all the plants which possess that particular feature, like triparni which means three leaves can virtually refer to any trifoliate plant. Similarly, satamuli (hundred roots) is used as a synonym of plants with fibrous roots. Thus, multiplicity of names for one plant and similar names for different herbs along with a lack of detailed description of morphology are the main detailed description of morphology are the main problems faced in establishing the botanical identity of Ayurvedic herbs.

This difficulty of botanical identification was realized long back and with the able contributions from scholars of Ayurveda particularly Dravyaguna, working in collaboration with botanists, bulks of Pharmacopoeias have been prepared, listing the Latin names of plants along with their Sanskrit and local names. However, this problem though at a smaller scale will continues in the form for controversial and representative drugs and same synonyms a critical analysis should be made by considering the etiology of the disease and properties of the drug.

Referring many Ayurvedic texts for this will be of immense help in selection of the right drug.

Ayurvedic herbs whose botanical identity has not yet been established with surety are referred to a controversial drugs. In such cases different drugs are sued by the same name in different parts of the country e.g., there are at least 12 plants claimed and used as Rasna (5). SACs developed from these plants may not possess the desired pharmacological properties. All the plants are not available in different parts of the country and means of transport were not adequately developed in the past. Considering these problems, there is provision for use of different drugs, known as representative drugs, when the originally referred drugs are not available. A representative drug is considered to possess almost similar properties and therefore pharmacological profile as the original drug. It is, however, generally agreed that these drugs are poorer in efficacy than the original ones. There is provision for use of alternative drugs in Caraka Samhita (C.Su, 4/20) and Susruta Samhita (S.Su. 37/33) and for rare drugs like those of Astavarga possible representative drugs have also been suggested. (6,7) Ayurvedic physicians in different parts of the country continued to discover and use alternative drugs according to their requirements and the effective herbs were accepted for common use; many of these
were either not documented or the texts have been lost. In either case, the lack of available documentation raises doubts about their utility and safety.

The pharmacological actions of herbs for which repeated references in different texts are available, may be preferred for evaluation. On the other hand, evaluation of rarely mentioned drugs and rarely referred pharmacological actions can be avoided at an initial stage.

**Gunas** are the properties of a herb accountable for its pharmacological effects and **prabh ava** refers to the pharmacological effects of the herb, not explained by its properties. A drug can act either through its guna, prabhava or gunaprabhva, both (C.Su, 26/13). Till date, amongst the Ayurvedic herbs that have been successfully evaluated on modern parameters, with or without separation of active constituents, most of them act through their prabhava; *Bacopa monnieri*, *Nerium indicum*, *Commiphora mukul*, *Tinospora cordifolia* are few important examples. It seems that herbs acting through their prabhava or gunaprabhava are more likely to be successful as molecular probes as compared to drugs acting through gunas only.

In compound formulations, besides the principal herb other herbs are included to increase the efficacy, improve bioavailability and to reduce or antagonize adverse effects. Thus, compound formulations are more patient friendly is being more potent, safer and more holistic as they counter the disease at various etiologic levels. In such formulations, however, it often seems difficult to differentiate between the active drug and the supplements used to enhance the efficacy and counteract the adverse effects. A lack of detailed and organized documentation is the reason behind such confusions. However, some leads are available in the texts which need to be put together and organized, e.g. in Caraka Samhita (Sutrasthana Chapter IV), drugs have been classified according to their pharmacological actions and this classification can be referred to determine the active drugs which can be analyzed chemically to identify the leads for new chemical entities (NCE). **Agrayaprakrana** is another place to choose a candidate herbal drug.

This section lists the single drug which is considered the best for a particular disease condition.

There are many more references recording the use of single herbs for a disease. Such drugs, indicated individually for an ailment are assumed to be more potent with lesser side effects, thus, offer better changes of success in the endeavour to discover a new therapeutic molecule or drug development.

The safety and efficacy of a herb needs to be put on test and then step by step selecting the right extract and finally reaching to NCE using modern sophisticated technology. This required exhaustive experimental and chemical studies. The therapeutic value of the herb can also be confirmed by clinical trials, the failure of such trials can be due to the fact that sometimes herbs are not prescribed in accordance with Ayurvedic principles, this can also result in appearance of adverse effects.

Another important fact worthy mentioning is that in a busy outdoor setting, evaluation of patients’ prakrti a very important aspect of Ayurvedic therapeutics, is most prone to be ignored. With drugs that vitiate any of the dosas, patients’ dosic prakrti particularly of those with ekdosic prakrti (predominance of one of the dosas), should be noted down for
consideration during statistical analysis of the results. The incidence of adverse effects is, however, expected to be lesser with tridosahara drugs, the drugs which pacify all the three dosas (i.e. none of the dosas is vitiating) and thus, can safely be prescribed to individuals with different prakrti.

CONCLUSION

According to current industrial statistics, a new drug application to be regulatory authority requires approximately $200 millions and 12 years of furious multidisciplinary research. These costs and efforts can be dramatically cut down by selecting the herbs in the light of their uses in Ayurveda and other alternative systems. The pharmacodynamic investigations of herbs should be undertaken according to their Ayurvedic usage and further chemical research should be planned keeping the principles of processings prescribed in Ayurveda into consideration. A wrong selection of herbs, on the other hand raises doubts about their therapeutic efficacy and validity of the system as a whole. Differences in therapeutic principles and misinterpretation of Ayurvedic literature are primarily the reasons for wrong selection. As herb selection is the most crucial step for drug development, a critical analysis of Ayurvedic literature is of immense help. The herbs should better be opted according to their pharmacological actions as described in texts, while avoiding the selection of representative, controversial and rarely mentioned drugs.

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