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## Renaissance of ethnopharmacology to recess the impasse in the drug discovery - review

**A Elamaran****Abstract**

Renaissance of ethnopharmacology has already making huge impact in the innovative approach for drug discovery. Most of the ethnopharmacology research is on botanicals, which offer natural libraries of diverse chemical scaffolds and structures. Every botanical contains hundreds of molecules and bioactive compounds. Each of the bioactive compounds may have the capability to modulate one or more targets. Of late, ethnopharmacology is helping in a big way in the overall strategy of containing antimicrobial resistance (AMR). World over organizations like Food and Agriculture Organization (FAO), World Health Organization (WHO), World Organization for Animal Health (OIE) talk about the concerns of antimicrobial use and AMR loudly. Apparently, there is limited scope in the existing approach of using antimicrobials rather indiscriminately. However, revival of ethnopharmacology and drug development through ethnopharmacology fits into the scheme of thing which will reduce the overdependence on antimicrobials.

**Keywords:** Ethnopharmacology, antimicrobial resistance drug discovery

**1. Introduction**

From the ages throughout history, people had used various substances from nature to cure human and animal's illness and improved their health. Substances were derived from flora, fauna, and mineral sources located not only in people's immediate surroundings but also in remote places <sup>[1]</sup>. Nature has been the source of medicinal agents for thousands of years, and an impressive number of modern drugs have been isolated from natural sources, many based on traditional medicine. Plants have been the basis of many traditional medicine systems throughout the World for thousands of years and still remain as the main new source of structurally important chemical substances that lead to the development of innovative drugs. The use of medicinal plants for the treatment of many diseases is associated with folk medicine from different parts of the World <sup>[2]</sup>. Nowadays, the search for modes of action of phytochemicals from the huge array of medicinal plant resources is intensifying. The understanding of the cellular and molecular mechanisms involved in the disease process has increased considerably in recent decades and this has permitted the discovery of many promising targets for the development of new drugs. These plant-based traditional medicinal systems continue to play an essential role in health care, with about 80% of world's inhabitants relying mainly on traditional medicines for their primary health care, although medicinal plants form the principle component of traditional medicine <sup>[3]</sup>.

Medicinal folklore over the years has proved to be an invaluable guide in the present day screening of drugs. Many important modern drugs such as digitoxin, reserpine, tubocurarine, ephedrine, ergometrine, atropine, vinblastine and aspirin have been discovered by following leads from the folk use. Hence, there is great promise for new drug discovery based on traditional plant uses. Moreover, plants may be used as food, and it is difficult to draw a line between these two groups, and it is difficult to draw a line between these two groups; food may be medicine vice versa <sup>[4]</sup>.

**2. Need for the revival of Ethnopharmacology**

The loss of language and traditional knowledge owing to acculturation and plant habitat destruction is a major concern, particularly among smaller and more vulnerable tribes and indigenous groups. Serious dangers exist for the survival of such people and their cultures and the ecosystems that nurture them and provide western and traditional medicine with novel plant products for human well-being everywhere. Loss of indigenous knowledge has an impact

on the modern medicine. As indigenous cultures become increasingly fragmented and threatened by modern development pressures in developing countries, folk knowledge may be lost forever. Like the current spasm of plant and animal species extinction, the practitioners of ethnomedicine appear to be at a great risk of extinction than even forests and other biomes. Knowledge of the use of plants is disappearing faster than themselves. In this race against ecosystem destruction, researchers in many disciplines must rally to provide the impetus in accelerating studies of ethnomedicine in consort with biomedical and chemical terms for developing new natural products and drugs needed by humans and animals [5].

### 3. Ethnopharmacology and pharmacognosy

Pharmacognosy considers a broad range of natural products used as therapeutic agents for medical purposes (such as cotton), as pharmaceutical aids, biologics, and as poisons; ethnopharmacology is restricted to natural products used in a traditional context. Pharmacognosy is concerned with the history, economics and commercial processing of natural substances that affect human health; ethnopharmacology seeks to provide a comprehensive view of the human use of crudely processed drugs that includes ethnographic information. Pharmacognosy has tended to move toward specialized fields such as biosynthesis and fermentation microbiology; ethnopharmacology aims to support interdisciplinary collaboration [6].

### 4. Ethnopharmacology and traditional medicine

Numerous drugs have entered the international pharmacopoeia via the study of ethnopharmacology and traditional medicine. For traditional medicines, newer guidelines of standardization, manufacture, and quality control and scientifically rigorous research on the scientific basis for traditional treatments will be required. Traditional medicine can offer a more holistic approach to drug design and myriad possible targets for scientific analysis. Powerful new technologies such as automated separation techniques, high-throughput screening, and combinatorial chemistry are revolutionizing drug discovery. Traditional knowledge can serve as a powerful search engine, which will greatly facilitate and rediscover intentional, focused, and safe natural product drug discovery. By looking at the historical trends in drug and medical developments, it is possible to understand how current drug developments will benefit from this partnership [7].

Ayurvedic and traditional Chinese systems are great living traditions. These traditions have relatively organized databases and more exhaustive descriptions of botanical material that are available and can be tested using modern scientific methods. Both systems of medicine, thus, have an important role in bioprospecting of new medicines. Good botanical practices, which can improve the quality control procedures of monitoring impurities, heavy metals, and other toxins in the raw material, can make ethnopharmacology research more meaningful. Drug discovery in the current scenario has become unproductive to the point where the economic future of the industry is questionable. The research and development thrust in the pharmaceutical sector needs to focus on development of new drugs, innovative processes for known drugs, and development of plant-based drugs through investigation of leads from the traditional systems of medicine. Traditional medicine can provide novel inputs into

the drug development process [8].

### 5. Ethnopharmacognosy and cultural relativism

It is commonly accepted that people differ culturally. The Giger and Davidhizar Transcultural Assessment Model was developed in 1988 in response to the need for nursing students in an undergraduate program to assess and provide care for culturally diverse patients. The model included six cultural phenomena: Communication, time, Space, Social organization, Environmental control, and biological variation. These provide a framework for patient assessment and from which culturally sensitive care can be designed. In the assessment model cultural differences are evident in communication spatial relationship and needs, social organisation, time orientation, the ability or desire to control the environment and biological variations. While many individual appreciate that there are differences between culture what is less well recognized is that people also vary according to biological variations in depending on their racial and ethnic group. In the last two decades information about biological variations has rapidly expanded and that knowledge is essential in order to understand and provide care to individual from another culture or another racial and ethnic group. Attention to biological variations related to race and ethnicity, the last component of the transcultural assessment model is a critical phenomenon that needs to be assessed in order to develop and implement a culturally sensitive plan of care in an effort to understand ethnopharmacology [9].

### 6. Ethnopharmacology and mass bioprospecting

Numerous studies dealing with medicinal and other useful plants and their bioactive compounds have used a multitude of concepts and methodologies. In many cases these were interdisciplinary or multidisciplinary studies combining such diverse fields as Anthropology, Pharmacology, Pharmacognosy, Pharmaceutical Biology, Natural product chemistry, Toxicology, Clinical Research, Plant physiology and others. In order to permit, analysis of their strengths and weakness and especially of the outcomes of the research, to conceptually and methodologically different but closely related approaches have been distinguished. Bioprospecting focuses on the development of new drugs for the huge market globally. New potentially high profitable pharmaceutical products are developed based on the biological and chemical diversity of the various ecosystems of the earth and the research an enormous financial input. Field explorations to seek and document indigenous and traditional medicinal knowledge and / or the biodiversity with which is attached and it's conversion into commercialized product is known as bioprospecting or biodiversity prospecting. When performed in a large-scale operation the effort is referred to as mass bioprospecting. The research goes from the collection of biogenic samples (plants, fungi, other microorganisms and animals), to the subsequent analysis of the biological-pharmacological activities and to the study of the organisms' natural products to the development of drug templates or new drugs. Essential in this search are high-throughput screening systems as they are established by the major international pharmaceutical companies. Huge libraries of compounds (and sometimes extracts) are screened for biological activity against specific targets. Active natural products are only one of the many sources of material for these batteries of tests but serve as a starting point for drug development. Experiences from the mass bioprospecting efforts undertaken by the

United States National Cancer Institute, The National Cooperative Drug Discovery Groups (NCDDG), and the International Cooperative Biodiversity Groups (ICBG) programs demonstrate that mass bioprospecting is a complex process, involving expertise from diverse areas of human endeavors, but central to it is the Memorandum of Agreement (MOA) that recognizes issues on genetic access, prior informed consent, intellectual property, and the sharing benefits that may arise as a result of the effort. Future mass bioprospecting endeavors must take heed of the lessons learned from the past and present experiences in the planning for a successful mass bioprospecting venture <sup>[10]</sup>.

### 7. Ethical issues

Ethics is defined as the science of moral value. Ethnopharmacology involves a series of sociopolitical, economic and ethical dilemmas, at various levels. Most research projects involve more than one country (e.g., field work in a remote part of an underdeveloped country). Frequently host country scientists, visiting scientists, and informants disagree about these dilemmas. As a result, such research efforts are perceived as scientific imperialism; scientists are accused of stealing plant materials and appropriating traditional plant knowledge for financial profit and/or professional advancement. Many governments, as well as indigenous societies are increasingly reluctant to permit such research. Increasingly, funding for field work utilizing indigenous informants is coming from industry. Historically neither native populations nor host countries have shared to a significant extent the financial benefits from any drug that reaches the market. Unless these issues are amply discussed and fairly resolved, medicinal plant research runs the risk of serving ethically questionable purposes. When new plant-derived therapeutics based on indigenous knowledge is being explored, it is important that pharmaceutical companies return benefits to the native populations and the local governments from which the research material was obtained. When potentially marketable plant product is being developed, it is essential that equitable agreements have already been established between the pharmaceutical companies and the people and/or countries from which this indigenous knowledge was acquired. Equally important is the commitment to provide immediate reciprocity that will enhance the welfare, biological diversity, and the well-being of native people <sup>[11]</sup>.

### 8. Conclusion

To sum up, an important goal is development of improved preparations for use by local people. Thus, it is essential to obtain information on the active ingredients / bioactive compounds from these plants their relative contribution to the effects of the extract (including for example, synergic or antagonistic effects) and the toxicological profile of the extract and its constituents. By restricting ethnopharmacology to the bioscientific study of indigenous uses, attention is drawn to the need for improving indigenous phytochemical systems, especially in developing countries. Improvement of ethnopharmacology in India needs more involvement of botanist in these fields especially the former and also application of quantitative methods not only for compilation of lists of useful plant or just medicinal ones but also for understanding the rational and cultural sets behind these uses. Because of the interdisciplinary nature of these fields, few individuals can be expected to be experts in all components of

the cross-disciplinary research that ethnobotany represents in botany, anthropology, pharmacology, chemistry, linguistics and medicine. Therefore, it needs a close cooperation and multidisciplinary teams of researchers of different professionals from botany, pharmacology, anthropology and medicine. It is clear that inter- and multidisciplinary approaches can lead to more fruitful, thorough and systematic approximations in the study of plant-people interactions. No doubt there are many lessons left for us to ponder as we revisit natural molecules. New approaches to integrate high-content screening with the latest technologies are appearing in the literature regularly. For sure, new ways to connect chemotypes with phenotypes in natural products are more and more evident, providing yet one more tool to accelerate the essential work of drug hunters. Can a powerful reemergence of natural products in all their glory be far away?

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