

MINI-REVIEW

Herbal Medicine: Current Status and the Future

Sanjoy Kumar Pal¹, Yogeshwer Shukla^{2*}

Abstract

The number of patients seeking alternate and herbal therapy is growing exponentially. Herbal medicines are the synthesis of therapeutic experiences of generations of practicing physicians of indigenous systems of medicine for over hundreds of years. Herbal medicines are now in great demand in the developing world for primary health care not because they are inexpensive but also for better cultural acceptability, better compatibility with the human body and minimal side effects. However, recent findings indicate that all herbal medicines may not be safe as severe consequences are reported for some herbal drugs. Most herbal products on the market today have not been subjected to drug approval process to demonstrate their safety and effectiveness. Thousand years of traditional use can provide us with valuable guidelines to the selection, preparation and application of herbal formulation. To be accepted as viable alternative to modern medicine, the same vigorous method of scientific and clinical validation must be applied to prove the safety and effectiveness of a therapeutical product. In the present review we attempted to describe the present scenario and project the future of herbal medicine.

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Introduction

Herbal medicine is still the mainstay of about 75 - 80% of the world population, mainly in the developing countries, for primary health care (Kamboj, 2000). This is primarily because of the general belief that herbal drugs are without any side effects besides being cheap and locally available (Gupta and Raina, 1998). According to the World Health Organization (WHO), the use of herbal remedies throughout the world exceeds that of the conventional drugs by two to three times (Evans, 1994). The use of plants for healing purposes predates human history and forms the origin of much modern medicine. Many conventional drugs originated from plant sources: a century ago, most of the few effective drugs were plant based. Examples include aspirin (willow bark), digoxin (from foxglove), quinine (from cinchona bark), and morphine (from the opium poppy) (Vickers and Zollman, 1999).

Medical history from the beginning of time is filled with descriptions of persons who used herbs to heal the sick of the society. However, parallel to the onset of the industrial revolution we witnessed the rise of allopathic medicine. Herbal medicine was also an effective healing method, but was viewed less enthusiastically (Tirtha, 1998). Herbal

products were discarded from conventional medical use in the mid 20th century, not necessarily because they were ineffective but because they were not as economically profitable as the newer synthetic drugs (Tyler, 1999). In the early 19th century, scientific methods became more advanced and preferred, and the practice of botanical healing was dismissed as quackery. In the 1960s, with concerns over the iatrogenic effects of conventional medicine and desire for more self-reliance, interest in "natural health" and the use of herbal products increased. Recognition of the rising use of herbal medicines and other non-traditional remedies led to the establishment of the office of Alternative Medicine by the National Institute of Health USA, in 1992. Worldwide, herbal medicine received a boost when the WHO encouraged developing countries to use traditional plant medicine to fulfill needs unmet by modern systems (Winslow and Kroll, 1998).

Herbal Medicine

The WHO has recently defined traditional medicine (including herbal drugs) as comprising therapeutic practices that have been in existence, often for hundred of years, before the development and spread of modern medicine and are

¹Department of Gastroenterology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Raibareilly Road, Lucknow - 226 014, UP, India. ²*Environmental Carcinogenesis Division, Industrial Toxicology Research Centre, P.O. Box No. 80, M.G. Marg, Lucknow -226 001, India Fax: 0091-522-2228-227 Email: Yogeshwer_Shukla@hotmail.com * To whom all correspondence should be addressed

still in use today. Traditional medicine is the synthesis of therapeutic experience of generations of practicing physicians of indigenous system of medicine. Traditional preparations comprise medicinal plants, minerals and organic matter etc. Herbal drugs constitute only those traditional medicines which primarily use medicinal plant preparations for therapy. The earliest recorded evidence of their use in Indian, Chinese, Egyptian, Greek, Roman and Syrian texts dates back to about 5000 years. The classical Indian texts include Rigveda, Atharvaveda, Charak Samhita and Sushruta Samhita. The herbal medicines / traditional medicaments have therefore been derived from rich traditions of ancient civilizations and scientific heritage (Kamboj, 2000).

Difference of Herbal and Conventional Drugs

Although superficially similar, herbal medicine and conventional pharmacotherapy have three important differences:

Use of Whole Plants- Herbalists generally use unpurified plant extracts containing several different constituents. It is claimed that these can work together synergistically so that the effect of the whole herb is greater than the summed effects of its components. It is also claimed that toxicity is reduced when whole herbs are used instead of isolated active ingredients ("buffering"). Although two samples of a particular herbal drug may contain constituent compounds in different proportions, practitioners claim that this does not generally cause clinical problems. There is some experimental evidence for synergy and buffering in certain whole plant preparations, but how far this is applicable to all herbal products is not known (Vickers and Zollman, 1999).

Herb Combining- Often several different herbs are used together. Practitioners say that the principles of synergy and buffering apply to combinations of plants and claim that combining herbs improves efficacy and reduces adverse effect. This contrasts with conventional practice, where polypharmacy is generally avoided whenever possible (Vickers and Zollman, 1999).

Diagnosis- Herbal practitioners use different diagnostic principles from conventional practitioners. For example, when treating arthritis, they might observe, "under functioning of a patient's symptoms of elimination" and decide that the arthritis results from "an accumulation of metabolic waste products". A diuretic, cholerectic or laxative combination of herbs might then be prescribed alongside herbs with anti-inflammatory properties (Vickers and Zollman, 1999).

Why People Use Herbal Medicine

The earliest evidence of human's use of plant for healing dates back to the Neanderthal period (Winslow and Kroll, 1998). Herbal medicinal is now being used by an increasing number of patients who typically do not report to their clinicians concomitant use (Miller, 1998). There are multiple

reasons for patients turning to herbal therapies. Often cited is a "sense of control, a mental comfort from taking action," which helps explain why many people taking herbs have diseases that are chronic or incurable viz. diabetes, cancer, arthritis or AIDS. In such situations, they often believe that conventional medicine has failed them. When patients use home remedies for acute, often self-limiting conditions, such as cold, sore throat, or bee sting, it is often because professional care is not immediately available, too inconvenient, costly or time-consuming (Winslow and Kroll, 1998).

In rural areas, there are additional cultural factors that encourage the use of botanicals, such as the environment and culture, a "man earth relationship." People believe that where an area gives rise to a particular disease, it will also support plants that can be used to cure it (Winslow and Kroll, 1998). In India vast sections of the rural population have no access to modern medicine (Mudur, 1997). Hundred of primary health centers which are intended to serve rural areas, lack staffs, diagnostic facilities, and adequate supplies of drugs. The rural population is heavily dependent on traditional medical systems (Mudur, 1995).

Natural plant products are perceived to be healthier than manufactured medicine (Gesler, 1992). Additional, report of adverse effect of conventional medications are found in the lay press at a much higher rate than reports of herbal toxicities, in part because mechanisms to track adverse effect exist for conventional medicines whereas such data for self treatment is harder to ascertain. Even physicians often dismiss herb as harmless placebos (Winslow and Kroll, 1998).

Regulation of Herbal Medicine

Herbal remedies form a potpourri that ranges from plants that people collect themselves and then take for health reasons to approved medical products. Many herbal products fall between the far ends of this regulatory range: unlicensed preparations are thought to account for over 80 per cent of herbal sales. European union legislation requires herbal products to be authorized for marketing if they are industrially produced and if their presentation or their function, or both, bring them inside its definition of a medicinal product. Unfortunately, the drawing of sharp borderline is difficult. Many medicine-like products on the British herbal market remain unregistered for two reasons: acceptable data on efficacy, safety and quality may not be available, and the licensing fee is high (De Smet, 1995).

Special licensing procedures for herbal medicines are already in force in Germany, where regulatory evaluations of medicinal herbs have been laid down in more than 300 monographs, and in France more than 200 herbs have been listed as acceptable ingredients of phytomedicines. Australia developed an integral approach to the herbal market that will also cover various non-western herbs (De Smet, 1995). The main registering and regulating body for Western herbal practitioner is the National Institute of Medical Herbalist,

situated in Exeter U.K. Only graduates of approved courses are accepted on to the register, and a strict code of ethics is maintained. The European Herbal Practitioner Association, an umbrella body with about 1000 members, has been set up to encourage greater unity among herbalists. However, it has no formal criteria for screening membership and no published code of ethics as yet (Vickers and Zollman, 1999).

Safety Issue of Herbal Medicines

Traditional herbal products are heterogeneous in nature. They impose a number of challenges to quality control, quality assurance and the regulatory process. Most herbal products on the market today have not been subjected to drug approval process to demonstrate their safety and effectiveness. Some of them contain mercury, lead, arsenic (Kew et al., 1993) and corticosteroids (De Smet, 1997) and poisonous organic substances in harmful amount. Hepatic failure and even death following ingestion of herbal medicine have been reported (Chattopadhyay, 1996). A prospective study shows that 25% of the corneal ulcer in Tanzania and 26% of the childhood blindness in Nigeria and Malawi were associated with the use of traditional eye medicine (Harries and Cullinan, 1994). Side effect of some medicinal plant is currently reviewed (Gupta and Raina, 1998).

Sometimes patients use traditional and conventional medicine simultaneously. The interaction of these two types of drugs in vivo may be dangerous and have raised serious concern among the medical scientists about the safety of the patients (Chattopadhyay, 1997). If patients are taking conventional drugs, herbal preparation should be used with extreme caution and only on the advice of a herbalist familiar with the relevant conventional pharmacology. There are case reports of serious adverse events after administration of herbal products. In most cases the herbs involved were self prescribed and bought over the counter or obtained from a source other than a registered practitioner. In a recent instance, several women developed rapidly progressive interstitial renal fibrosis after taking Chinese herbs prescribed by a slimming clinic (Vickers and Zollman, 1999). Doctors in Belgium have discovered recently that a Chinese herb, *Aristolochia fangchi* is not only linked to kidney failure, but may cause cancer as well (Kew et al., 1993). After a dozen of dieters of a weight loss clinics developed symptom of kidney failure, investigation revealed that Belgian pharmacists has been using mislabeled Chinese herb to concoct the diet pills (Greensfelder, 2000). As herbal medicines are used by increasingly number of people, pharmacist must be knowledgeable about their safety. This requires appreciation of the magnitude of use, as well as regulation under which the products are marketed that may affect their safety (Boullata and Nace, 2000). The adverse effect of some traditional Chinese medicines is recently reviewed (Yi-Tsan and Chuang-Ye, 1997).

Medicinal plant materials and possibly herbal tea, if stored improperly allow the growth of *Aspergillus flavus* a known producer of aflatoxin mycotoxin. In a study (Halt,

1998) 18 per cent of the 62 medicinal samples and 9 per cent of the herbal tea samples was found contaminated with *A. flavus*. The majority of Ayurvedic formulation available on the market is either spurious, adulterated or misbranded (Kumar 1998). Most commercially available preparation does not even conform to ancient Ayurvedic text. The herb loses their medicinal properties a year after collection, powders made from them remains effective for six month only, and the pastes for one year. Yet, formulations do not usually carry an expiry date or potential side-effect.

Alarming herbal medicines in some cases are found to be admixed with allopathic medicines. In Leicester Royal Infirmary one sample of traditional Chinese medicine given to a lady for eczema was found to contain a steroid (Graham-Brown et al., 1994). Several undeclared drugs including phenylbutazone, diazepam and corticosteroids were detected in a traditional Chinese cure for arthritis (Vander Stricht et al., 1994). Without a quality control, there is no assurance that the herb contained in the bottle is the same as what is stated on the outside. The widespread disregard for quality control in the health food industry has tarnished the reputation of many important medicinal herbs. For example, it has been estimated that because of supplier errors in collection, more than 50% of the Echinacea sold in the US from 1980 through 1991 was actually *Parthenium integrifolium*. This highlights the importance of using the Latin scientific name, since both of the above mentioned herbs are refereed to as 'Missouri snakeroot', as well as the need for proper plant identification based upon organoleptic, microscopic and technological analysis (Murray and Pizzorno, 2000).

Plant materials are used through developed and developing countries as home remedies, over-the-counter drug products and raw materials for the pharmaceutical industry, and represent a substantial proportion of the global drug market. It is therefore essential to establish internationally recognized guidelines for assessing their quality. The World Health Assembly – in resolutions WHA31.33 (1978), WHA40.30 (1987) and WHA42.43 (1989) has emphasized the need to ensure the quality of medicinal plant product by using modern control techniques and applying suitable standards (WHO, 1998).

Need for Clinical Trials

To gain public trust and to bring herbal product into mainstream of today health care system, the researchers, the manufacturers and the regulatory agencies must apply rigorous scientific methodologies and clinical trails to ensure the quality and lot-to-lot consistency of the traditional herbal products. Since the identities of the final products are not well defined and there are essentially no purification steps involved in the productions of herbal products, the quality and lot to lot consistency of the products rely mostly on the quality control of source materials and their manufacturing into the final products. Using modern technologies the quality and consistency of the heterogeneous herbal products

can be monitored. A well-designed clinical trial is the method of choice to prove the safety and effectiveness of a therapeutical product. Manufacturers of the herbal products must adhere to the requirements of good manufacturing practices (GMPs) and preclinical testing before these products can be tested on human. The basic principle and design of the clinical trials for herbal products are the same as those for single component chemical product. A number of randomized double-blinded controlled studies have been carried out using herbal formulations. These studies have proven the effectiveness of the herbal products tested and shown little side effects. Thousands of years of traditional use can provide us with valuable guidelines to the selection, preparation and application of herbal formulations. To be accepted as viable alternatives to western medicine, the same rigorous methods of scientific and clinical validations must be applied (Yuan, 1997).

Although anecdotal reports of utility are of interest, particularly in giving indications of herb worthy of future study, they should never be viewed as a substitute for detailed clinical trials. The cost of such evaluation is a stumbling block, but not an impossible barrier for organizations interested in promoting the public health and not just reaping a profit by the sale of a commodity. A number of herbal marketers have already made, and continue to make, a substantial investment in clinical studies. Indena of Italy sponsored a number of trials on herbal drugs including grape seed (*Vitis vinifera* L.) extract. Pharmaton in Switzerland, subsidizer of clinical trials on ginseng (*Panax ginseng* C. A. Meyer), Schwabe of Germany, conducted many trials on St. John's wort (*Hypericum perforatum* L.). Madaus also of Germany, sponsored innumerable studies on ginkgo (*Ginkgo biloba* L.). Lichtwer, is well known for studies on garlic (*Allium sativum* L.). Nutrilite and Pharmanex in the United State promoted the study on saw palmetto [*Serenoa repens* (Bartr.) small] and red yeast (*Monascus purpureus* Went) respectively (Tyler, 1999).

Bioavailability of Herbal Drugs

The bioavailability of the active constituents of the herb is another area of considerable importance. Before a compound can act systemically it must pass from the gastrointestinal tract into the blood stream. This is an area in which surprisingly little is known for herbal constituents. Compound, such as berberine and hydrastine in the popular botanical goldenseal (*Hydrastic canadensis* L.), are essentially not absorbed following oral consumption. Studies showing systemic effect in animal have all involved parenteral administration of these alkaloids. Yet goldenseal remains one of the best-selling herbs, is widely promoted, and is accepted by a misinformed public as a nonspecific immunostimulant (Tyler, 1999).

Cinnabar has been for a long time in traditional medicine. The toxic effects of inorganic mercury are well recognized, but because of its insolubility it has been assumed that this compound would not be significantly absorbed from the

gastrointestinal tract. However, investigation of (Yeoh et al., 1986) on the oral absorption of cinnabar in mice found a significant increase in mercury concentration in the liver and kidney. Concomitant use of cinnabar and drugs containing bromides, sulphates, sulphides, nitrates and iodine may enhance its toxicity by increasing the gastrointestinal absorption (Shaw et al., 1995).

Present Status of Herbal Medicine

The wide spread use of herbal medicine is not restricted to developing countries, as it has been estimated that 70% of all medical doctors in France and German regularly prescribe herbal medicine (Murray and Pizzorno, 2000). The number of patients seeking herbal approaches for therapy is also growing exponentially (Alschuler et al., 1997). With the US Food & Drug Administration (FDA) relaxing guidelines for the sale of herbal supplement (Gottlieb, 2000), the market is booming with herbal products (Brevoort, 1998). As per the available records, the herbal medicine market in 1991 in the countries of the European Union was about \$ 6 billion (may be over \$20 billion now), with Germany account for \$3 billion, France \$ 1.6 billion and Italy \$ 0.6 billion. In 1996, the US herbal medicine market was about \$ 4 billion, which have doubled by now. The Indian herbal drug market is about \$ one billion and the export of herbal crude extract is about \$80 million (Kamboj, 2000).

In the last few decades, a curious thing has happened to botanical medicine. Instead of being killed off by medical science and pharmaceutical chemistry, it has made come back. Herbal medicine has benefited from the objective analysis of the medical science, while fanciful and emotional claims for herbal cures have been thrown out, herbal treatments and plant medicine that works have been acknowledge. And herbal medicine has been found to have some impressive credentials. Developed empirically by trail and error, many herbal treatments were nevertheless remarkably effective (Dwyer and Rattray, 1993). In a recent survey (Cragg et al., 1997) estimated that 39% of all 520 new approved drugs in 1983-1994 were natural products or derived from natural products and 60-80% of antibacterial and anticancer drugs were derived from natural products (Harvey, 1999).

The penicillin that replaced mercury in the treatment of syphilis and put an end to so many of the deadly epidemics comes from plant mold. Belladonna still provides the chemical used in ophthalmological preparations and in antiseptics used to treat gastrointestinal disorders. *Rauwolfia serpentina* (The Indian snake root) which has active ingredient, reserpine, was the basic constituent of a variety of tranquilizer first used in the 1950's to treat certain types of emotional and mental problems. Though reserpine is seldom used today for this purpose, its discovery was a breakthrough in the treatment of mental illness. It is also the principal ingredient in a number of modern pharmaceutical preparations for treating hypertension. But reserpine can have a serious side effect-severe depression. On the other hand tea made of *R.*

serpentina has been used in India as a sedative for thousand of years (Dwyer and Rattray, 1993).

Examination of the history of medicine and pharmacy reveals a definite pattern. Humankind first utilized materials found in the environment on an empirical basis to cure various ailments. These plant, animal parts and even microorganisms were initially employed in unmodified form, then as concentrated extract to improve their intensity and uniformity of action. Subsequently, pure chemical compounds as prototypes synthetic chemical entities were developed that possessed even greater activity (Robbers et al., 1996). In fact, plant substance remain the basis for a very large proportion of the medications used today for treating heart diseases, hypertension, depression, pain, cancer, asthma, neurological disorders, irritable bowel syndrome, liver diseases and other ailments (Vickers and Zollman, 1999; Alschuler et al., 1997; Carter, 1999; Bensoussan et al., 1998; Schuppan et al., 1999).

By 1994, pharmacologist Norman Farnsworth had identified over 119 plant-derived substances that are used globally as drug. Many of the prescription drugs sold in United States are molecules derived from or modeled after naturally occurring molecules in plant. Interest in natural product research has been rekindled by discoveries of novel molecules from marine organisms (such as bryostatin) and potent new chemotherapeutic agents from plants (such as Taxol). Research has been facilitated by new rapid-throughput bioassays in which robotic arms and computer controlled cameras test exceedingly small quantities of plant samples for the presence of the compounds active against a multiplicity of disease targets. It is possible to accomplish in a few minutes that once took months to analyze in laboratory. Even with new technology, it appears that one of the best sources for finding plant species to test is still the healer's pouch, because such plants have often been tested by generations of indigenous people. Yet at this crescendo of enthusiasm for herbal medicine, an increasing number of aged healers are dying with their knowledge left unrecorded. Too often though forests disappear without any notice. Currently 12.5 percent of all plant species are threatened with immediate extinction. Most botanists regard this estimate by the International Union for the Conservation of Nature (IUCN) as conservative, because it considers only species known to science; numerous undiscovered species pass from the world unrecorded and unmourned (Cox, 2000).

Status of Herbal Medicine in India

India has a rich tradition of herbal medicine as evident from Ayurveda, which could not have flourished for two thousand years without any scientific basis. Ayurveda which literally means knowledge (Veda) of life (Ayur) had its beginning in Atharvaveda (Circa 1500-1000 BC). Charak Samhita and Sushruta Samhita are the two most famous treatises of Ayurveda several other were compiled over the centuries such as Bela Samhita, Kashyap Samhita, Agnivesh Tantra, Vagbhata's Ashtang hridaya (600), Madhava Nidan

(700 AD) (Lele, 1999). Vegetable products dominated *Indian Materia Medica* which made extensive use of bark, leaves, flower, fruit, root, tubers and juices. The theory of *rasa*, *vipaka*, *virya* and *prabhava* formed the basis of Ayurveda pharmacology, which made no clear distinction between diet and drug, as both were vital component of treatment (Valiathan, 1998). Charak, Sushruta and Vagbhata described 700 herbal drugs with their properties and clinical effects. Based on clinical effects 50 categories of drug have been described – such as appetizers, digestive stimulant, laxatives, anti-diarrhea, anti-haemorrhoid, anti-emetic, anti-pyretic, anti-inflammatory, anti-pruritic, anti-asthmatic, anti-epileptic, anti-helminthic, haemoptietic, haemostatic, analgesis, sedative, promoter of life (Rasyana), promoter of strength, complexion, voice, semen and sperm, breast milk secretion, fracture and wound healing, destroyer of kidney stones etc (Lele, 1999).

The advent of western medicine in the eighteen century was a set back to the practice of Ayurveda, which suffered considerable neglect at the hands of the colonial administration. After the first success of reserpine, an enormous amount of characterization of medicinal plants was done in many laboratories and University Departments, but the outcome was discouraging because the effort was disorganized, thin spread and nonfocused (Valiathan, 1998). Molecular pharmacology now provides a new interface between Ayurveda and modern medicine. Using modern techniques, various categories of Ayurvedic drug could provide novel molecular probes. It is now possible to explore the mechanism of action of Ayurvedic drugs in terms of current concept of molecular pharmacology. Some striking example, of Ayurvedic drugs which are understood in terms of today's molecular pharmacology:

Sarpagangha (*Rauwolfia serpentina*) Reserpine uniquely prevent pre-synaptic neuronal vesicular uptake of biogenic amines (dopamine, serotonin and nor-epinephrine).

Mainmool (*Coleus forskoli Brik*) Forskolin directly stimulates adenylate cyclase and cyclic AMP, with inotropic and Lusitropic effect on heart muscle.

Sallaki (*Boswellia serrata*) Boswellic acid inhibits 5-lipo-oxygenase and leukotriene B₄ resulting in anti-inflammatory and anti-complement effect.

Shirish (*Albizia lebek*) prevents mast cell degranulation, similar to sodium cromoglycate.

Aturagupta (*Mucon pruriens*) contains L-DOPA

Ashwagandha (*Withania somnifera*) GABA-A receptor agonist.

Katuka (*Picrorhiza kurua*) anti-oxidant action equal to a tocopherol, effect on glutathion metabolism in liver and brain (Lele, 1999).

(Sukh Dev, 1997) listed 15 crude Ayurvedic drugs, which have received support for their therapeutic claims. Some of Rasyana dravyas have been shown to increase phagocytosis, activate macrophages and enhance resistance to microbial invasion. Drugs like *Asparagus racemosus*, *Tinospora codifolia* and *Ocimum sanctum* antagonise the effect of stress (Dhuri et al., 2000). *Emblica officinalis* L., *Curcuma longa*

L., *Mangifera indica* L., *Momordica charantia* L., *Santalum album* L., *Swertia chirata* Buch-Ham, *Winthania somnifera* (L.) have well defined antioxidant properties and justify their use in traditional medicine in the past as well as the present (Scartezzini and Speroni, 2000).

Use of the herbal medicine in jaundice, presumably viral hepatitis, has been known in India since the Vedic times. About 170 phyto-constituents isolated from 110 plants belonging to 55 families have been reported so far to possess liver protective activities. It is estimated that about 6000 commercial herbal formulations are sold world over as hepatoprotective drugs. Of them about 40 patent polyherbal formulations representing a variety of combinations of 93 Indian herbs from 44 families are available in the Indian market (Bhatt and Bhatt, 1996). However, the following four herbal medicines have been found to be most promising in the treatment of viral hepatitis, (i.) Silymarin obtained from the seeds of *Silibum marianum*, (ii.) Extracts of *Picrorrhiza kurroa*, popularly known 'Kutki' (iii.) Extract of many plant of the genus, *Phyllanthus*, have been used as hepatoprotective, of them, the most widely used ones have been *Phyllanthus niruri* and *Phyllanthus amarus*, (iv.) Glycyrrhizin preparation have been used in the past for peptic ulcer as well as liver diseases with mixed results. However, a new Japanese preparation from glycyrrhizin, stronger neomenophagen C (SNMC), appear to be very promising in the treatment of virus related chronic liver diseases (Tandon, 1999). Liv 52, an extract of several plants prepared for Ayurvedic medicine was reported to improve serum biochemistry values in rats with toxic liver damage, and uncontrolled observations in patients with liver disease seemingly gave similar result (Jain and DeFilippis, 1991). Double-blinded and well-designed clinical trials have also been conducted with Argyowardhani in viral hepatitis, *Mucuna pruriens* in Parkinson's disease, *Phyllanthus amarus* in hepatitis and *Tinospora cordifolia* in obstructive jaundice (Pal, 2002).

India is one of the 12 mega biodiversity centers having over 45,000 plant species. About 1500 plants with medicinal uses are mentioned in ancient texts and around 800 plants have been used in traditional medicine (Kamboj, 2000). However, India has failed to make an impact in the global market with drugs derived from plants and the gap between India and other countries is widening rapidly in the herbal field (Valiathan, 1998). The export of herbal medicine from India is negligible despite the fact that the country has a rich traditional knowledge and heritage of herbal medicine (Kamboj, 2000). The circumstance, which tends to frustrate a major developmental initiative for herbal products are many sided in the country: (i.) There is no clear definition of the target to be achieved or a time frame within which the target, if any, should be achieved. (ii) There is no co-ordination among the national laboratories that are investigating medicinal plants. (iii) A serious dialogue between publicly funded institution and the industry is conspicuous by its absence. (iv.) A mechanism for regular interaction between the expert in Ayurveda and R&D group

on medicinal plant does not exist. At the political level, Ayurveda is constantly extolled, but no effort is made to unify the scattered and thinly-spread effort into a powerful course of action with specified goal in the development of herbal drugs (Valiathan, 1998).

Problems to be Solved Before Herbal Medicine Become Mainstream

To reach a stage where herbal products of assured quality and effectiveness become integrated into mainline medicinal treatment, several obstacles must be overcome. The prejudice of current practicing health-care professional who did not learn about phytomedicines during their academic programs and, consequently, believe all of them to be ineffective forms a barrier (Tyler, 1999). Orthodox medical practitioners are to be convinced of the efficacy of plant extract (Tattam, 1999).

Equal obstinate is the opinions of some traditional herbalist who believe that unprocessed natural products have an innate superiority and that the mystical aura surrounding herbs will somehow be destroyed by extraction and standardization (Tyler, 1999). The use of folk beliefs and knowledge of traditional healers is a short cut to the discovery and isolation of pharmacologically active compound (Holland, 1994). However, intellectual property right should protect the tribal and traditional knowledge so that it can help end the 'piracy' by both Indian and foreign drug companies (Jayaraman, 1996).

Major challenge that must be overcome before herbs can join mainstream medicine is the quality of the literature in the field. Books, pamphlets, journals, and especially these days the Internet are filled with misinformation, much of it written to sell product, some of it written to express a point of view based on hope, not fact, or on misinformation (Tyler, 1999). Most sites merely list herbs and their uses few mention regulation, safety, or efficacy. Even an herb with well-recognized toxicities, such as ephedra may have no cautionary statement (Winslow and Kroll, 1998).

Another problem is that clinicians working with herbal products are still relatively unfamiliar with them often do not realize the necessity of adequate dosage from definition in the published papers. Many erroneous and unreproducible results have appeared in the medical literature because the clinicians accept at face value the quality of an herb that was adulterated, misidentified. In addition, they often fail to identify specifically, that is by scientific name, the botanicals in the product tested, as well as the precise dosage administered (Scuppan et al., 1999).

Conclusions

The wide spread use of herbal medicine is not restricted to developing countries. The rebirth of herbal medicine, especially in developed countries, is largely based on a renewed interest by the public and scientific information concerning plants. Herbal remedies are popular among

patient with chronic diseases. Classically trained physicians cannot ignore herbal medicines any more. They must realize that large number of patients are using herbal medicines. They must have adequate knowledge and should be more open to discuss with their patient regarding herbal medicine. Patient disclosure of herbal use may provide an opportunity for the physician to redirect the patient towards effective conventional health care. By taking a complete drug and supplement history, a dialogue can be initiated to rationally compare the appropriateness of herbal remedies and regulated pharmaceuticals in relation to the severity of the condition. Patient with chronic conditions such as AIDS or cancer should also be warned that some of the adverse effect of herbals are often similar to symptoms of problem associated with their disease or treatment, thus making it difficult to discern if the disease or the "remedy" is the problem. For the herb-using patient who views conventional medicine with ambivalence, the physician can foster a more open and communicative relationship by demonstrating an objective understanding of both alternative and conventional approaches (Winslow and Kroll, 1998). Finally, doctors should monitor the perceived benefits and adverse effect of self prescribed herbal treatments consumed by their patients, and bears in mind the possibility of herb-drug interactions. The public should be better protected and informed on herbal medicine, and doctors should take an active part in this process (Ernst, 2000).

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