WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 9, 459-485. Review Article ISSN 2277–7105

HERBAL MEDICINE AND THEIR CURRENT STATUS

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Article Received on
03 March 2024,

Revised on 24 March 2024,
Accepted on 14 April 2024

DOI: 10.20959/wjpr20249-32087

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ABSTRACT

Herbal medicine, boasting a rich history as a cornerstone of traditional healthcare, is experiencing a significant revival. this review article explores the contemporary landscape of herbal therapies, investigating the factor behind their growing popularity alongside the critical need for robust scientific validation.

KEYWORDS: Herbal drug technology, History of Use, Regulatory Status, Pharmacovigilance, Status of Herbal Medicine.

INTRODUCTION

Herbal drugs referred as plants materials or herbals, involves the use of whole plants or parts of plants, to treat injuries or illnesses.[1] Herbal drugs are use of therapeutic herbs to prevent and treat diseases and ailments or to support health and healing.[2] These are drugs or preparations made from a plant or plants and used for any of such purposes. Herbal drugs are the oldest form of health care known to mankind.[3] There are many herbal products offered that assert to treat the symptoms of a broad range of problems, from depression to cold and flu. World Health Organization[4] (WHO) has distinct herbal drugs as complete, labeled medicinal products that have vigorous ingredients, aerial or secretive parts of the plant or other plant material or combinations. World Health Organization has set precise guidelines for the evaluation of the safety, efficacy, and quality of herbal medicines. WHO estimates that 80% of the world populations currently use herbal drugs for major healthcare. Exceptionally, in some countries herbal drugs may also enclose by tradition, natural organic or inorganic active constituents which are not of plant source. Herbal drug is a chief constituent in traditional medicine and a common constituent in ayurvedic, homeopathic, naturopathic and other medicine systems. Herbs are usually considered as safe since they belong to natural sources.[5]

Herbal medicine is still the mainstay of about 75 - 80% of the world population, mainly in the developing countries, for primary health care. This is primarily because of the general belief that herbal drugs are without any side effects besides being cheap and locally available.[6,7]

Herbal medicines obtained from plants

India has one of the richest plants medical traditions in the world. There are estimated to be around 25,000 effective plant-based formulations, used in folk medicine and known to rural communities in India. There are over 1.5 million practitioners of traditional medicinal system using medicinal plants in preventive, promotional and curative applications. It is estimated that there are over 7800 medicinal drug-manufacturing units in India, which consume about 2000 tonnes of herbs annually.

Table 1: Medicinal plant parts exported from India, importing medicinal plants and their parts.

Exporting of herbals		**Importing of herbals**	
Botanical names	Parts used	Botanical name	Parts used
Acorus calamus	Rhizome	Aloe vera	Dried leaf
Argemone mexicana	Fruit	Adhatoda vasica	Whole plant
Curcuma amada	Rhizome	Cinnamomum iners	Bark and leaf
Curcuma longa	Rhizome	Curcuma aromatica	Rhizome
Curcuma aromatica.	Wild turmeric	Garcinia indica	ruit
Cassia lanceolata	Leaves	loriosa superba	Tuber and seed
Glycyrrhiza glabra	Root	Juniperus communis	Fruit
Withania somnifera	Vegetable rennet	Myrica nagi	Bark
Myrica nagi	Leaf	Strycnos nux-vomica	Bark and seed
Piper longum	Fruit	Phyllanthus amarus	Fruit
Rubia cordifolia	Madder root	Ricinus communis	Seed
Symplocos racemosa	Bark	Rauvolfia serpentine	Root
Swertia chirata	Whole plant	cimum sanctum	Leaf and essential oil
Terminalia chebula	Bark and seed	Tylophora purpuria	Root

Medicinal plants play an important role in the development of potent therapeutic agents. During 1950- 1970 approximately 100 plants based new drugs were introduced in the USA drug market including deserpidine, reseinnamine, reserpine, vinblastine and vincristine which are derived from higher plants. From 1971 to 1990 new drugs such as ectoposide, Eguggulsterone, teniposide, nabilone, plaunotol, Zguggulsterone, lectinan, artemisinin and ginkgolides appeared all over the world. 2% of drugs were introduced from 1991 to 1995 including paciltaxel, toptecan, gomishin, irinotecan etc. Plant based drugs provide outstanding contribution to modern therapeutics; for example: serpentine isolated from the

root of Indian plant Rauwolfia serpentina in 1953, was a revolutionary event in the treatment of hypertension and lowering of blood pressure. Vinblastine isolated from the Catharanthus rosesus (Farnsworth and Blowster, 1967) is used for the treatment of Hodgkins, choriocarcinoma, non-hodgkins lymphomas, leukemia in children, testicular and neck cancer. Vincristine is recommended for acute lymphocytic leukemia in childhood advanced stages of hodgkins, lymophosarcoma, cervical and breast cancer. (Farnsworth and Bingel, 1977). Phophyllotoxin is a constituent of Phodophyllum emodi currently used against testicular, small cell lung cancer and lymphomas. Plant derived drugs are used to cure mental illness, skin diseases, tuberculosis, diabetes, jaundice, hypertension and cancer. Medicinal plants play an important role in the development of potent therapeutic agents. Plant derived drugs came into use in the modern medicine through the uses of plant material as indigenous cure in folklore or traditional systems of medicine. More than 64 plants have been found to possess significant antibacterial properties; and more than 24 plants have been found to possess antidiabetic properties. Daboia russellii and Naja kaouthia used as antidote activity. Venom neutralization by lupeol acetate isolated from the root extract of Indian sarsaparilla Hemidesmus indicus (Chatterjee, et al., 2006). The present investigation explores the isolation and purification of another active compound from the methanolic root extract of Hemidesmus indicus, which was responsible for snake venom neutralization. Antagonism of both viper and cobra venom and antiserum action potentiation, antioxidant property of the active compound was studied in experimental animals. Recently, Chatterjee et al. (2004) reported that an active compound from the Strychnus nux vomica seed extract, inhibited viper venom induced lipid peroxidation in experimental animals. The mechanism of action of the plant derived micromolecules induced venom neutralization need further attention, for the development of plant-derived therapeutic antagonist against snakebite. However, the toxicity of plants has known for a long period of time, and the history of these toxic plants side by side with medicinal ones are very old and popular worldwide. These plants are major natural source of folk medication and also induce toxication. (Adailkan and Gauthaman, 2001; Heinrich, 2000).

Teniposide and etoposide isolated from Podophyllum species are used for testicular and lung cancer. Taxol isolated from Taxus brevifolius is used for the treatment of metastatic ovarian cancer and lung cancer. The above drugs came into use through the screening study of medicinal plants because they showed less side effects, were cost effective and possessed better compatibility.

Herbal drug technology

Herbal drug technology involves conversion of botanical materials into medicines where standardization and quality control with proper integration of modern scientific techniques and traditional knowledge is employed, and various drug delivery technologies used for herbal drugs were reported.[8,9] Conventional pharmaceutical products, herbal medicinal products may vary in composition and properties, and increasing reports of adverse reactions has drawn the attention of many regulatory agencies for the standardization of herbal formulations. In this context, correct identification and quality assurance is an essential prerequisite to ensure reproducible quality of herbal medicine, which contributes to its safety and efficacy. This review article deals with various techniques employed in extraction, characterization and standardization of herbal, poly-herbal as well as nano-herbal medicines.[10]

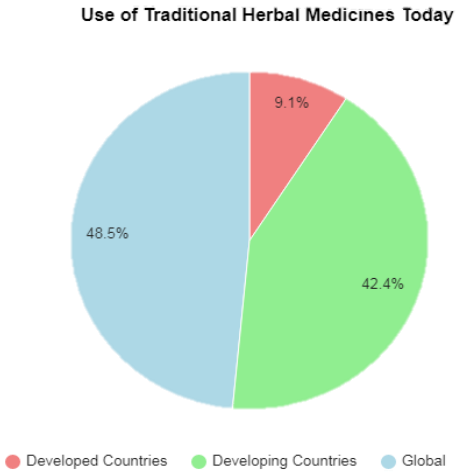
Advantages of Herbal Drugs

- Low/Minimum cost
- Potency and efficiency
- Enhanced tolerance
- More protection
- Fewer side-effects
- Complete accessibility
- Recyclable

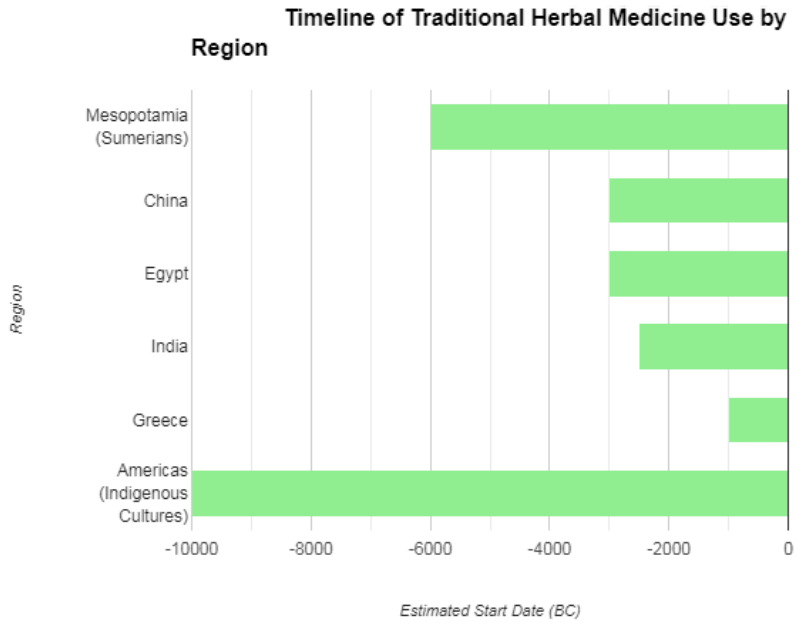
Disadvantages of Herbal Drugs

- Not able to cure rapid sickness and accidents
- Risk with self dosing
- Complexity in standardizations

Usage and Preparation of Herbal Drugs

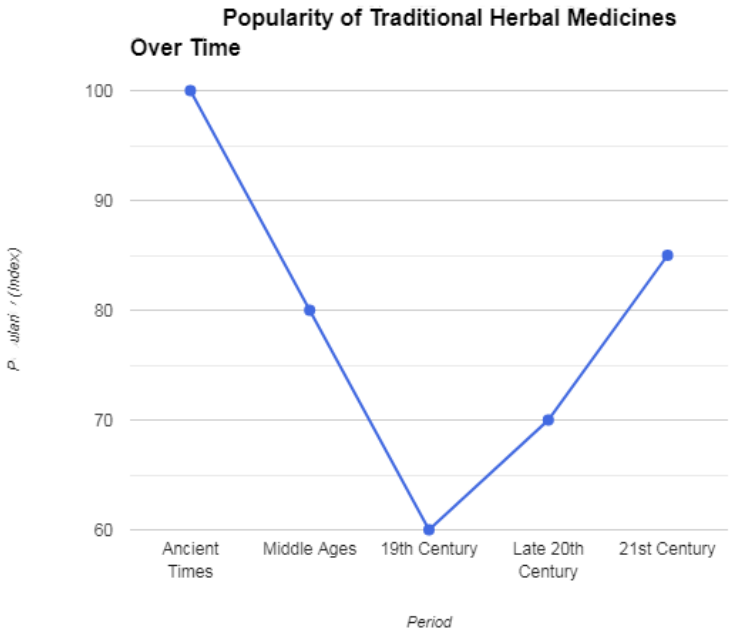


The use of herbal drugs in the correct way provides effectual and safe treatment for many ailments. The efficiency of the herbal drugs is typically subjective to the patient (11). The strength of the herbal drugs varies based on the genetic distinction, growing conditions, timing and method of harvesting, revelation of the herbs to air, light and dampness, and type of conservation of the herbs.



Some of the plants that make up herbal drugs are cultured and processed in the country and other are imported from around the world. Raw materials for herbal drugs may be derived

from carefully cultivated plants or collected in the wild.[12] Herbal drugs are accessible in several forms and often require preparation before their use. They can be normally purchased in mass form as dried plants, plant parts or insecurely packed for herbal teas and decoctions. Decoctions are made by boiling the herb in water, then straining out of the plant material. More intense forms of herbal drugs are available in the form of hydro alcoholic tinctures and fluid extracts. Methods of preparation may differ because of the nature of the plants active chemical constituents.[13]



History of Use of Traditional Herbal Medicines

By definition, 'traditional' use of herbal medicines implies substantial historical use, and this is certainly true for many products that are available as 'traditional herbal medicines'. In many developing countries, a large proportion of the population relies on traditional practitioners and their armamentarium of medicinal plants in order to meet health care needs. Although modern medicine may exist side-by-side with such traditional practice, herbal medicines have often maintained their popularity for historical and cultural reasons. Such products have become more widely available commercially, especially in developed countries. In this modern setting, ingredients are sometimes marketed for uses that were never contemplated in the traditional healing systems from which they emerged. An example is the use of Ephedra. for weight loss or athletic performance enhancement. While in some countries, herbal medicines are subject to rigorous manufacturing standards, this is not so

everywhere. In Germany, for example, where herbal products are sold as 'phytomedicines', they are subject to the same criteria for efficacy, safety and quality as are other drug products. In the USA, by contrast, most herbal products in the marketplace are marketed and regulated as dietary supplements, a product category that does not require pre-approval of products on the of any of these criteria.[14]

Trends in use

Data on the global nutrition products industry, in which herbal and botanical products are often included, are given in Table 1. Sales of dietary supplement products, including herbal and botanical supplements, in the USA increased dramatically during the 1990s, stimulated in the latter part of the

Table 1: The global nutrition products industry in 1999, including herbal and botanical products (in millions of US $).

Country	Vitamins/minerals	Herbs/botanicals	Sports, meal replacement, homeopathy, specialty Naturala foods	Natural personal care	Functional foodsb	Total
USA	7,070	4,070	4,320	9,470	3,590	44,520
Europe	5,670	6,690	2,510	8,280	3,660	42,200
Japan	3,200	2,340	1,280	2,410	2,090	23,150
Canada	510	380	250	700	330	3,670
Asia	1,490	3,170	970	710	880	8,670
Latin America	690	260	250	460	250	2,270
Australia and New Zealand	300	190	90	340	140	1,600
Eastern Europe and Russian Federation	350	220	250	180	40	1,300
Middle East	180	90	60	70	30	570
Africa	160	80	70	80	10	520
Total global	19,260	17,490	9,960	22,700	11,020	128,470

From Nutrition Business Journal (2000), derived from a number of sources. Totals may not add up due to rounding. a Natural foods: foods grown or marketed with a focus on the perceived benefits of 'foods derived from natural sources' and that are, to varying degrees, free of pesticides, additives, preservatives, and refined ingredients b Functional foods: foods fortified with added or concentrated ingredients to improve health and/or performance decade by the Dietary Supplements Health and Education Act of 1994 (DSHEA) (Tyler, 2000). This pattern of growth has been replicated elsewhere in the world (Table 2), although more

recently, sales of herbal products have apparently experienced a decline. In the European Union (EU), in general, herbal products for which therapeutic claims are made must be marketed and regulated as drugs, while those that do not make such claims may be found in the food or cosmetic categories. Attempts are at present being made to harmonize the scientific and regulatory criteria that govern the marketing of herbal products (AESGP, 1998).

Table 2: Trends in the global nutrition products industry, 1997–2000 (in millions of US $).

	Vitamins/minerals	Herbs/botanicals	Sports, meal replacement, homeopathy, specialty	Natural foods	Natural personal care	Functional foods	Total
1997	20440	18070	10710	25420	11850	51480	137980
1998	19620	17490	9960	22700	11020	47670	128470
1999	18870	16980	9310	19910	10280	43940	119290
2000	18000	15990	8760	16690	9620	40320	109380

From Nutrition Business Journal (2000), derived from a number of sources a Natural foods: foods grown or marketed with a focus on the perceived benefits of ‘foods derived from natural sources’ and that are, to varying degrees, free of pesticides, additives, preservatives, and refined ingredients b Functional foods: foods fortified with added or concentrated ingredients to improve health and/or performance

In 1994, when the Dietary Supplements Health and Education Act (DSHEA) was passed in the USA, approximately 50% of the adult population of the country was reported to use dietary supplements and sales of all products combined were approximately $4 billion. This category of products includes vitamins, minerals and a variety of other ingredients; herbal products accounted for about one quarter of those sales. In 2000, the last year for which comparable data are available, again 50% of the adult population reported use of dietary supplements, and sales were close to $15 billion; herbals accounted for nearly one third of those sales. Table 3 identifies some trends in herbal supplement use in the USA from 1997 to 2000.

In the 1990s, the USA saw the growth of government organizations concerned with dietary supplements, such as the National Institutes of Health (NIH) National Center for Complementary and Alternative Medicine and Office of Dietary Supplements, and the

National Cancer Institute (NCI) Chemoprevention Program of the Division of Cancer Prevention and Control. Organizations involved with dietary supplements such as the

Table 3: Ten top-selling herbs in the USA, 1997–2000 (in millions of US $).

	Combination herbs	Ginkgo biloba	Echinacea	Garlic (Allium sativum)	Ginseng	St John's wort (Hypericum perforatum)	Saw palmetto (Serenoa repens)	Soy (soya)	Valerian (Valeriana officinalis)	Kava-kava	Total herbal supplements	
1997	1659	227	203	216	228	100	86	0	30	22	NaN	
1998	1762	300	208	198	217	308	105	0	41	44	NaN	
1999	1740	298	214	176	192	233	117	36	57	70	4070	
2000	1821	248	210	174	173	170	131	61	58	53	4130	

From Nutrition Business Journal (2001) and Schulz et al. (2001). US consumer sales via all channels (includes all retail channels, direct sales, multilevel marketing, mail order and practitioner sales) b Combination herbs include products sold for weight management, athletic performance enhancement or energy enhancement and often include mixtures of several herbal extracts, as well as single-compound ingredients. Others that have appeared in the top 10 list in earlier years, but not in 2000, include: goldenseal (Hydrastis canadensis), cranberry, bilberry (European blueberry), aloe (see monograph on Rubia tinctorum, Morinda officinalis and anthraquinones in this volume). c Two types of coneflower preparation can be recommended and prescribed today: alcoholic extracts made from the root of the pale purple coneflower (Echinacea pallida) and juices expressed from the fresh aerial parts of the purple coneflower (Echinacea purpurea). It is noteworthy that until about 1990, the root of Echinacea pallida appears to have been regularly confused with that of the species Echinacea angustifolia. d Panax ginseng is cultivated in Asia; panax quinquefolius is cultivated in the USA.

American Nutraceutical Association and the Foundation for Innovative Medicine, as well as industry trade associations such as the American Herbal Products Association, the Consumer Healthcare Products Association, the National Natural Foods Association, the Utah Natural Products Alliance and the Council for Responsible Nutrition have been expanding during the 1990s.

In Canada, herbal use has also increased. Berger (2001) noted, in summarizing the results of a 2001 survey of 2500 persons, 15 years of age and older, that herbal remedies were used by 38% of respondents, up from 28% in 1999. A survey in 1998 of the most popular remedies reported in Canada is given in Table 4.

In 1994, the European herbal medicine market was worth over £1.8 billion [US$ 2.8 billion] at retail selling prices. Although the UK market was smaller than that of Germany (in 1994 it was £88 million, compared with £1400 million), it had one of the highest forecast growth rates in Europe (Shaw, 1998).

Table 4: Top 10 most popular herbal remedies in Canadaa.

Herb	% who use among herbal users	% of users in general population
Echinacea	**54**	**19**
Garlic (Allium sativum)	**52**	**18**
Ginsengb	**42**	**15**
Camomile (Chamomilla recutita) c	**38**	**13**
Ginkgo biloba	**20**	**7**
Evening primrose (Oenothera biennis)	**20**	**7**
Devil's claw (Harpagoghytum procumbens)	**17**	**6**
St John's wort (Hypericum perforatum)	**17**	**6**
Tea tree oil (Melaleuca alternifolia)	**15**	**5**
Valerian (Valeriana officinalis)	**13**	**5**

From Non-Prescription Drug Manufacturers Association of Canada (1998), Sibbald (1999) and Schultz et al. (2001) a From a survey of 6849 adults in April 1998 b See Table 3. c Reported previously as Matricaria chamomilla (WHO, 1999).

The European market for herbal medicinal products was estimated to be worth $5.6 billion at public price level in 1995 (AESGP, 1998).

The role of herbal medicines in traditional healing

The pharmacological treatment of disease began long ago with the use of herbs.. Methods of folk healing throughout the world commonly used herbs as part of their tradition. Some of these traditions are briefly described below, providing some examples of the array of important healing practices around the world that used herbs for this purpose.[15]

Use of Traditional Herbal Medicines in Developed Countries

Plants and their secondary metabolite constituents have a long history of use in modern 'western' medicine and in certain systems of traditional medicine, and are the sources of important drugs such as atropine, codeine, digoxin, morphine, quinine and vincristine.

Use of herbal medicines in developed countries has expanded sharply in the latter half of the twentieth century. Monographs on selected herbs are available from a number of sources, including the European Scientific Cooperative on Phytotherapy, German Commission E and the World Health Organization.[16,17,18] The WHO monographs, for example, describe the herb itself by a number of criteria (including synonyms and vernacular names) and the herb part commonly used, its geographical distribution, tests used to identify and characterize the herb (including macroscopic and microscopic examination and purity testing), the active principles (when known), dosage forms and dosing, medicinal uses, pharmacology, contra-indications and adverse reactions. Other resources that provide detailed information about herbal products in current use include the Natural Medicines Comprehensive Database and NAPRALERT (NAtural PRoducts ALERT) (2001).[19]

Tradition and safety of herbal medicines

Many supporters of herbal medicines argue that products with a long history of popular use are generally safe when used properly at common therapeutic doses. A crucial question underlying this statement is the extent to which the absence of evidence of toxicity could be taken as evidence of the absence of toxicity or safety of herbal medicines. Whether the absence of records of adverse effects is an indication of lack of toxicity depends on the type of toxic effect and the likelihood of observing such an adverse outcome under the conditions prevailing in the traditional usage. Acute symptoms and short term toxic effects, such as gastro-intestinal disturbances and dermatological effects, are likely to be recognized and associated to herbal medicine. Therefore, the absence of such observations provides some evidence of safety in these particular endpoints. Long-term adverse outcomes, such as cancer, liver and kidney damage, reproductive dysfunctions, birth defects and several morbidities that

are more difficult to detect, however, are unlikely to be associated with the popular use of a medicine, unless an adequately designed epidemiology study (preferably, a prospective cohort study) is undertaken.

Thus, the absence of evidence of these adverse effects within the context of traditional usage of herbal medicines is not evidence of the absence of potential to cause them. As far as drugs are concerned, safety is assumed only when the null hypothesis (absence of toxicity) has not been disproved after being challenged by properly designed and comprehensive set of pre-clinical and clinical studies, that had enough statistical power to reject it if it were false.[20]

Regulation of herbal medicines

WHO has evolved guidelines to support the member in their efforts to formulate national policies on traditional medicine and to study their potential usefulness including evaluation, safety, and efficacy.[21,22] In India, traditional medicine is governed by the Drugs and Cosmetics Act, 1940 and the provisions of the Act are implemented by the state governments. The first Indian National Health Policy 1983claims that India's is the richest source of herbs and the drugs should be standardized. The department of AYUSH, Government of India, launched a central scheme to develop standard operating procedures for the manufacturing process to develop pharmacopeia standards for Ayurvedic preparations. The Regulation for herbal drug products in Europe and United states are more stringent than in India.[23,24,25]

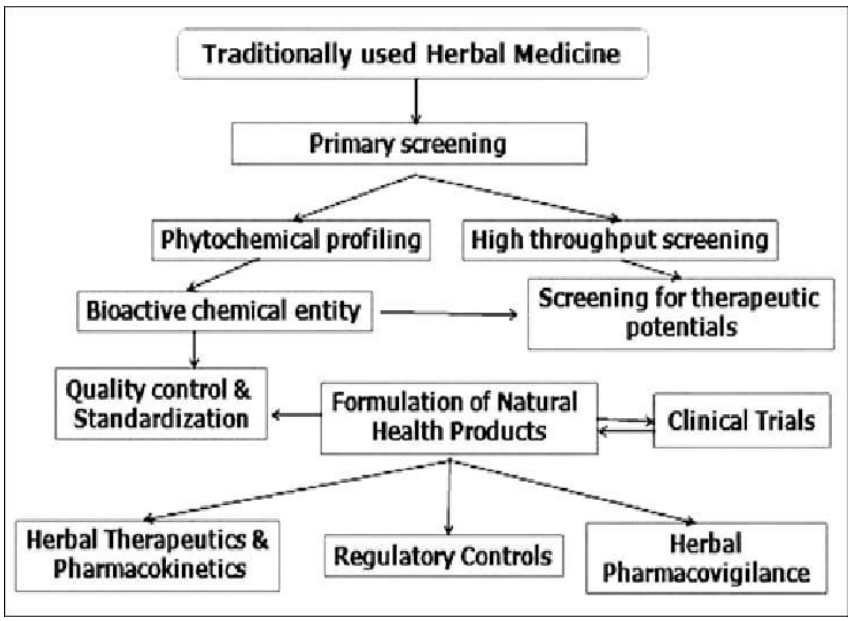


Fig. 1: Integrated approaches for the development of herbal medicine.[56]

Pharmacovigilance of Herbal Medicines

Pharmacovigilance means the science and activities relating to detect, assess, understand, and to prevent the adverse effects or any other possible drug-related problems, which is not only confined to chemical drugs, but extended to herbal, traditional and complementary medicines, biological, vaccines, blood products and medical devices.[26] There is an increasing recognition of the need to develop safety monitoring systems for herbal medicines.[27,28] The herbal products of ginseng are in great demand as it is considered as a safe herbal drug for human health in spite of few reports on adverse drug reactions. But this is not applicable to every herbal product. Therefore, pharmacovigilance is essential for herbal drug before being considered as a safe for human health.[29]

WHO has set specific guidelines for the assessment of the safety, efficacy and quality of herbal medicines as a prerequisite for global harmonization .The Medicines and Healthcare Products Regulatory Agencies, UK had launched 'yellow card' scheme for monitoring the safety of herbal medicines. Medicinal herbs as potential source therapeutics aids have attained a significant role in health care system all over the world for human beings not only in the diseased condition but also as potential material for maintaining proper health.[30] Canadian Health Care department has analyzed various unapproved Ayurvedic medicinal products that contain high levels of lead, mercury, and arsenic in various Indian formulations [Karela capsules (Himalaya Drug, India), Maha Sudarshan Churna (Zandu Pharmaceuticals, India), Safi liquid (Hamdard, India & Pakistan), Shilajit capsules (Dabur, India)] and some herbal products were found to contain 0.1 to 0.3 mg of betamethasone which produced corticosteroid-like side effects. Reports have been received by drug safety monitoring agencies of prolonged prothrombin times, increased coagulation time, subcutaneous hematomas, and intracranial hemorrhage associated with the use of Ginkgo biloba.[31]

Regulatory Status of Herbal Drugs

The lawful situation of herbal drugs varies from country to country. Developing countries have folk knowledge of herbs and their use in traditional medicine is wide spread. But, these countries do not have any lawmaking criteria to include these traditionally used herbal drugs in drug legislation.[32]

Endorsement of herbal drugs in most countries is based on traditional herbal references, provided they are not known to be unsafe when used to treat slight illnesses. But, now-a-days claims are being made to treat more serious illnesses with herbal drugs for which no

traditional knowledge is present.[33] Therefore, narrow requirements for herbal drugs are necessary to ensure the safety efficacy and quality and to support specific indications; scientific and clinical evidence must be acquired. Depending upon the nature of herbs and market availability, different requirements exist for submission of clinical trial data and toxicity data. The regulatory requirements of herbal drugs is varies from one country to other country Some countries accept traditional, experience based evidence while some consider herbal remedies as dangerous or of questionable value.[34]

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. The number of patients seeking herbal approaches for therapy is also growing exponentially.[35,36] With the US Food & Drug Administration (FDA) relaxing guidelines for the sale of herbal supplement[37], the market is booming with herbal products.[38]

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.[6] In the last few decades, a curious thing has happened to botanical medicine. Instead of being killed of 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.[39]

In a recent survey[40] 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.[41] 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. Belladona still provides the chemical used in opthalmological preparations and in antiseptics used to treat gastrointestinal disorders. *Rauvolfia 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.[39]

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[42] 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.[40,43,44,45] By 1994, pharmacologist Norman Farnswoth 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–through put 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 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.[46]

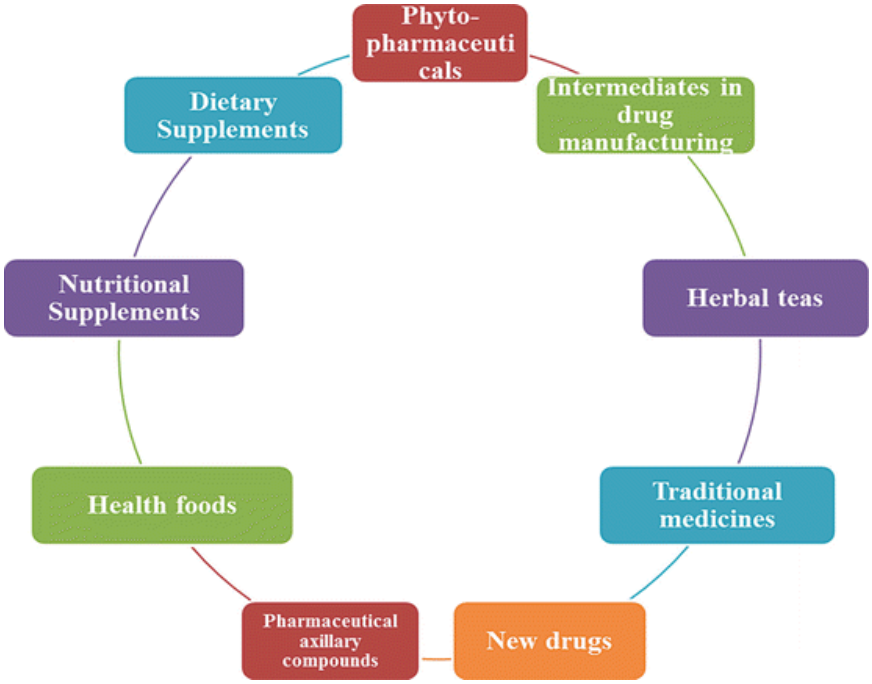


Fig. 2: History and current status of herbal medicines.[57]

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).[47] Vegetable products dominated *Indian Meteria 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.[48] Charak, Sushruta and Vagbhata described 700 herbal drugs with their properties and clinical effects.

Based on clinical effects 50 categories of drug have been decribed – such as appetizers, digestive stimulant, laxatives, anti-diarrhea, anti-haemorrhoid, anti-emetic, anti-pyretic, anti-inflammatory, anti-pruritic, anti-asthmatic, antiepileptic, 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.[47]

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.[48] 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-synaptc neuronal vesicular uptake of biogenic amines (dopamine, serotonin and nor-epinephrine). Mainmool (*Coleus forskoli Briq*) Forskolin directly stimulates adenylate cyclase and cyclic AMP, with inotropic and Lusitropic effect on heart muscle. Sallaki (*Boswellia serrata*) Boswelic acid inhibits 5-lipooxygenase and leukotreine B4 resulting in anti inflammatory and anti-complement effect. Shirish (*Albizzia lebek*) prevents mast cell degranulation, similar to sodium cromoglycate. Aturagupta (*Mucona 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[47&49] 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 racemousus*, *Tinospora codifolia* and *Ocimum sanctum* antagonise the effect of stress.[50] *Emblica officinalis*., *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 Use of the herbal medicine in jaundice, presumably viral hepatitis, has been known in India science 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 hepatoproctective 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.[52] 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 'Kutaki' (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 prepration 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.[53] 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.[54] 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.[55]

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.[6]

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.[48] 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.[6] 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 coordination among the national laboratories that are investigating medicinal plants. (iii) A serious dialogue between publicly funded institution and the industry is conspicuous by it's 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.[48]

CONCLUSION

Herbal medicine holds immense promise, offering a natural approach to healthcare and potentially. While historically used for centuries, many herbal remedies are now being re-

evaluated though a scientific lens. This review explore the current status of herbal medicine, highlighting its potential benefits alongside the need for rigorous research.

ACKNOWLEDGEMENTS

We are highly thankful to the management, Director and Principal of SES's Rupesh Badhan Institute of Pharmacy, Pimpalner for encouraging us constantly and providing us all the necessary facilities to carry out this work.

REFERENCE

1. Winslow, L; Kroll, DJ, "*Herbs as Medicines, Archives of Internal Medicine*", 1998; 158: 2192-2199.
2. Gossell, M; Simon, OR; West, ME, "The past and the present use of plants for medicines", *West Indian Medical Journal*, 2006; 55: 217.
3. De-Smet, PGAM, "The role of plant derived drugs and herbal medicines in healthcare drugs, 1997; 54: 801-840.
4. WHO technical report series, "*Guidelines for the Assessment of Herbal Medicines*", 1996; 863: 178-184.
5. Abhishek, K; Ashutosh, M and Sinha, BN, "Herbal drugs- present status and efforts to promote and regulate cultivation", *The Pharma Review*, 2006; 6: 73-77.
6. Kamboj VP. Herbal Medicine. *Current Science*, 2000; 78: 35-9.
7. Gupta LM and Raina R. Side effects of some medicinal plants. *Current Science,* 1998; 75: 897-900.
8. Ray A, Gulati K. Recent advances in herbal drug research and therapy. I K International, 2010; 23-25.
9. Agarwal SS, Paridhavi M. Herbal drug technology, Universities Press India Pvt Ltd, 2007.
10. Zafar R, Panwar R, Sagar Bhanu PS. Herbal drug standardization: The Indian Pharmacist, 2005; 4(36): 21-25.
11. Sutherland, LR and Verhoef, MJ, "Why do patients seek a second opinion or alternative medicine", *Clinical Gastroenterology*", 1994; 19: 194-197.
12. Harish, P, "Herbal drugs", *Current Science*, 2001; 81(1): 15.
13. Coleman, LM and Fowler, LL and Williams ME, "Use of unproven therapies by people with alzheimer"s disease", *Journal of the American Geriatrics Society*, 1995; 43: 747-750.

14. Shaw, D. Risks or remedies ? Safety aspects of herbal remedies. *J. Roy. Soc. Med.*, 1998; 91: 294–296.
15. Schulz, V., Hänsel, R. & Tyler, V.E. *Rational Phytotherapy. A Physician's Guide to Herbal Medicine*, 4th Ed., Berlin, Springer-Verlag, 2001.
16. ESCOP (European Scientific Cooperative on Phytotherapy) *ESCOP Monographs on the Medicinal Uses of Plant Drugs*, Exeter, UK., 1999.
17. Blumenthal, M., Busse, W.R., Goldberg, A., Gruenwald, J., Hall, T., Riggins, C.W. & Rister, R.S., eds., *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines*, Austin, TX/Boston, MA, American Botanical Council/Integrative Medicine Communications, 1998.
18. WHO *WHO Monographs on Selected Medicinal Plants*, Geneva, 1999; 1.
19. Jellin, J.M. (2002) *Natural Medicines Comprehensive Database (Pharmacists Letter/Prescribers Letter)*, Stockton, CA, Therapeutic Research Faculty.
20. Fong, H.H., Integration of herbal medicine into modern medical practices: issues and prospects. Integr. Cancer Ther., 2002; 1: 287-293.
21. Quality Control Methods for Medicinal Plant Materials, WHO, Geneva, 1996.
22. Organisation Mondiale De and La Sante .Quality control methods for medicinal plant materials. Original English, World Health Organisation, 1992; 159.
23. Shrikumar S, Maheshwari U, Sughanti A, Ravi TK .WHO guidelines for standardization of herbal drugs. Pharminfo.net, 2006; 2: 78-81.
24. Kalaiselvan V, Kalpeshkumar SA, Patel FB, Shah CN, Kalaivani M, Rajasekaran A. Quality assessment of different marketed brands of *Dasamoolaristam*, an Ayurvedic formulation. Int J Ayurvedic Res., 2010; 1(1): 10-13.
25. Singh A, Sharan VA, Kharab V, Bhandari A. Current status of regulation for herbal medicine in Europe united state and India. J Natura Conscientia, 2011; 2(3): 406-422.
26. Pharmacovigilance of herbal medicines: Current state and future directions: London, UK, 26 28 April, 2006. Drug Safety, 2006; 29(4): 341-370.
27. http://apps.who.int/medicinedocs/en/m/abstract/Js7148e..
28. Asiri Y, Al-Dhawailie A, Alqasoumi S, Al-Yahya M, Rafatullah S . Pharmacovigilance in herbal medicine: A paradigm to drug toxicity monitoring in conventional health care. Hung Med J., 2008; 2(3): 351-363.
29. Barnes J. Pharmacovigilance of herbal medicines: a UK perspective. Drug Safety, 2003; 26(12): 829-851.

30. Atmakuri LR, Dath S. Current trends in herbal medicines. Journal of Pharm Res., 2010; 3(1): 109-111.
31. Wal P, Wal A, Gupta S, Sharma G, Rai AK. Pharmacovigilance of herbal products in India. J Young Pharmacists, 2011; 3: 256-258.
32. Sukhdev, S; Arun, N and Kalia, AN, "Patentability of herbal products: A review", *The Pharma Review*, 2008; 4: 118-124.
33. Raskin, L *et al.*, "Plants and human health in the twenty first century", *Trends in Biotechnology*, 2002; 20(12): 522-531.
34. Calixto, JB, "Efficacy, safety, quality control, marketing, and regulatory guidelines for herbal medicines", *Brazilian Journal of Medical and Biological Research*, 2000; 33: 179-189.
35. Murray MT and Pizzorno JE Jr. Botanical medicine - a modern perspective. In Text Book of Natural Medicine (eds. Pizzorno JE Jr., Murray M T) Churchill Livingstone, 2000; 1: 267-79.
36. Alschuler L, Benjamin SA, Duke JA. Herbal medicine - what works, what is safe. *Patient Care*, 1997; 31: 48-103.
37. Gottlieb S. Chinese herb may cause cancer. *BMJ*, 320,1623A.Gottlieb S. US relaxes its guidelines on herbal supplements. *BMJ*, 2000; 320: 207.
38. Brevoort P. The booming US botanical market. A new overview. *Herbal Gram*, 1998; 44.
39. Dwyer J and Rattray D. Anonymous. Plant, People and Medicine. In Magic and Medicine of Plant. *Reader's Digest general book*, 1993; 48-73.
40. Carter AJ. Dwale: an anesthetic from old England. *BMJ*, 1999; 319: 1623-6.
41. Harvey AL. Medicines from nature: are natural product still relevant to drug discovery? *Trends Pharmacol Sci.*, 1999; 20: 196-8.
42. Robbers JE, Speedie M, Tyler VE. Pharmacognosy and Pharmacobiotechnology. *Williams and Wilkins, Baltimore*, 1996; 1-14.
43. Vickers A and Zollman C. ABC of complementary medicine: herbal medicine. *BMJ*, 1999; 319: 1050 -3.
44. Bensoussan A, Talley NJ, Hing M, et al. Treatment of irritable bowel syndrome with Chinese herbal medicine: a randomized controlled trial. *JAMA*, 1998; 280: 1585-9.
45. Schuppan D, Jia JD, Brinkhaus B, et al. Herbal product for liver diseases: A therapeutic challenge for the new millennium.*Hepatology*, 1999; 30: 1099-104.
46. Cox PA. Will tribal knowledge survive the millennium? *Science*, 2000; 287: 44-5.

47. Lele RD. Ayurveda (Ancient Indian System of Medicine) and modern molecular medicine. *J Assoc Physicians India*, 1999; 47: 625-8.
48. Valiathan MS. Healing Plants. *Curr Science,* 1998; 75: 1122 –7.
49. Sukh Dev. Ethnotherapeutics and modern drug development: The potential of Ayurveda. *Current Science*, 1997; 73: 909-28.
50. Dhuri KD, Vaidya VA, Vaidya AD, et al. Stress and Ayurveda: Selye-Mehata Dialogue in context of the current findings. *JAPI*, 2000; 48: 428-31.
51. Scartezzini P and Speroni E. Review on some plant of Indian tratitional medicine with antioxidant activity. *J Ethnopharmacol*, 2000; 71: 23-43.
52. Bhatt AD and Bhatt NS. Indigenous drugs and liver disease. *Indian J Gastroenterol*, 1996; 15: 63-7.
53. Tandon RK. Herbal medicine in the treatment of viral hepatitis. *J Gastroenterol Hepatol*, 1999; 14: A291-2.
54. Jain SK and DeFilipps RA. Medicinal plants of India. *Reference Publication, Inc.*, 1991.
55. Pal SK. Complementary and alternative medicine: An overview. *Curr Science*, 2002; 82: 518-24.
56. Adailkan, P.G. and Gauthaman, K. The Aging Male, 2001; 4: 163-169.
57. Farnsworth, N.R. and Bingel, A.S. Problems and prospects of discovery new drugs from higher plants by pharmacological screening. Springer Verlag, Berlin, 1977; 1-22.
58. Farnsworth, N.R., Blowster, R.N., Darmratoski, D., Meer, W.A., and Cammarato, L.V. Studies on Catharanthus alkaloids IV Evaluation by means of TLC and ceric ammonium sulphate spray reagent, Lloydia, 1967; 27: 302-314.
59. Chatterjee, I. Chakravarty, A.K. and Gomesa A. Br. J. Ethnopharmacol, 2006; 106(1): 38-43.
60. Chatterjee, I., Chakravarty, A.K. and Gomes, A. Indian J. Exp Biol., 2004; 42: 468-475.
61. Heinrich, M., Phytochemistry, 2000; 53: 619-620.
62. https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.researchgate.net%2Ffigure%2FIntegrated-approaches-for-the-development-of-herbal-medicine_fig2_316546661&psig=AOvVaw2qEzFIDrXUZyorlSO5tJ40&ust=1710054738920000&source=images&cd=vfe&opi=89978449&ved=0CBEQjRxqFwoTCNjwttDr5oQDFQAAAAAdAAAAABAD
63. https://www.google.com/url?sa=i&url=https%3A%2F%2Flink.springer.com%2Fchapter%2F10.1007%2F978-3-319-43806-1_2&psig=AOvVaw2J94feX2TX7zXqXE8Yk8sW&ust=1710062587278000&source=i

mages&cd=vfe&opi=89978449&ved=2ahUKEwioqd7Z7eaEAxVbbGwGHbOADxUQjRx6BAgAEBU

64. AESGP (Association Européenne des Spécialités Pharmaceutiques Grand Public; The Association of the European Self-Medication Industry) (1998) *Herbal Medicinal Products in the European Union. Study Carried out on Behalf of the European Commission*, Brussels.
65. Allison, D.B., Fontaine, K.R., Heshka, S., Mentore, J.L. & Heymsfield, S.B. Alternative treatments for weight loss: A critical review. *Crit. Rev. Food Sci. Nutr.*, 2001; 41: 1–28.
66. Angell, M. & Kassirer, J.P. Alternative medicine — The risks of untested and unregular remedies. *New Engl. J. Med*., 1998; 339: 839–841.
67. Awang, D.V.C. Quality control and good manufacturing practices: Safety and efficacy of commercial herbals. *Food Drug Law Inst*., 1997; 52: 341–344.
68. Berger, E. (2001) *The Canada Health Monitor Surveys of Health Issues in Canada, Survey 22*, Ottawa, Health Canada.
69. Bhat, K.K.P. (1995) Medicinal plant information databases. In: *Non-Wood Forest Products. 11. Medicinal Plants for Conservation and Health Care*, Rome, Food and Agriculture Organization.
70. Blumenthal, M., Busse, W.R., Goldberg, A., Gruenwald, J., Hall, T., Riggins, C.W. & Rister, R.S., eds (1998) *The Complete German Commission E Monographs: Therapeutic Guide to Herbal* 66 IARC MONOGRAPHS VOLUME 82 *Medicines*, Austin, TX/Boston, MA, American Botanical Council/Integrative Medicine Communications.
71. Calixto, J.B. Efficacy, safety, quality control, marketing and regulatory guidelines for herbal medicines (phytotherapeutic agents). *Braz. J. med. biol. Res.*, 2000; 33: 179–189.
72. Castot, A., Djezzar, S., Deleau, N., Guillot, B. & Efthymiou, M.L. [Drug surveillance of herbal medicines] *Thérapie*, 1997; 52: 97–103. (in French)
73. Chan, T.Y.K. Monitoring the safety of herbal medicines. *Drug Safety*, 1997; 17: 209–215.
74. Chang, J. Scientific evaluation of traditional Chinese medicine under DSHEA: A conundrum. *J. altern. complem. Med*., 1999; 5: 181–189.
75. Cho, B.-H. The politics of herbal drugs in Korea. *Soc. Sci. Med.*, 2000; 51: 505–509.
76. Council of Europe (1996) *European Pharmacopoeia*, 3rd Ed., Strasbourg.
77. De Smet, P.A. Should herbal medicine-like products be licensed as medicines? *Br. med. J*., 1995; 310: 1023–1024.

78. Eguchi, K., Hyodo, I. & Saeki, H. Current status of cancer patients' perception of alternative medicine in Japan. A preliminary cross-sectional survey. *Sup. Care Cancer*, 2000; 8: 28–32.
79. EMEA (European Agency for the Evaluation of Medicinal Products) (2000) *Working Party on Herbal Medicinal Products: Position paper on the risks associated with the use of herbal products containing* Aristolochia species *(EMEA/HMPWP/23/00)*, London
80. ESCOP (European Scientific Cooperative on Phytotherapy) (1999) *ESCOP Monographs on the Medicinal Uses of Plant Drugs*, Exeter, UK.
81. European Commission Council Directive 65/65/EEC of 26 January 1965 on the approximation of provisions laid down by Law, Regulation or Administrative Action relation to proprietary medicinal products. *Off. J.*, 1965; P22: 369–373.
82. European Commission Second Council Directive 75/319/EEC of 20 May 1975 on the approximation of provisions laid down by Law, Regulation or Administrative Action relating to proprietary medicinal products. *Off. J.*, 1975; L147: 13–22.
83. European Commission Council Directive 92/28/EEC of 31 March 1992 on the advertising of medicinal products for human use. *Off. J.*, 1992a; L113: 13–18.
84. European Commission Council Directive 92/25/EEC of 31 March 1992 on the wholesale distribution of medicinal products for human use. *Off. J.*, 1992b; L113: 1–4.
85. Food and Drug Administration (2000) *Guidance for Industry: Botanical Drug Products*, Washington DC, Center for Drug Evaluation and Research [http://www.fda.gov/cder/guidance/index.htm]
86. Food and Drug Administration (2002) *Good Manufacturing Practices (GMP)/Quality System (QS) Regulation* [http://www.fda.gov/cdrh/dsma/cgmphome.html]
87. Goldman, S.A. & Kennedy, D.L. FDA's Medical Products Reporting Program. A joint effort toward improved public health. *Postgr. Med.*, 1998; 103: 13–16.
88. 91)Griffin, J.P. The evolution of human medicines control from a national to an international perspective. *Adverse Drug React. Toxicol. Rev.*, 1998; 17: 19–50.
89. Health Canada Online Advisory: Health Canada Requests Recall of Certain Products containing Ephedra/ephedrine, Jan. 9, 2002a.
90. Health Canada Online Advisory: Health Canada is advising consumers not to use any products containing kava, Jan. 16, 2002b.
91. Jellin, J.M. (2002) *Natural Medicines Comprehensive Database (Pharmacists Letter/Prescribers Letter)*, Stockton, CA, Therapeutic Research Faculty.

92. Johnson, T. News. Chinese medicine now part of primary care scene in BC. *Can. med. Assoc. J*., 2001; 164: 1195.
93. Keller, K. Legal requirements for the use of phytopharmaceutical drugs in the Federal Republic of Germany. *J. Ethnopharmacol*., 1991; 32: 225–229.
94. Kozyrskyj, A. Herbal products in Canada. How safe are they ? *Can. Family Phys. Med. Famille Can*., 1997; 43: 697–702.
95. Kraft, K. Herbal medicine products and drug law. *Forsch. Komplementärmed.*, 1999; 6: 19–23.
96. Li, L. [Opportunity and challenge of traditional Chinese medicine in face of the entrance to WTO (World Trade Organization)]. *Chin. Inform. trad. Chin. Med.*, 7: 7–8 (in Chinese)
97. Mills, S.Y. The House of Lords report on complementary medicine. *Complem. Ther. Med*., 2001; 9: 34–39.
98. Ministry of Agriculture, Fisheries and Food (MAFF) (1998) *Herb Legislation*, London, Herb Society.
99. Morgan, K. (2002) Medicine of the Gods: Basic Principles of Ayurvedic Medicine]
100. Moulds, R.F.W. & McNeil, J.J. Herbal preparations — To regulate or not to regulate *Med. J. Austral.*, 1988; 149: 572–574.
101. NAPRALERT (2001) University of Illinois at Chicago, Program for Collaborative Research in the Pharmaceutical Sciences [http://pcog8.pmmp.inc.edu/mcp/mcp.html
102. Non-prescription Drug Manufacturers Association of Canada (1998) *Health Vision 98*, Ottawa.
103. Nutrition Business Journal (2000) *Global Nutrition Industry*, San Diego, CA.
104. Nutrition Business Journal (2001) *US Nutrition Industry: Top 70 Supplements 1997–2000*, San Diego, CA.
105. Saito, H. Regulation of herbal medicines in Japan. *Pharmacol. Regul.*, 2000; 41: 515–519.
106. Sandberg, F. & Corrigan, D. *Natural Remedies. Their Origins and Uses*, New York, Taylor & Francis, 2001.
107. Schulz, V., Hänsel, R. & Tyler, V.E. *Rational Phytotherapy. A Physician's Guide to Herbal Medicine*, 4th Ed., Berlin, Springer-Verlag, 2001.
108. Shaw, D. Risks or remedies ? Safety aspects of herbal remedies. *J. Roy. Soc. Med.*, 1998; 91: 294–296.

109. Sibbald, B. New federal office will spend millions to regulate herbal remedies, vitamins. *Can. med. Assoc. J*., 1999; 160: 1355–1357.
110. Therapeutic Goods Administration *Medicines Regulation and the TGA* (December 1999), Woden, ACT, Australia, 1999.
111. Tyler, V.E. Herbal medicine: From the past to the future. *Public Health Nutr*., 2000; 3: 447–452.
112. WHO *Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines*, Manila, 1993.
113. WHO *Annex II. Guidelines for the Assessment of Herbal Medicines* (WHO Technical Report Series No. 863), Geneva, 1996.
114. WHO (1999) *WHO Monographs on Selected Medicinal Plants*, Vol. 1, Geneva.
115. Zhang, X. (1998) *Regulatory Situation of Herbal Medicines. A Worldwide Review*.
116. 1), Geneva, World Health Organization.